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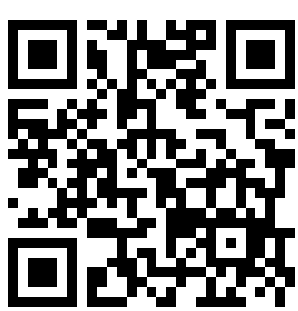
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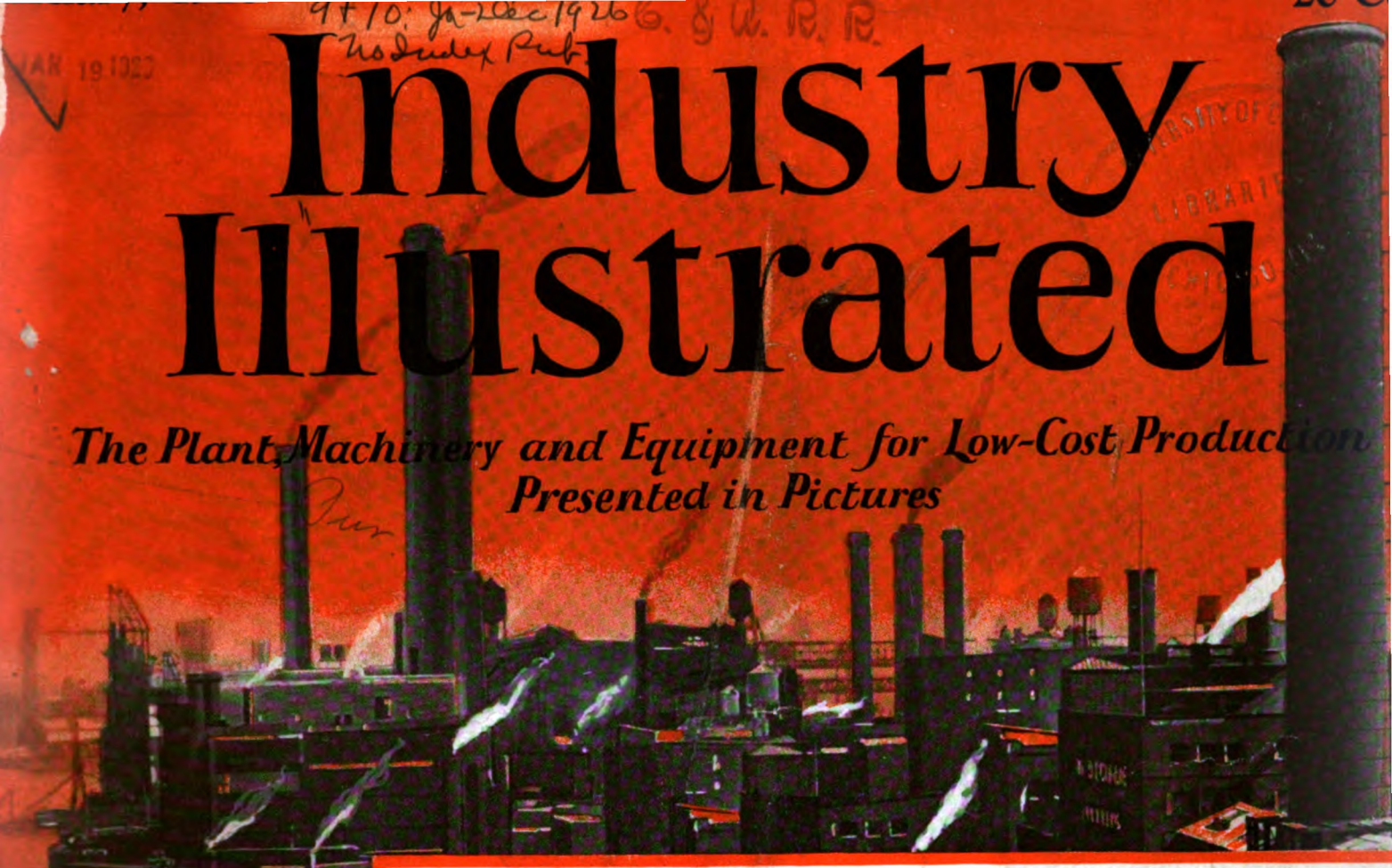
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JAN 19 1927

Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures



Mr. Hoover's New Year's Greeting

"The dominant favorable factor in our outlook is our increased productivity, due to fundamental and continuing forces—such as the cumulation of education, the advancement of science, skill and elimination of waste.

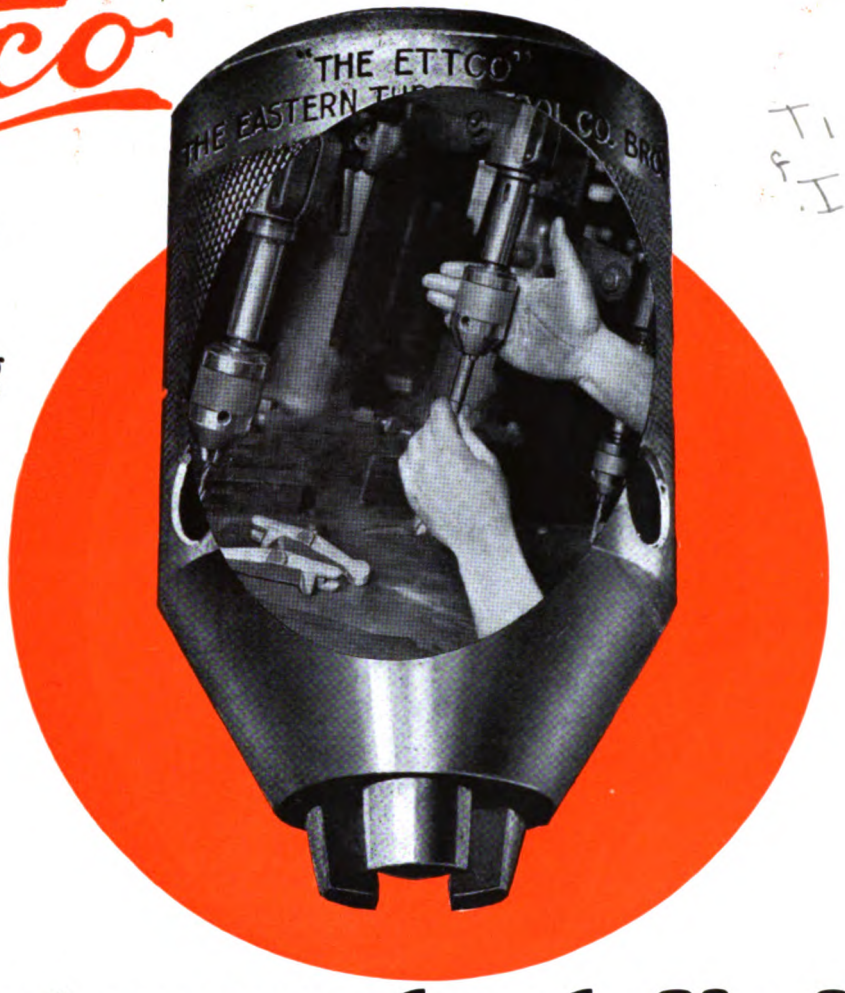
"On the whole, both our own country and the rest of the world face a more favorable outlook at this turn of the year than for a long time past. We, ourselves, however, need to be on our guard against reckless optimism. What we need is an even keel in our financial controls, and our growing national efficiency will continue us in increasing prosperity."

It is this "growing national efficiency," which INDUSTRY ILLUSTRATED aims to promote. On every page—advertising as well as editorial—is presented an idea which needs but to be applied to your own problems to yield dividends.

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Ettco

Keyless Ball Bearing Drill Chucks

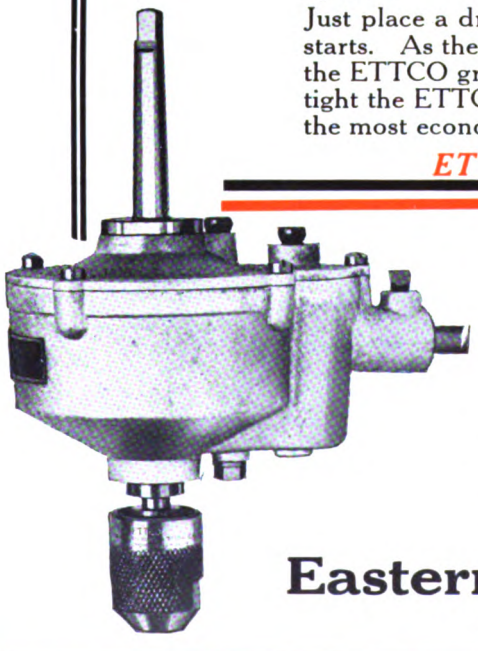


Cut your chuck Up-Keep

ETTCO Keyless Drill Chucks solve the problem of lower maintenance—of greater production from the same machines, and greatly increase the life of drills. The men at the machines like to use them because they are so easy to operate.

Just place a drill in the ETTCO Chuck—tighten, no key required, the drilling starts. As the drill point goes deeper the load on the Chuck increases, so does the ETTCO grip. Any increase in the load tightens the grip. No matter how tight the ETTCO grip, a slight twist of the wrist releases it. Undoubtedly it is the most economical and efficient Chuck for all drilling operations.

ETTCOS Double the Value of Electric Drills



ETTCO High Speed Tapping Attachments

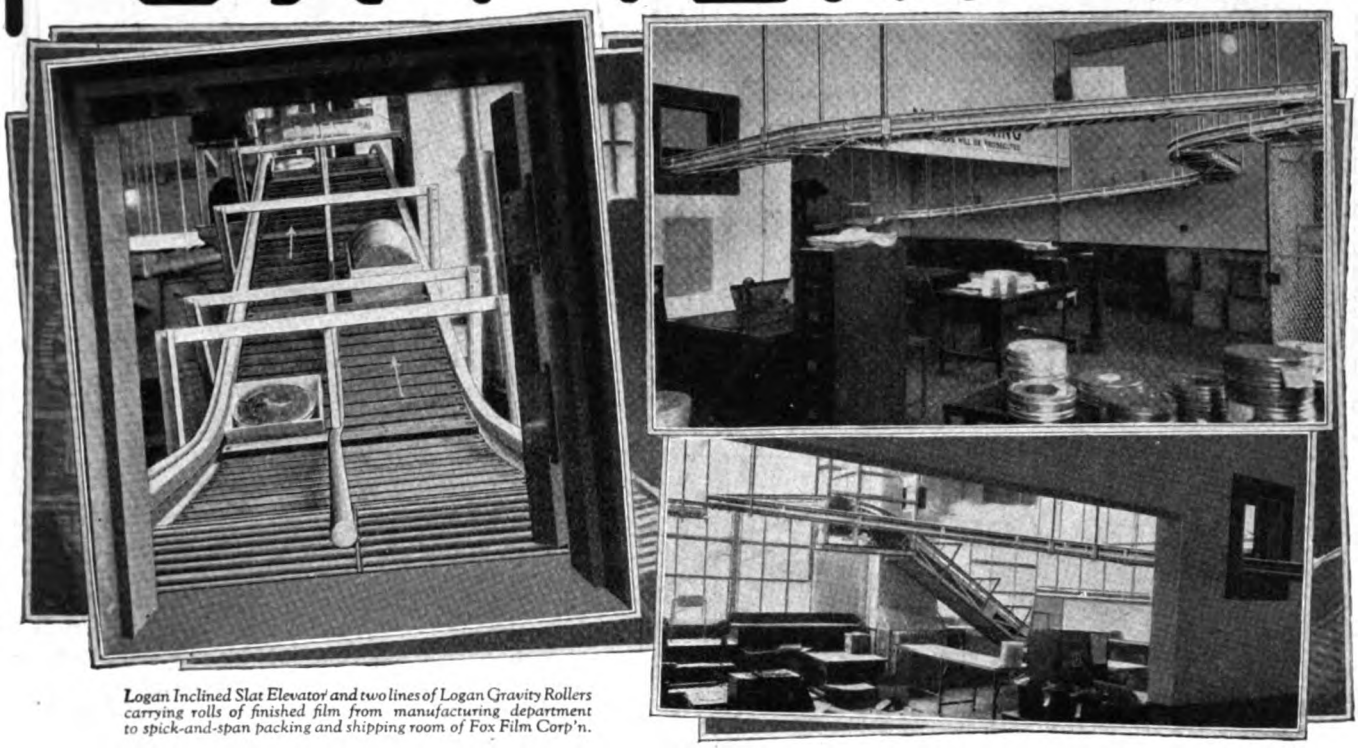
Tap Small Holes as easily as you drill them.
Tap Small Holes 2 or 3 times faster than usual.
Wear Out Those Small Taps you are now breaking.

You can do all these things with the ETTCO HIGH SPEED TAPPING ATTACHMENT. Cased in Aluminum it is especially designed for tapping holes up to 1/4" diameter. ETTCO Tappers increase production enormously, particularly where used with "gun" taps. Put one on your work for ten days—without obligation. Then, if you can spare the ETTCO, it may be returned. Capacity to 3/16" in steel, 1/4" in cast iron or brass. Price, $35.00.

Eastern Tube & Tool Company, Inc.
590 Johnson Ave., Brooklyn, N. Y.

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FOX FILM - another user



Logan Inclined Slat Elevator and two lines of Logan Gravity Rollers carrying rolls of finished film from manufacturing department to spick-and-span packing and shipping room of Fox Film Corp'n.

"PALACE THEATER—All Next Week!" The machine-like precision with which Fox Films must reach their nation-wide destinations requires the utmost efficiency and expedition in handling and shipping. And so Logan Conveyors are called upon to perform their time and labor-saving functions in still another industry. Proving again that no business is so "different" that this economy equipment cannot readily adapt itself to the emergency. Wherever quantities of materials, parts or finished products are to be moved from one place to another, Logan Conveyors invariably prove a profit-paying investment. Our nearest office will gladly give you further details.



Just as Fox Films bring the thrill of romance and adventure to millions in the motion picture world, Logan Conveyors bring the satisfaction of greater handling efficiency and lower production costs to the many industries now using them.

Logan Co.

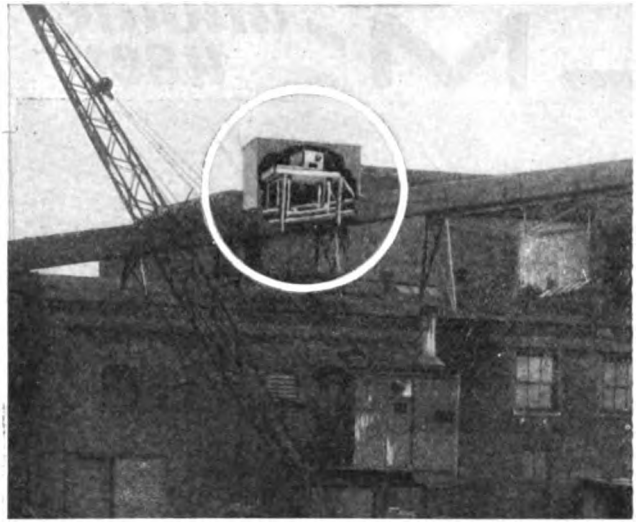
Formerly THE DOW CO., *Louisville, Ky.*

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Weigh as You Convey and Eliminate Losses

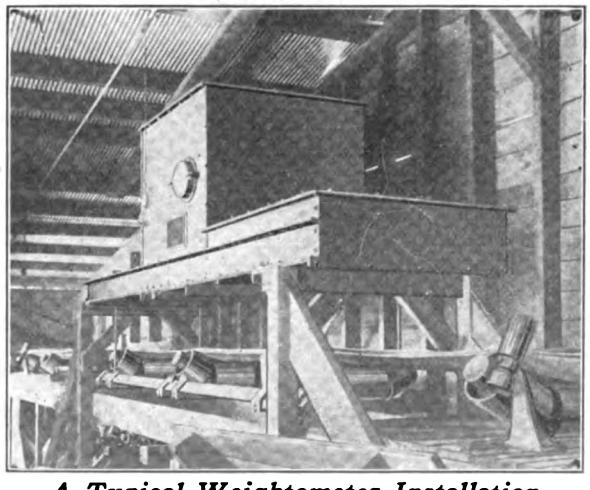
What check have you on materials handled on conveyors? Your bills of lading are not always correct. The chance for error is always present.

Conveyors equipped with Merrick Weightometers are assured of an accurate check on all conveyor handled materials—99% accuracy guaranteed—ore, sand, stone, gravel, coal, coke, finished cement, etc. The weighing is done while the materials move along and the weights recorded. It is ideal for checking receipts, shipments and interplant movements.

Write for the "Merrick Catalog." It explains how it works.

MERRICK SCALE MFG. CO.

180 Autumn St. Passaic, N. J.



A Typical Weightometer Installation

The Publisher's Column

Sane Thinking for 1926

THIS country today is enjoying prosperity—not a "boom," but prosperity based upon sane and lasting foundations. Industry as a whole is healthy. And this is true because industry is meeting the demand for fair wages and fair prices.

We have passed the day when a price rise spelled increased profit; because it also spells a narrower market—and an invitation to competition! We have passed the day when a wage cut spelled economy; because we have learned that it inevitably spells discouragement and reduced efficiency—as well as reduced buying power.

The pace will be fast in this year of 1926. We must not lose sight of the fact that prosperity implies thrift, and cutting out waste. Many of us need to learn how to save—but that is only the first step. For true thrift, as President Coolidge has emphasized, is the art of *spending money wisely*.

The management that is going to reap its full share of profit and growth in this year of fast pace and keen competition, is the management that roots out the small wastes, here, there and everywhere, which add up to an aggregate large loss; analyzes processes and methods with a view to more economical production; spends money sanely and wisely, wherever new methods or new equipment will yield added dividends.

These are the weapons with which you enter the competition. And these are the things which we are going to present to you in the pages of INDUSTRY ILLUSTRATED during this new year of substantial prosperity.

Industry Illustrated

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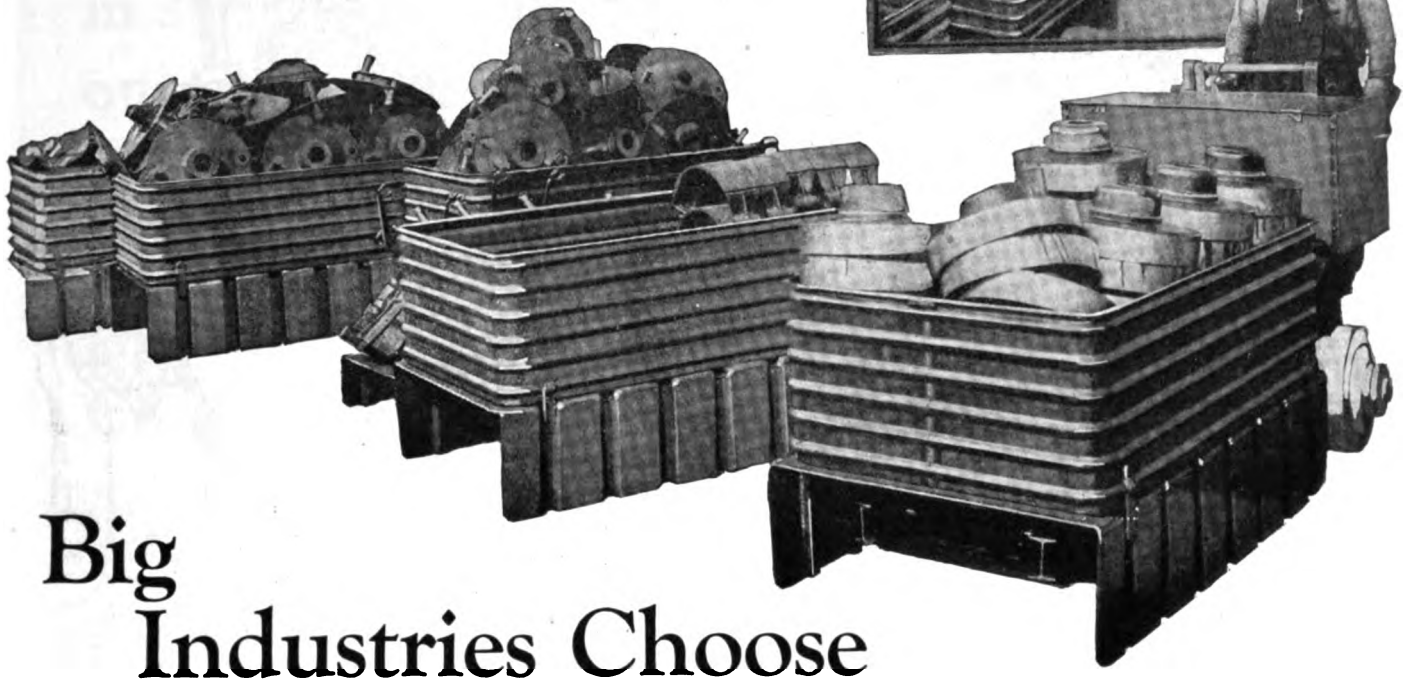
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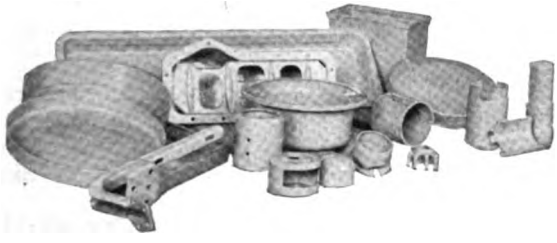
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Big Industries Choose Truscon Boxes for Economy



Expert counsel on the development of your product by the use of Pressed Steel will be gladly furnished by Truscon specialists. Pressed Steel improves your product, lightens its weight, reduces its cost.

Throughout industry there is constant need for handling of raw materials, materials in production and finished products. The aggregate of handling is very important in fixing production costs and the final cost of product. Competition makes economical handling a present day necessity. And manufacturers get it with Truscon Alloy Steel Boxes and Platforms because low price, remarkable durability and complete adaptability to all conveying systems puts Truscon equipment in a class by itself. It shows the maximum economy. So Big Industry says "Truscon."

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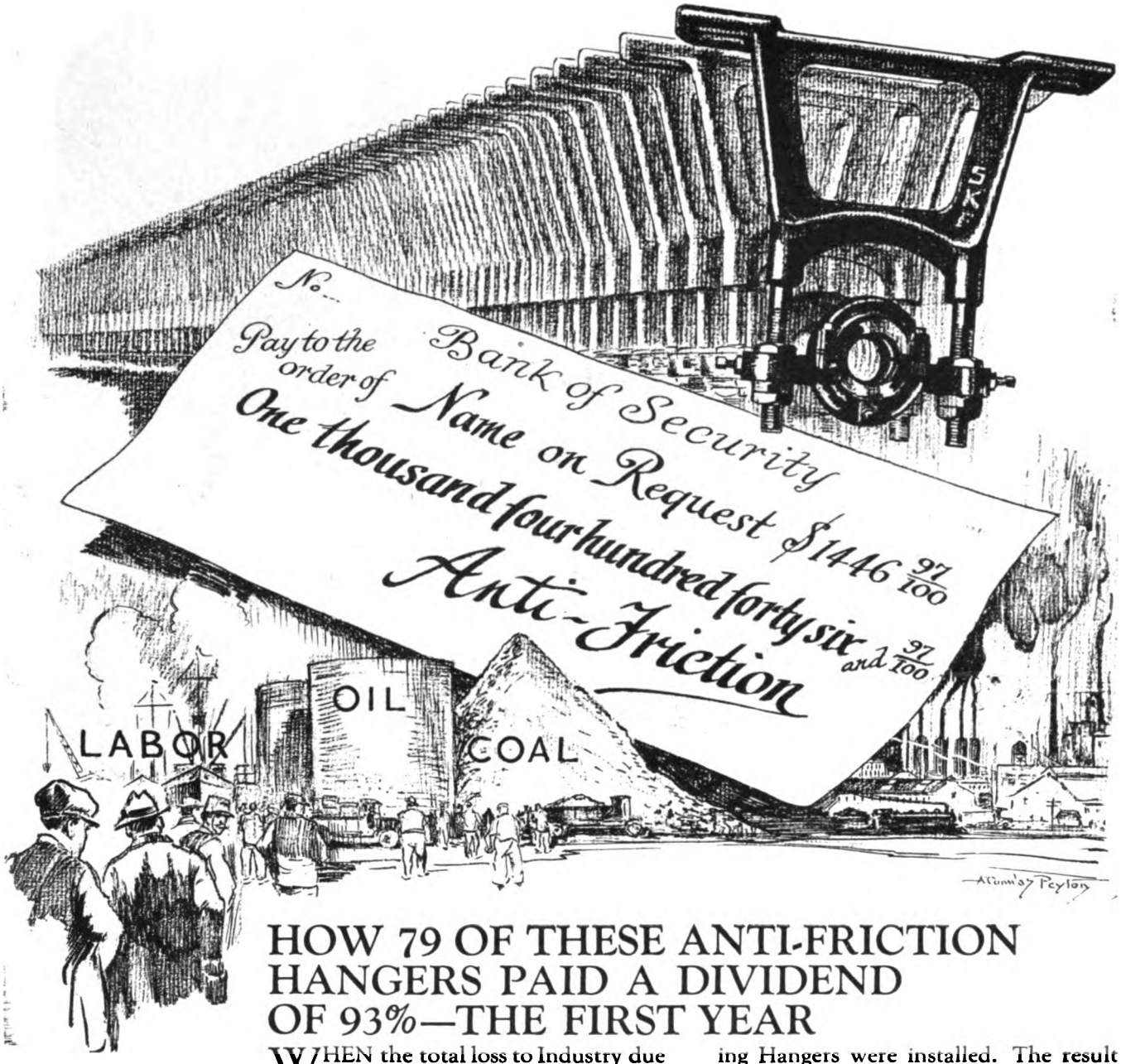
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MORE THAN 2,000,000 SKAYEF SELF-ALIGNING BALL BEARING HANGERS NOW IN USE THROUGHOUT THE WORLD



HOW 79 OF THESE ANTI-FRICTION HANGERS PAID A DIVIDEND OF 93%—THE FIRST YEAR

WHEN the total loss to Industry due to friction is tabulated, it probably will bulk even higher than the nation's fire loss. No one today knows just how much friction costs each year.

But an idea may be gleaned from the experience of a large textile mill* that formerly used plain bearings on its line shafting. After years of general dissatisfaction, excessive maintenance and power costs, 79 Skayef Self-Aligning Ball Bearing Hangers were installed. The result was that the very first year, the cost of power and maintenance was reduced $1,446.97—93% of the cost of Skayef installation.

SKF engineers will show you how Skayef line shaft equipment will reduce your power and maintenance costs, speed up production, eliminate expensive delays and pay for itself in less than two years' time.

* Name and certified copy of engineering report on request.

SKF
Certified Campaign
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The SKAYEF BALL BEARING COMPANY, 165 Broadway, New York

BALL BEARING 1516

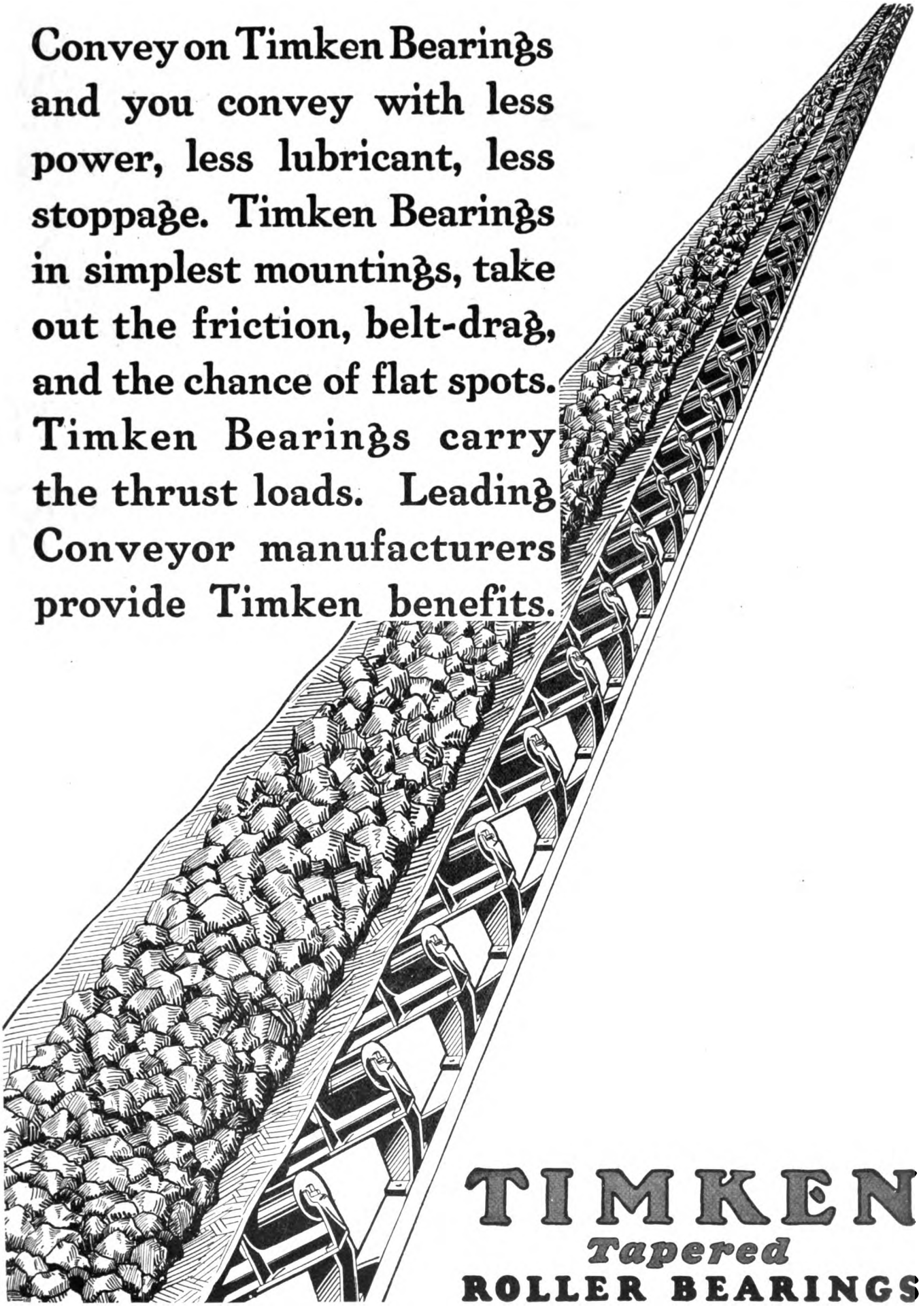
SKAYEF HANGERS

POST HANGERS, PILLOW BLOCKS SKF Puts the Right Bearing in the Right Place AND TRANSMISSION APPLIANCES

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Convey on Timken Bearings and you convey with less power, less lubricant, less stoppage. Timken Bearings in simplest mountings, take out the friction, belt-drag, and the chance of flat spots. Timken Bearings carry the thrust loads. Leading Conveyor manufacturers provide Timken benefits.



TIMKEN
Tapered
ROLLER BEARINGS

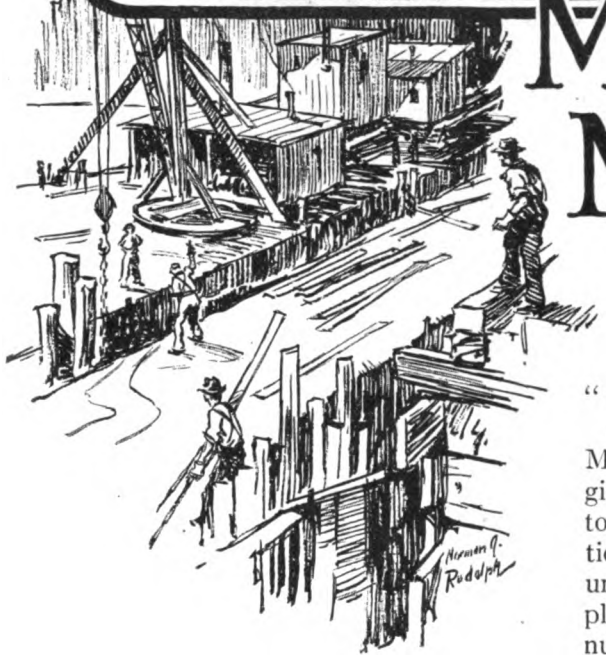
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McCaskey, keeping machines and men profitably busy, and lowering manufacturing costs for McCord Radiator & Mfg. Co.







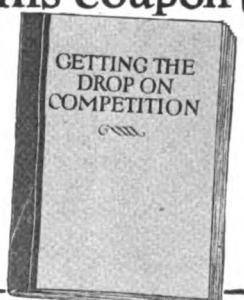
McCaskey Lowers Manufacturing Costs

"IN our gasket and stamping plant," says C. H. Royer, Cashier and in charge of Production, McCord Radiator & Mfg. Co., Wyandotte, Mich., "the McCaskey Register system gives us production control on all our machines. On each factory order the foreman's department makes out an assignment ticket in duplicate; the original goes to the McCaskey board under the number of the machine assigned to that job; the duplicate goes with the job. The assignment ticket shows machine number, customer, part number, piece work or day rate, quantity, operation, employee's number, date, material used.

"Duplicate time tickets showing similar information are used in the same way. These tickets are the basis for our cost records, and show elapsed time for each operation.

"Before installing the McCaskey Register system 5 years ago, the shop had no systematic way of assigning the work to the machines. As a result, we had no way of taking care of rush and special orders, and often had 1,000 orders waiting to be filled. McCaskey control gives us a close check on machines and workmen so that we have been able to increase production. The McCaskey system has paid for itself many times over in 5 years use."

Mail this coupon today



The McCaskey Register Co.
Alliance ~ Ohio

Your booklet "Getting the Drop on Competition" might help me. Please send me a copy free of any obligation.

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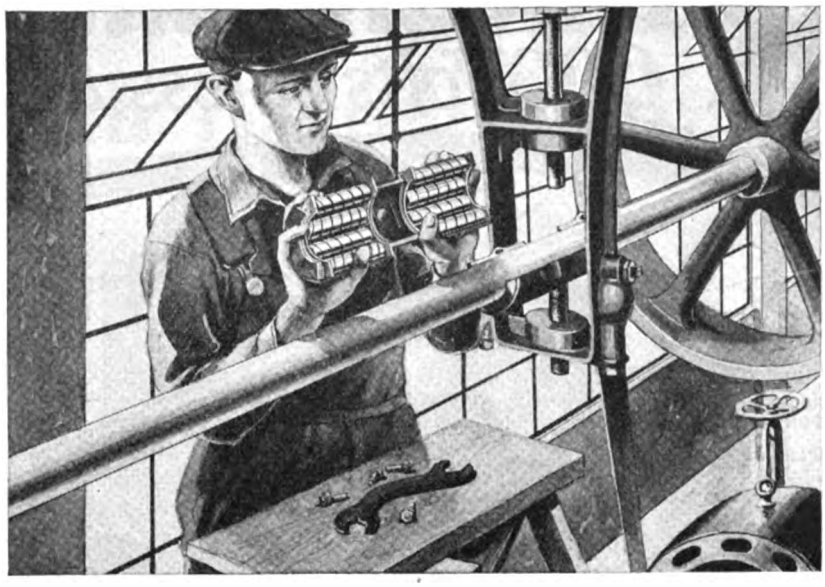
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McCASKEY ONE WRITING SYSTEMS

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Easy to install because it's *split*

THE *new* Hyatt lineshaft roller bearing is split, as its predecessors have been for 35 years.

Therefore, it is not necessary to dismantle the entire transmission line when installing. Pulleys, clutches and other shaft fittings are not disturbed, nor is it necessary to move hangers.

This unique feature has saved thousands of dollars for purchasers of nearly two million Hyatt lineshaft bearings.

It takes but seven minutes to remove an old bearing and install the *new* Hyatt. A small wrench is the only tool used.

Just lay the lower half of the box on the shaft and roll it under to its operating position. Tighten the adjusting bolt. Drop the top into place, turn down four bolts which seal the two halves, and then turn down the upper adjusting bolt in the hanger. Lubricate, align and turn on the power.

A small quantity of oil three or four times a year assures efficient operation of all Hyatt bearings. Machined housing joints prevent oil leakage.

Friction is eliminated where Hyatt roller bearings are used, because they impart an easy rolling motion.

Once installed, Hyatt line shaft bearings last a lifetime.

HYATT ROLLER BEARING COMPANY, NEWARK, NEW JERSEY

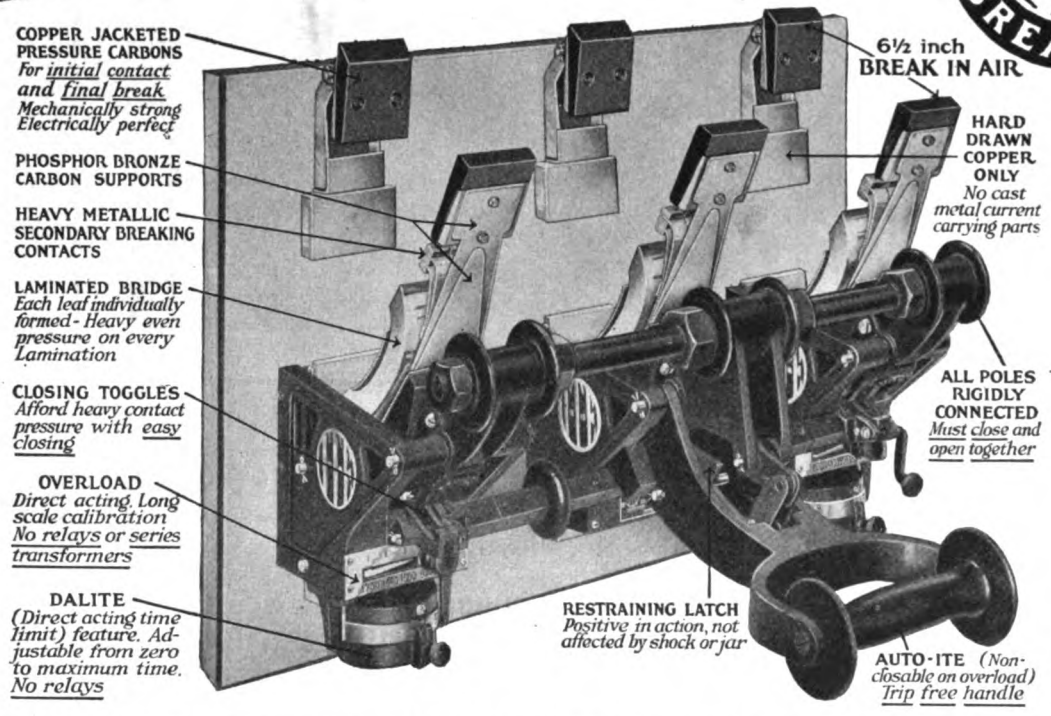
'Phone your nearest mill supply dealer

HYATT
ROLLER BEARINGS

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AIR CIRCUIT BREAKERS
600 Volts or less, A.C.

CIRCUIT I-T-E BREAKERS



Protection *without* Complication!
ALL PARTS ACCESSIBLE AND *VISIBLE*

I-T-E AIR BREAK has definite advantages not present in the oil breaker

1. No oil—to leak, carbonize, burn or explode—Just air.
2. No tanks to conceal anything—or the lack of it.
3. No cells—nothing which needs or deserves to be imprisoned—Just a faithful and efficient servant.
4. Inherent simplicity—with resulting low cost of installation and maintenance.

THE CUTTER COMPANY
ESTABLISHED 1888—PHILADELPHIA
501 North 19th Street

CUTTER
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Why COLGATE & CO. paint with Barreled Sunlight

VISITORS to the great Colgate plant are almost invariably struck with the spotless whiteness of the interior.

Yet the astonishing fact is that some of these ceilings and walls were painted white *several years ago* and have not been repainted since!

Here is a story of plant management that will be of interest to every plant owner or manager in the country. Read it in the words of one of the Vice-Presidents of the Colgate Company itself:

> **"Several years ago we painted with Barreled Sunlight. The paint has been washed whenever necessary, and is still fresh and white today."**

Experiences like this show why Barreled Sunlight is used in more plants today than any other interior white paint.

Barreled Sunlight produces a surface so smooth and even that the finest particles of dust or dirt cannot sink in. This surface can be washed like white tile—even after years of service. Repeated washings will not wear through the surface of Barreled Sunlight.

Furthermore, Barreled Sunlight is made by our exclusive Rice Process and is actually guaranteed to remain white longer than any gloss paint or enamel, domestic or foreign, applied under the same conditions.

A single coat is generally sufficient over a previously painted light surface. Where more than one coat is required, use Barreled Sunlight Undercoat.

Barreled Sunlight will not flake or scale. It contains no varnish and is easy to apply—can be put on either with brush or spray. It is sold in 55- and 30-gal. churn-equipped steel drums—and in cans from ½ pint to 5-gal. size.

Mail the coupon for our illustrated booklet, "More Light," and a painted sample of Barreled Sunlight.



The lustrous, long-lasting white finish of Barreled Sunlight washes like tile.

ORDINARY FLAT FINISH WHITE PAINT — BARRELED SUNLIGHT

U. S. GUTTA PERCHA PAINT CO.

Factory and Main Offices

5 DUDLEY STREET, PROVIDENCE, R. I.

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Save the surface and you save all

Barreled Sunlight

Reg. U. S. Pat. Off.

WHITE-SMOOTH-LUSTROUS-WASHABLE

BARRELED SUNLIGHT is also ideal for home painting. It means lustrous white woodwork from which smudges can be washed in a jiffy — bathrooms as washable as tile—and kitchens as spotless as your white china plates.

What paint looks like through a microscope

These photographs were taken through a powerful microscope. Each paint was magnified to the same high degree. The astonishing contrast shows why Barreled Sunlight is so easy to keep clean. Its surface is smooth, even and non-porous. It resists dirt and can be washed as easily as tile.



THE RICE PROCESS WHITE

U. S. GUTTA PERCHA PAINT CO.
5 Dudley Street, Providence, R. I.

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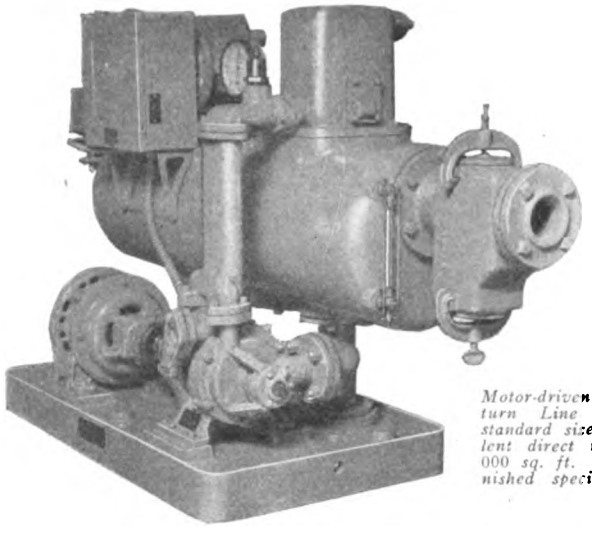
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Hytors are high in economy yet moderate in cost

Moderate first cost, virtually no expense for upkeep and maintenance, year-in year-out service at the original high efficiency, dependable heating at all times,—these are the universally acknowledged superiorities of Jennings Hytor Heating Pumps for removing condensation, air and gases from return line vacuum steam heating systems.

Jennings Hytors work right because they are built right. There is no metal-to-metal contact in a Hytor to cause wear and a decrease in vacuum. Air is handled separately from the water,—it is discharged directly to the atmosphere without back pressure. With this arrangement a material saving in power is effected,—frequently as much as 50% over other equipment of equivalent capacity.

Let us send you the Jennings Hytor Bulletins giving complete information.

Write for these Bulletins. They completely describe the several Jennings Heating Pumps—their construction, method of operation and the superior service they always give in the uses for which they are recommended.



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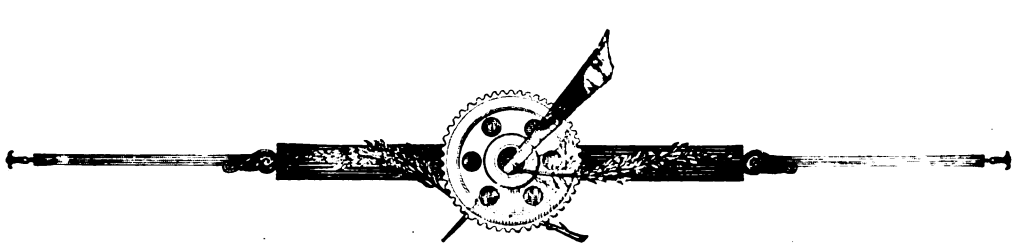
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Planning for Future Growth in Designing an Industrial Plant

The New Fort Wayne Works of the International Harvester Company

By Edwin M. Chance

Vice-President, Day & Zimmermann Engineering and Construction Co.

BEFORE attempting to develop a preliminary "plant layout," it is necessary that the industrial engineers to whom the design work has been assigned become familiar with all phases of the manufacturing and assembly operations and types of equipment to be used, that they may acquire a clear mental picture of the process to be housed and be in position to interpret the plant requirements in terms of capacity, floor space, types of buildings and the arrangement of departments. By reviewing, analyzing and verifying the program submitted by the owner, the industrial engineers must be able not only to visualize the various production problems to be solved, but must be sufficiently familiar with manufacturing methods in general and building economics in particular, to supplement and develop the owner's preliminary specifications and convert them into a finished plant built around the process needs.

The Fort Wayne Works of the International Harvester Company is an example of this.

The truck plant layout (Fig. 1) shows a preliminary development plan for the *ultimate* evolution of this large manufacturing establishment. It serves to illustrate the extent to which, after study, the principles previously discussed should be applied in advance of building construction. The extensive farm tract that was acquired for the new plant site is situated on the outskirts of Fort Wayne, Indiana, and admirably suited to a large industrial development. It was of ample size to be practically free from boundary restrictions.

The production processes in the manufacture of trucks as carried on in other plants of the International Harvester Co., as well as in other automotive plants, served as a basis for field study in determining the general size and arrangement of the Fort Wayne Works. It was the original intention to build at first an assembly plant only, with provision for the manufacturing operations to be added as needed. How provision for the development of a complete manufacturing plant was anticipated is evident from the general plan (Fig. 1). The future buildings are indicated by dotted lines, the buildings needed for the initial plant being in solid lines.

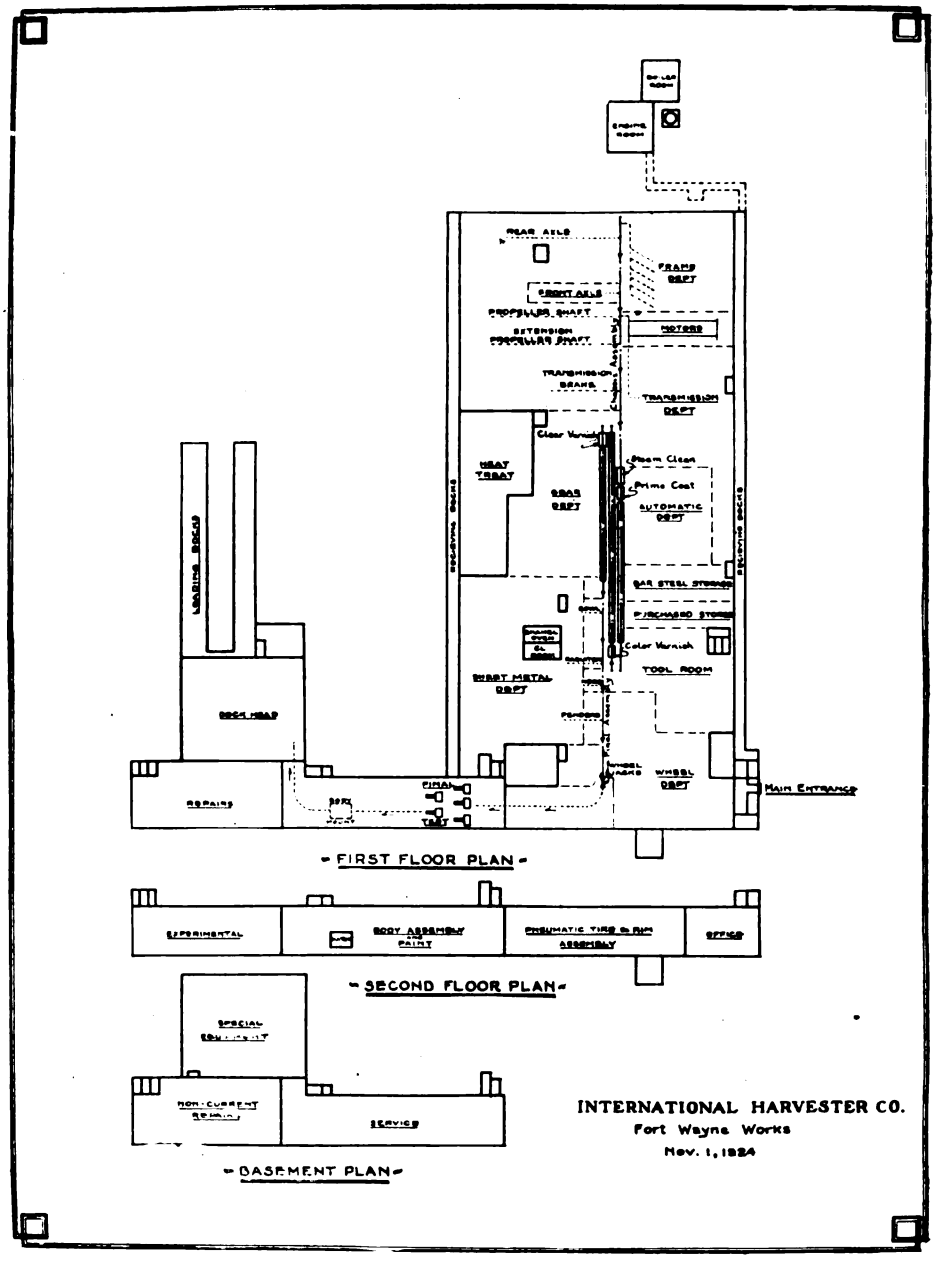


Fig. 2. The extent of the initial construction, showing also routing diagrams of the modified "assembly line." (See Figs. 3, 4, 5 and 6 for departments.)

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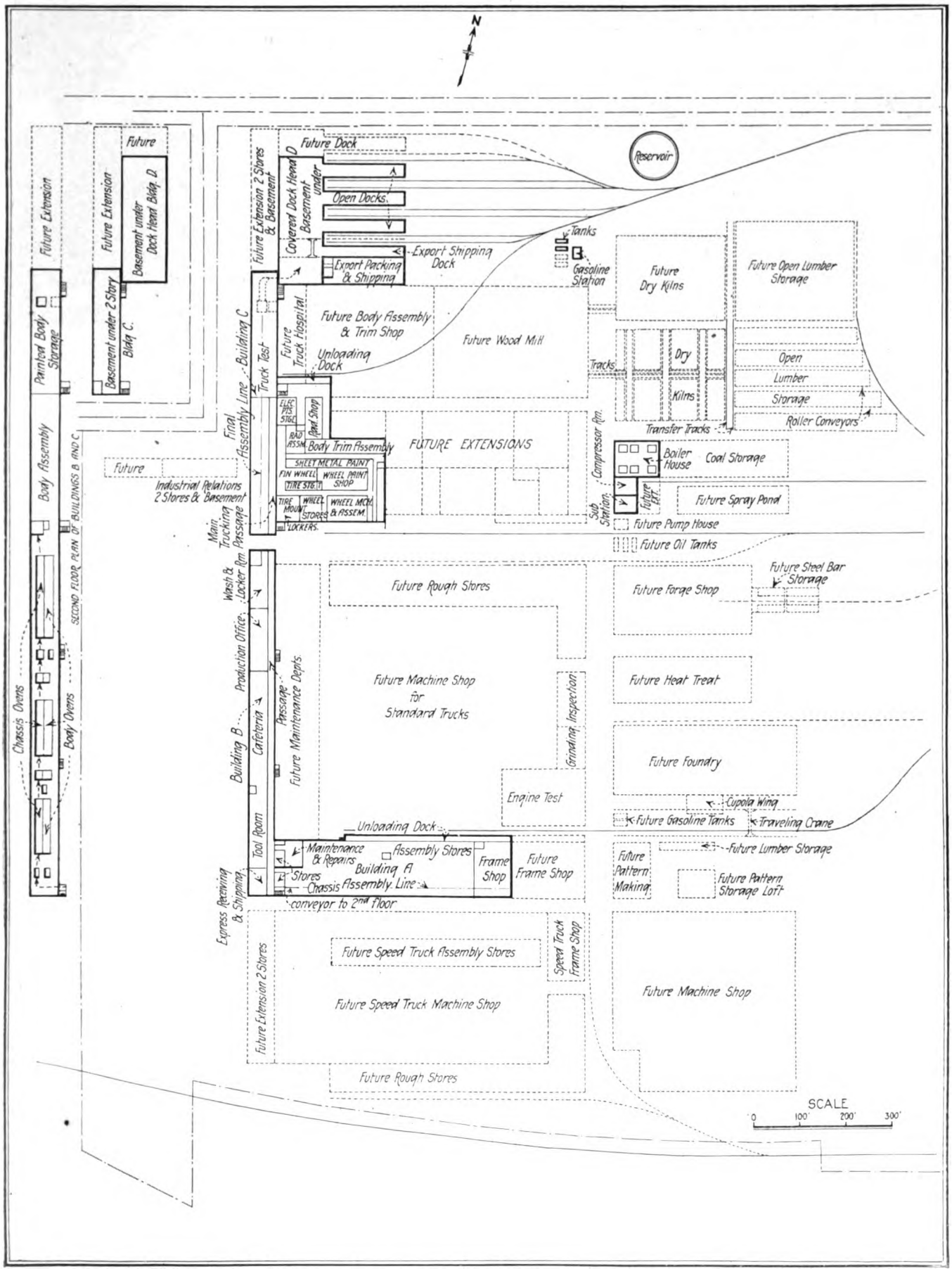


Fig. 1 The truck plant layout, showing a preliminary development plan for the ultimate evolution of the whole works. Initial plant is shown in solid lines, future buildings by dotted lines.

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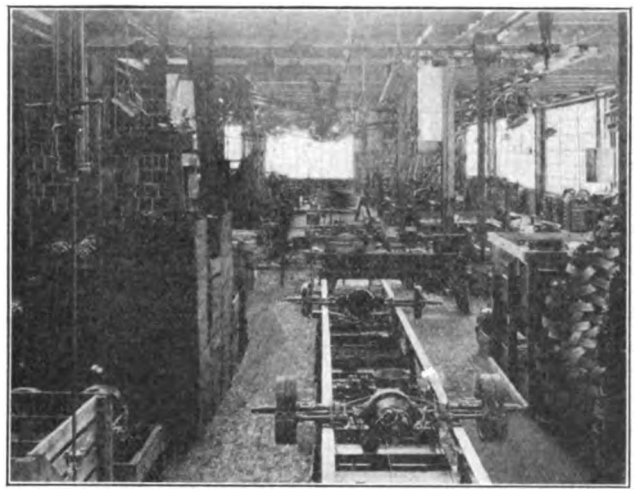


Fig. 3. Rear Axle assembly, to feed the main assembly line.

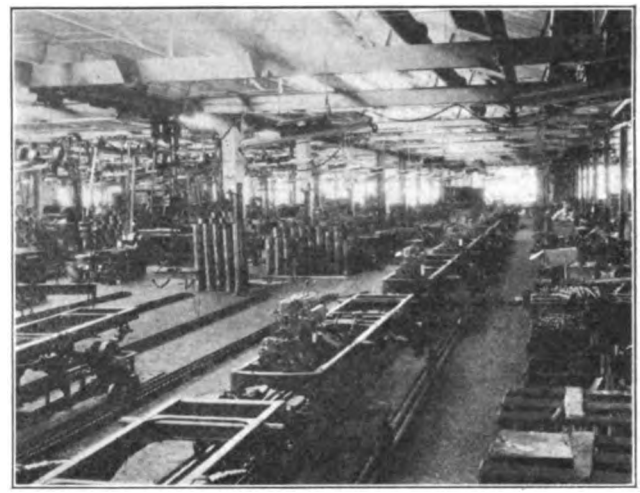


Fig. 4. Part of the assembly line at the Fort Wayne Works.

In any design, practical and physical considerations must be accommodated, in adapting the ideal to the practical. As one example: the existing locations of two intersecting streets, which terminated near the property, were governing factors in establishing the front building line for the main plant and for a future office building.

The progressive assembly of a motor truck itself, which is of considerable length in the larger sizes, necessitated a long "assembly line" and, for the production anticipated at first, a correspondingly large amount of storage space and reserved area for future manufacturing operations. To satisfy these requirements this future layout (Fig. 1) is of the size and arrangement shown.

Obviously, no finished drawing can show all of the mental processes, the analytical study, the application of principles, which form the background to its successful preparation. Considerations which exert literally a control upon the industrial plant layout include such factors as production capacity requirements; divisions of the production schedule; analysis of parts entering into product; necessary manufacturing and assembly operations; machine tool equipment and plant facilities needed; production time per operation; sequence of operations; space requirements per department; the "Assembly Line"; and a review of the various operations. Suffice it to say that in the preparation of the layout under discussion, as well as of the subsequent layouts, all of these factors were given full consideration and weight.

One of the criteria of a successful industrial layout is that of flexibility. The Fort Wayne layout, because of that characteristic, was readily adapted to a modification in the initial installation, made with a view to reduce the initial capital investment. The extent of the initial construction is given in outline in Fig. 2, which includes a routing diagram of the modified "assembly line." Therein are shown the several departments, as well as the storage of various materials and parts, the locations of process treatments, of testing stations and of shipping facilities.

A comparison of Fig. 1 and Fig. 2, in detail, will show the reader just how the sequence of production operations was maintained in both, and how due to the flexibility of the layout, space arrangements were able to be accommodated in the latter, but of course for a modified production schedule.

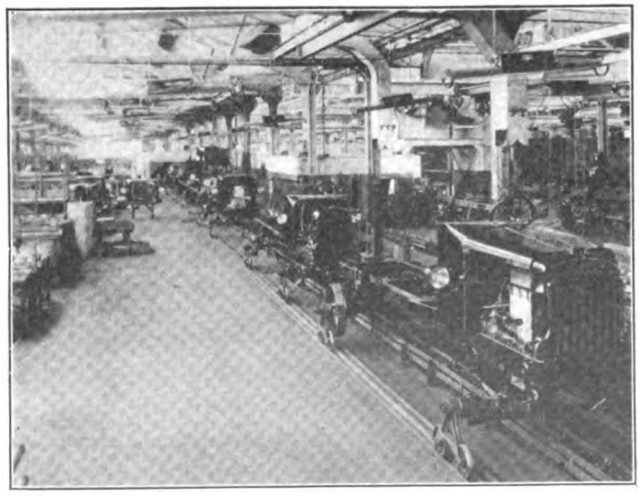


Fig. 5. Showing the assembly line near the end, with trucks nearing completion.

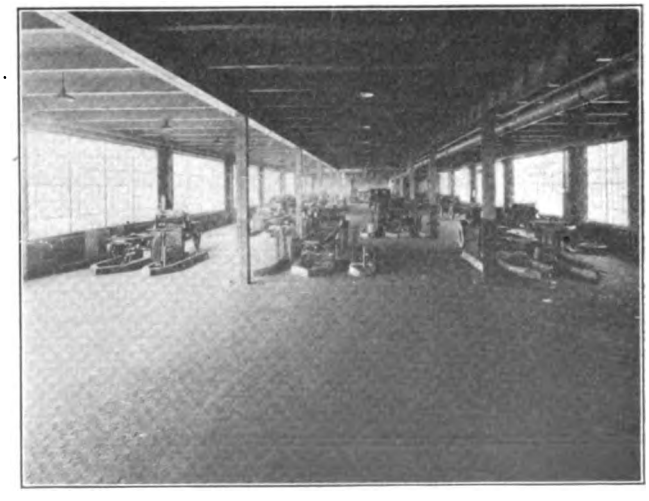


Fig. 6. Testing and body mounting department.

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Making the Most of Your Plant's Home Town

What the Surrounding Community Means to the Manufacturer and the Worker

By John A. Piquet

WHEN Lloyd-George was asked, in the middle of the war, why he had not produced the "A-1 army" he had promised, he pointed to the undersized soldiers from England's slums, and replied, "You cannot make an A-1 army with C-3 men."

"It is equally logical to say, "You cannot make an A-1 industry in a C-3 town."

No matter what splendid management a manufacturer may apply to his business and his plant, if he does not give a considerable amount of thought to his dependence on his community and what he is going to do about it, he may find that he is helping make or keep his town a C-3 town, with disastrous reactions on the town, the employees, and on costs and profits.

The community is the setting or background of the manufacturing plant, but every so often it comes decidedly into the foreground of the picture. Here is what the manufacturer is very much dependent on the community for:

1. Industrial land and buildings, near good transportation, and ample enough so proper routing and handling of materials can be carried out.
2. Good rail, water, or truck transportation to and from the city.
3. Fire and police protection, water supply, streets, and other municipal services.
4. Far-sighted banking and industrial financing facilities.

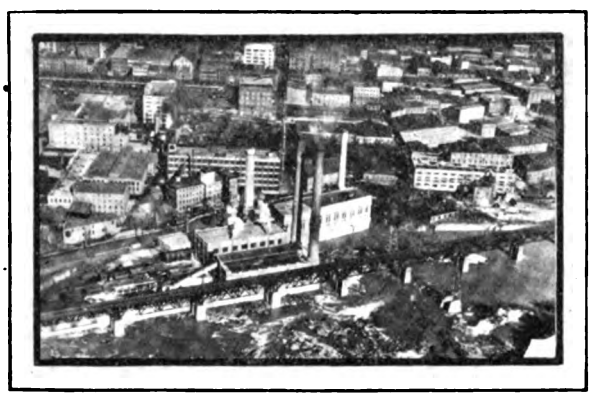


Fig. 1. A typical Eastern industrial environment. Richmond, Va. Note crowded conditions. These are balanced by fuel and power advantages, and excellent community coöperation.

Fig. 2. Electric Power is the environment at Buffalo and on the Canadian side, it makes industry possible in suburbs and decreases congestion of people and transport facilities.



Fig. 3. The Southern mill towns are owned and run by the mill. The great plant of the Ware Shoals Mfg. Co., at Ware Shoals, S. C. Mill villages are a passing phase in industry.

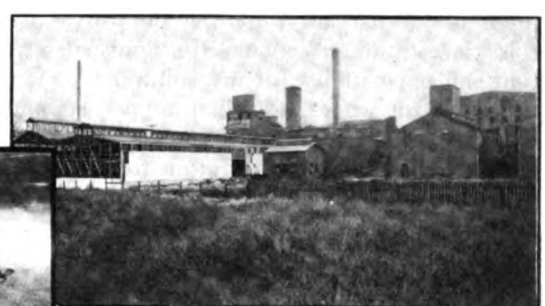


Fig. 4. A chemical plant in Louisville, Kentucky, which is a typical hustling mid-west manufacturing city. It has developed coöperation with industry to a high degree.



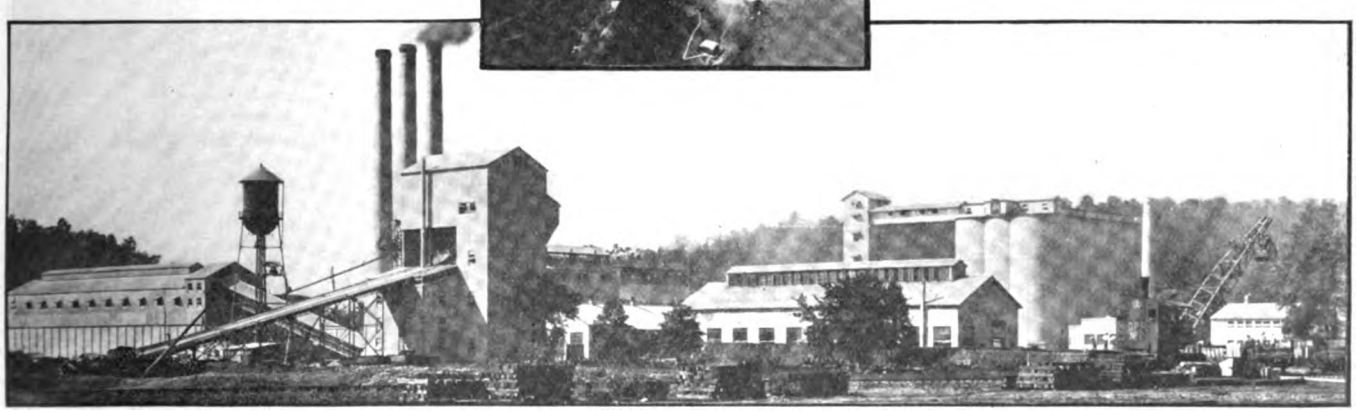


Fig. 5. Plants near natural resources require much room and much unskilled labor. Birmingham provides both to the Lehigh Portland Cement Co. plant.

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Fig. 6. With Texas begins the West's spread-out cities, with new, modern plants, bungalows and gardens, and little poverty. The Crisco plant of Procter and Gamble at Dallas.

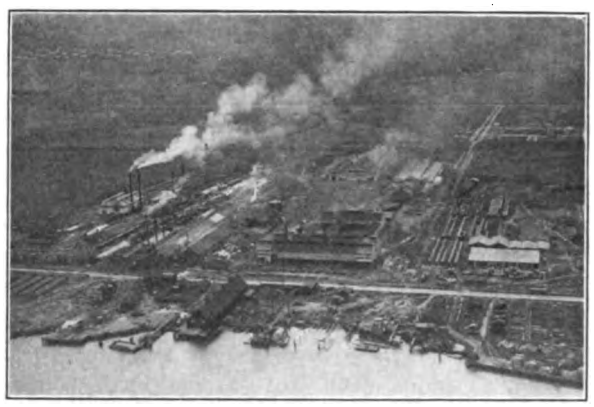


Fig. 7. The steel industry in a new setting. The Columbia Steel Co. plant at Pittsburg, California, is uncrowded, well-laid out, and efficient. Industry in California receives the utmost co-operation from communities.

5. The presence of local complementary industries, which can buy the manufacturer's products, or waste, or which can supply him with materials he needs.

6. Economical access to materials, fuel, power, etc.

7. An intelligent and reliable supply of workers.

The worker in the plant is himself no less dependent on the community in which he lives, for his efficiency and happiness; and it is highly important that he be happy if he would be efficient. His attitude toward the town is, "What am I getting out of this place, in wages, home-life, amusement, and education and opportunity for my children?"



Fig. 8. A factory district run by electricity, clean, planned, with tennis courts and parks. This a part of the model factory districts of Oakland, Cal., a city where workers are treated well, and industrial efficiency is high.

As regards wages, he calls it a good community which has a variety or number of plants and opportunities for employment. That is protection for him, and in such a town he feels more secure than in a place dominated by one or two manufacturers.

Home-life and the cost of living. The worker spends sixteen hours a day around the home, only eight hours in the plant. If rents are high, or homes in squalid surroundings, look out for trouble. It is peculiar, but true, that a model plant in a slum town isn't half as interesting to a worker, as an average plant in a town with good home conditions and reasonable prices and rents.

Recreation. The worker and his family, after putting in most of the day at the plant, kitchen or school, want rest and amusement, even as you and I. Again the community is judged. Is there room for gardens? Are there ball-fields, playgrounds, beaches, nearby woods and fields? Can young people meet frequently and economically? And to the worker's wife the movies are not a bit more interesting and recreational than alluring department stores in which to shop or look. Dull towns breed dull workers, bright towns call the live ones.

It is remarkable, but true, that the lowly worker has been more intelligent than his master, Industry, in locating himself in the right place for efficiency and happiness.

The manufacturer who does not feel he can relocate, and who wishes to see better local conditions, can do what other progressive executives have done.

Put yourself and the plant so solidly back of all community undertakings that the town will think your firm a good one to work for and to treat right.



Fig. 9. Lots of room is an invaluable environment anywhere. Note pretty residences near Los Angeles power station, and nearby ocean. Los Angeles lays out, plans, and organizes everything, with apparently good results.

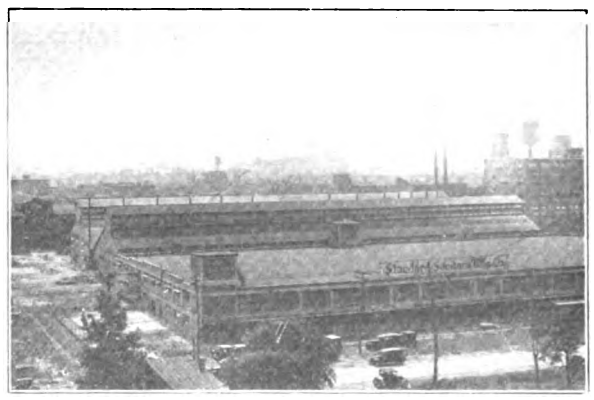


Fig. 10. Baltimore offers industry's workers excellent housing and low living costs. It also plans for modern, low-cost, easily financed factory space. An Eastern city with Western methods. This is the plant of the Standard Sanitary Mfg. Co.

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PROFIT POSSIBILITIES CAUGHT BY THE CAMERA

Ingenious Examples of Multiplied Manpower

Introducing the Orange to Mechanical Methods

Highlights on Modern Power Transmission

A Control Board That Saves Time and Confusion

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Ingenious Examples of Multiplied Manpower

Some Modern Milling Machine Operations that Speed Production

By Frederick B. Heitkamp

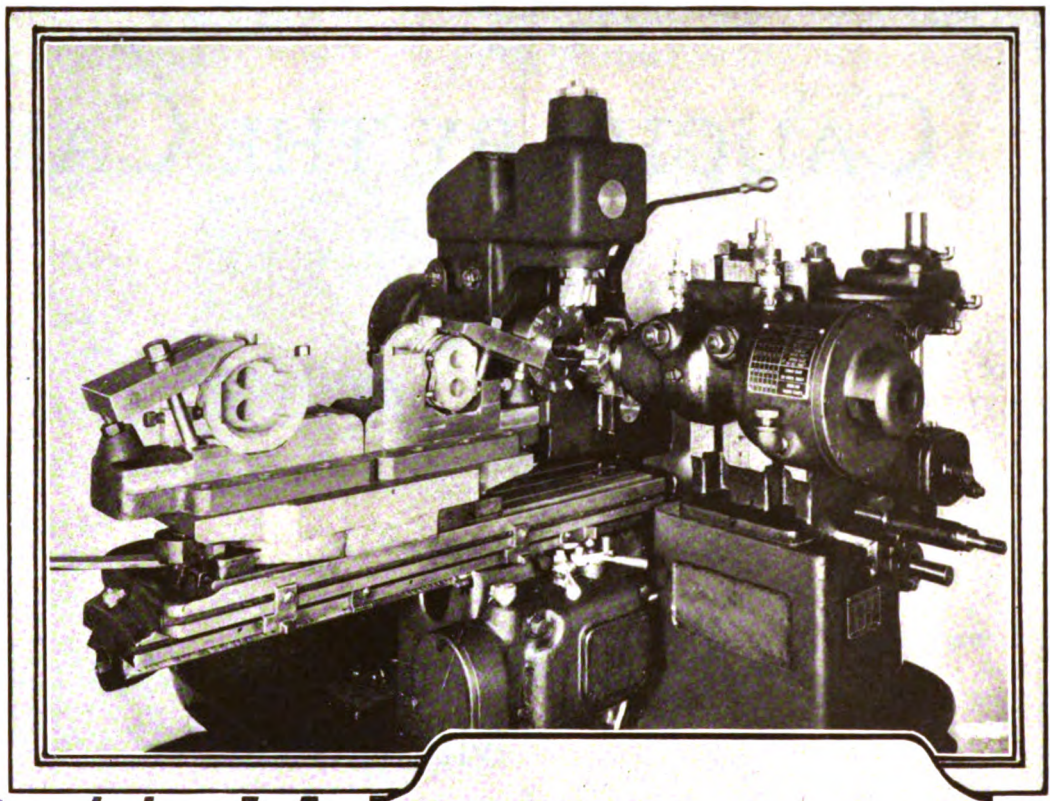


Fig. 1. At the right is an equipment for milling three surfaces on a small Air Compressor Cylinder Block. The top, bottom and side pads are all finished at one pass of the machine table by standard mills mounted on the spindles of the machine. A two-spindle carrier is mounted on the left hand headstock of the machine, which adds the additional vertical spindle required to mill the side pad. The work is loaded in the one fixture while that in the other fixture is being milled.

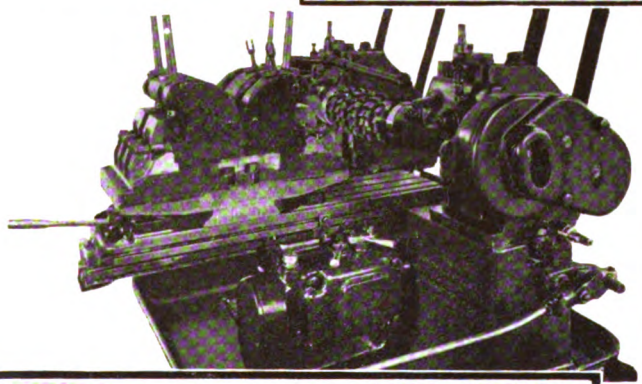


Fig. 2. Below—Milling the center slot and side bosses of four seat brackets at once. A special fixture holding 4 pieces is mounted on each end of a 12″ x 24″ Index Base. The pieces are held in position by 2 cam clamps operated at the top of the fixture. 12 cutters are mounted on a special arbor and are driven from both heads. The work feeds straight into the cutters. While one fixture is in operation the other is being reloaded.

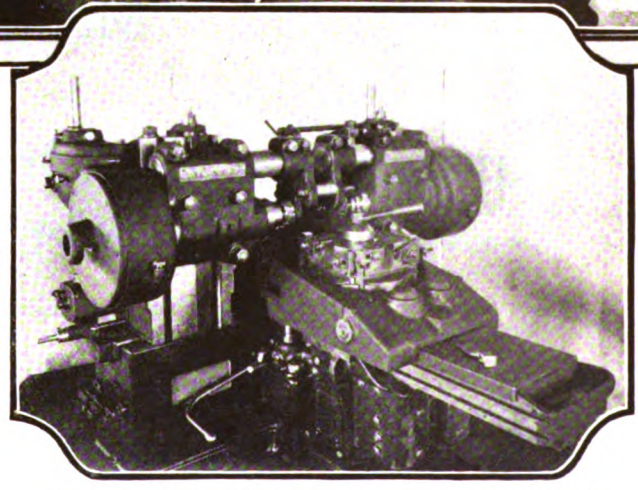


Fig. 3. Above—Milling serrations on a lather's hatchet. A special 90 degree hand-indexed fixture holds four pieces, one at each corner of a square. Each piece rests upon the cutting edge, is squared up by being clamped against the previously ground top, or back of the blade, and lined up against one fixed spherical headed top screw and one flat balance stop. The piece is held against these stops by a two-point clamp over one side. This equipment may also be used for milling of flat head hatchets by removing the cams and clamping the rear end of the bridge to a block on the table.

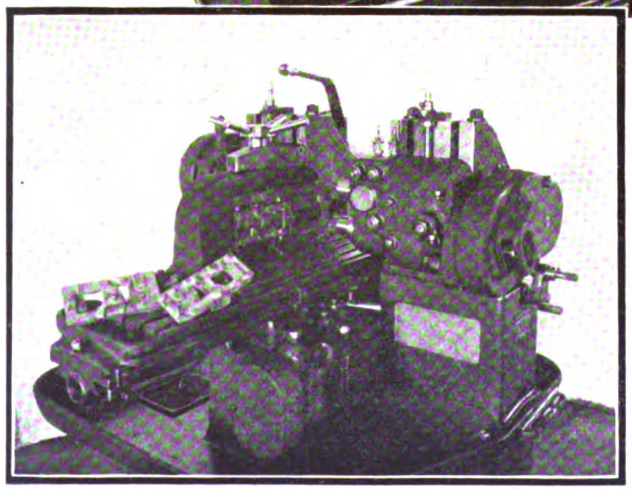


Fig. 4. At the left—milling the bottom, and bosses on top, of a casting. A special fixture mounted on the machine table holds one piece with the bosses in a vertical plane. The work feeds between three shell end mills, finishing one piece per pass.

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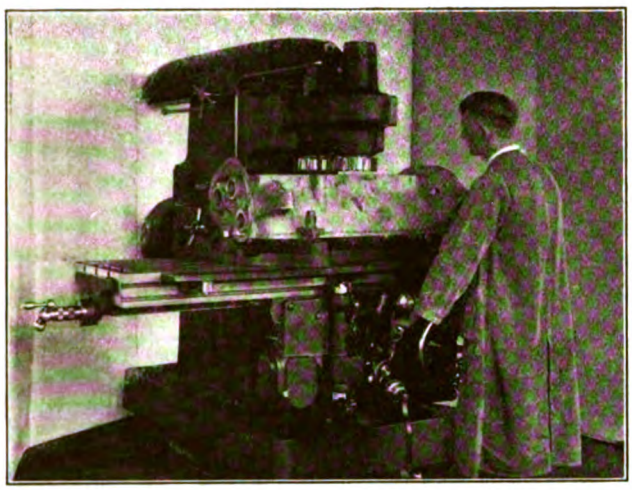


Fig. 5. Above—Milling the pad of a cylinder block. Equipment consists of a special 2-spindle vertical attachment and a special automatic feed trip mechanism to automatically control the cross and longitudinal movement of the machine to mill around a rectangle and return to the starting position with the cutter in the clear. The two-spindle vertical attachment is required to miss the flange faces. The two small pads at the front end of the case extended over or past the front flange. The work would therefore set on the machine table at a slight angle so that we could get the oval pad and then when throwing in the cross feed miss the front flange. The rear spindle was set somewhat to the left of the front spindle.

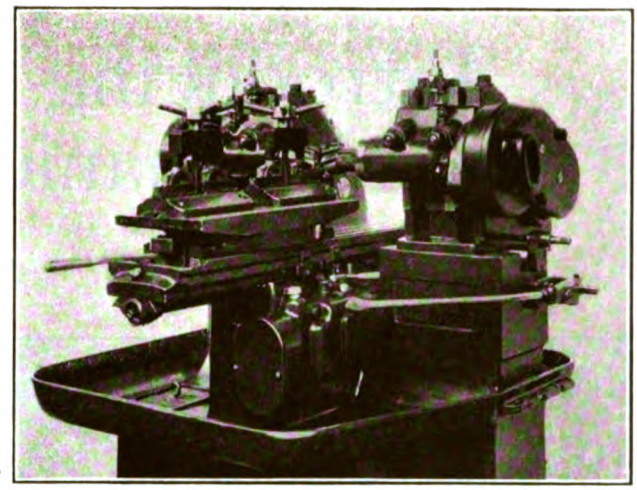


Fig. 6. Milling the ends of bearing cups, two at a time. A special universal fixture mounted on each end of the standard 12 x 24″ Index base holds two pieces in line. The work sets on its finished face over two dowel pins and is clamped over top by a single strap clamp. The fixture is made universal for all the bearing cups in the set by changing the top plate containing the locating pins. The work feeds between two shell end mills finishing two pieces per pass.

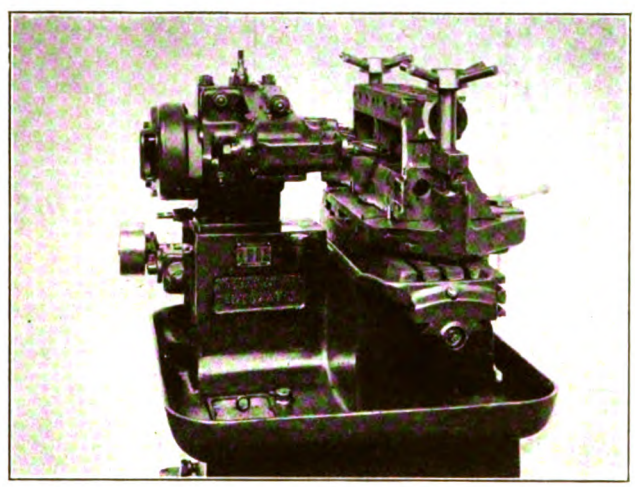


Fig. 7. Above—The purpose of this equipment is to mill the four pads against which the valve tappet guides belt. These bosses are placed in recesses in the casting and are divided by a center partition. The object of the equipment is to mill these four bosses with a minimum amount of handling on the operator's part. A special fixture is mounted on the machine table and carries one piece of work. The fixture comprices two pieces: the base, which is bolted solidly to the table of the machine; and the cross slide, in which is incorporated the work holding and locating means which is moved by a lever.

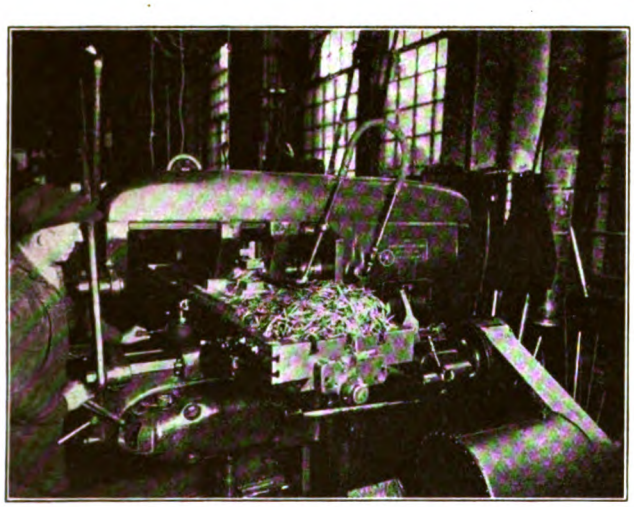


Fig. 8. Milling the yoke of an eccentric rod. The eccentric rod is clamped in a simple Universal Fixture mounted up to the cutter by rapid power traverse, second mill end of cut at ¾″ feed. Third raise the knee and reverse feed at 50⅝″ feed so as to finish proper width of slot. Note the rigid support of the cutter, this enables the operator to use very heavy feeds.

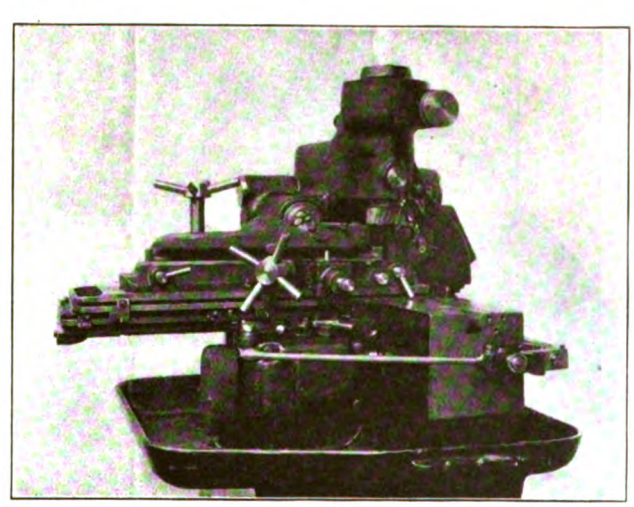
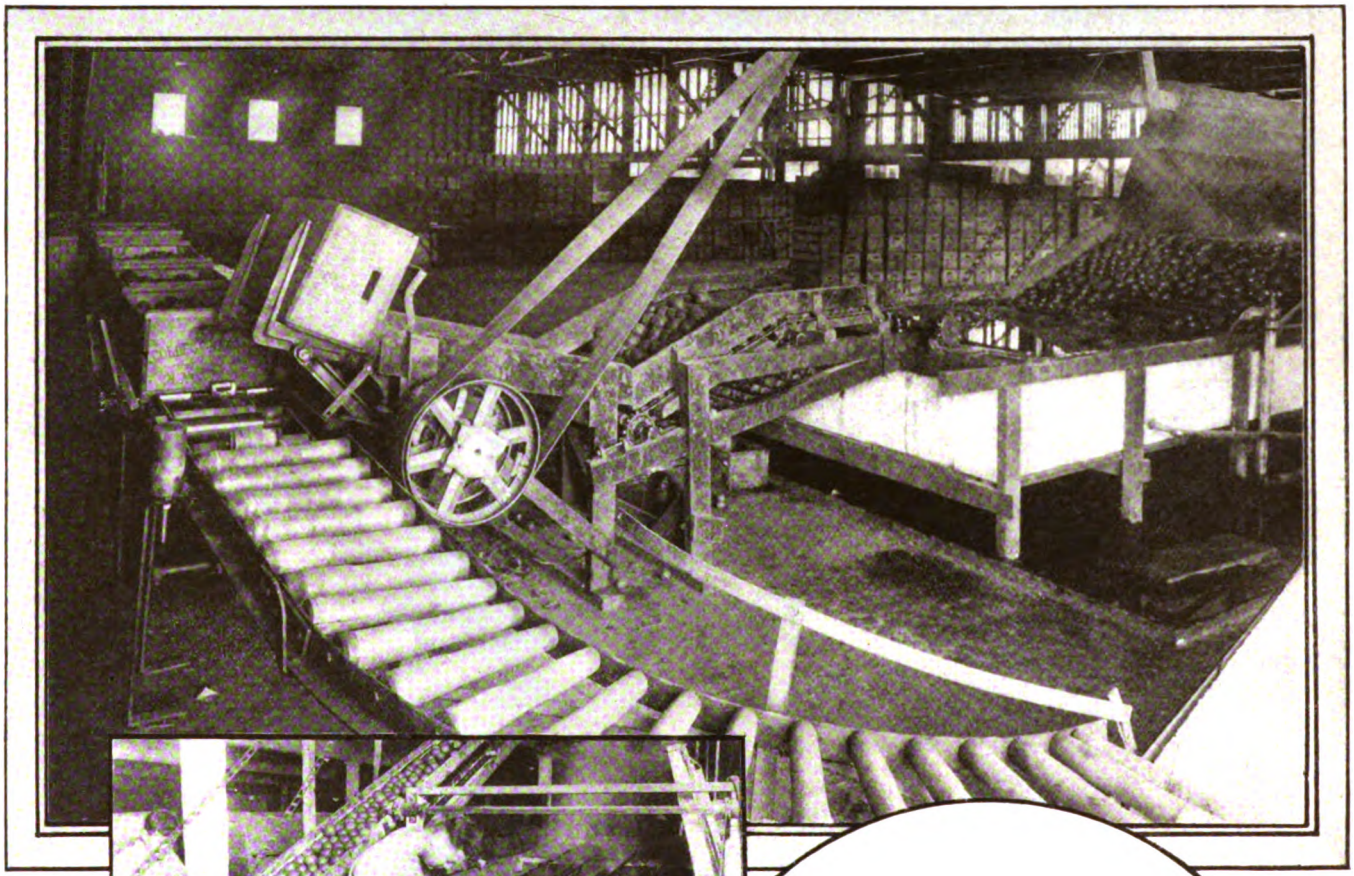


Fig. 9. Milling, simultaneously, the pads of an exhaust manifold. A special fixture mounted on the machine table carries one piece and is located by two dowel pins in the end holes. The dowel pins are made disappearing to allow work to be slid into position. Three clamps hold the work. The spindles are set in line with the cutters so spaced that all pads are milled simultaneously.

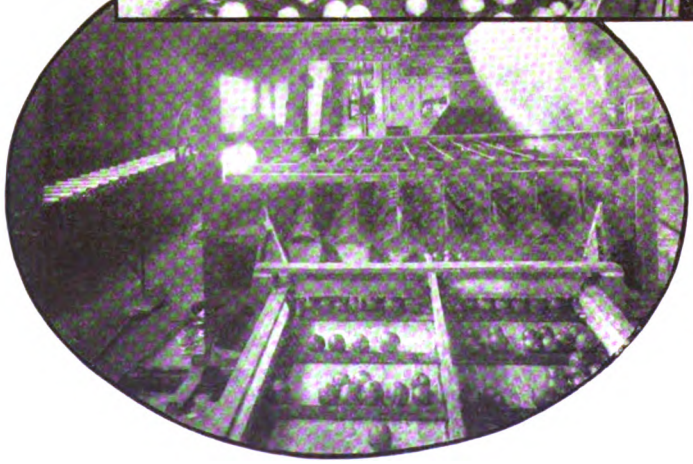
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Introducing the Orange to Mechanical Methods

How Industrial Brushes and Conveyors Help the Fruit Packer







When oranges and grapefruit are picked from the trees, they are usually covered with a considerable amount of dust, wind-blown dirt, or soil which becomes caked by moisture. To make the fruit attractive for market, it must be cleaned before shipment.

The oranges are brought in from the groves by means of trucks to the packing houses, where they are in turn dumped in large vats of water and from there they go on a conveyor belt which takes them over a set of rotary brushes about eight feet in length, on which water is constantly running. After they have gone over these brushes, they are thoroughly clean; from there they go on another conveyor set where they are graded according to size and from there they pass over some rotary horsehair polishing brushes which are filled with paraffin. This not only polishes the frut but closes the pores of the skin, thereby making the orange or grapefruit retain its juice.

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Highlights on Modern Power Transmission

Chain Drives amd Speed Reducers and Their Applications

By William Staniar

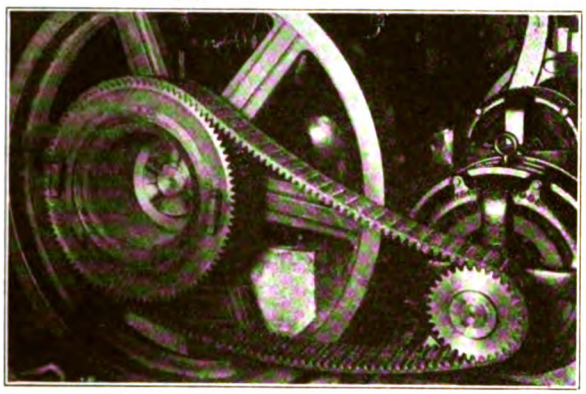


Fig. 1. Here is a high power drive of a large compressor; the drive being of the rocker joint, grooved sprocket guide link silent chain. This type of chain, due to its joint construction, requires but little oil. In consequence, such a drive can be operated without enclosure, even at comparatively high speeds, with grease lubrication. See Fig. 4, "A" and "B" for detail of the rocker joint construction.

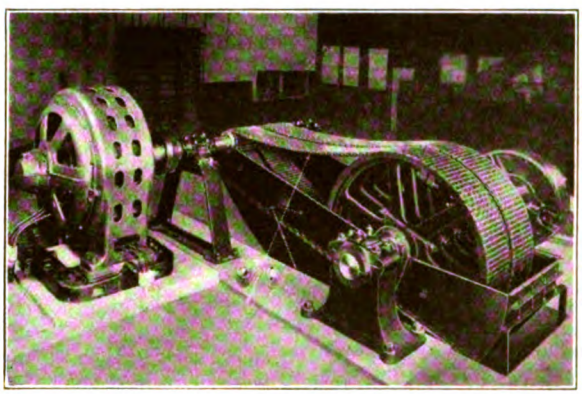


Fig. 2. Above, is a silent chain drive of the segmented bushed pin joint link construction; detail of which is shown at "C" in Fig. 4. This eight hundred horsepower drive is a tandem chain, and operates between a motor and a coal breaker. The driven sprockets have rim plate flanges to maintain alignment. This type drive should run in an oil bath. (See Fig. 5).

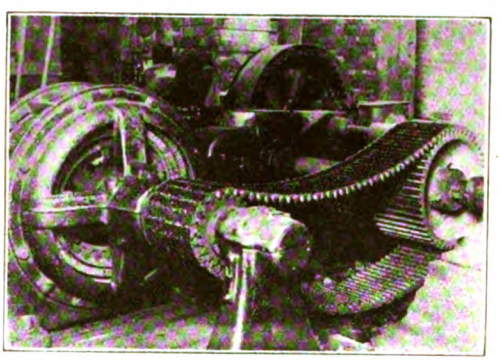


Fig. 3. The above drive is of the same type as that shown in Fig. 1, but in this case it operates from a motor direct to high power line shafting. The grooves on the driven sprocket are visible in the illustration.

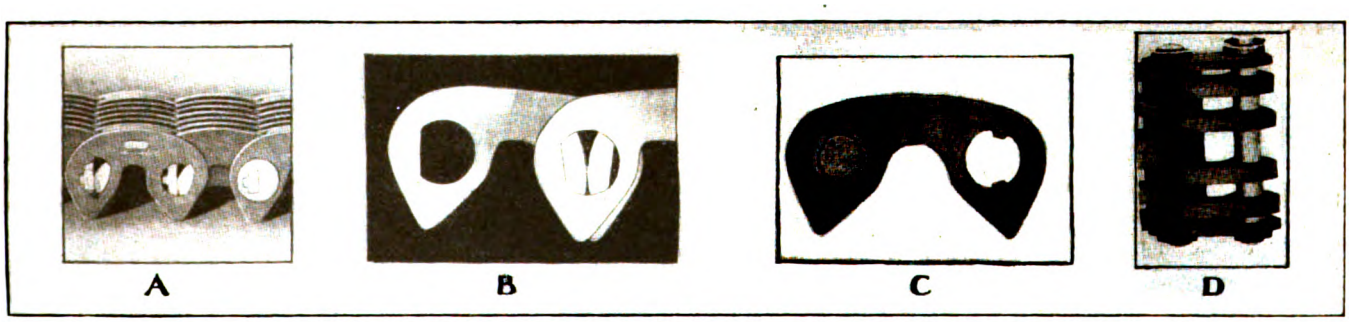


Fig. 4. Here are various forms of silent chain drive link joints. Two different types of rocker joint, both efficient from a lubricating standpoint, are shown at "A" and "B." At "C" is a segmental type split bushed chain link, and at "D" is shown the single large pin type of connection.

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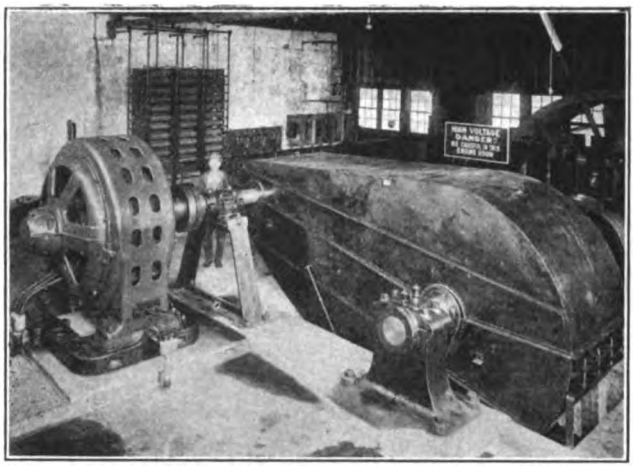


Fig. 5. Above, is the same coal-breaker drive shown in Fig. 2, but here illustrated as it actually operates, in an oil tight casing. Under such conditions as surround a coal-breaker drive, open chain would be subject to prohibitive grit and dirt. Note the cleanliness obtained by this method, which permits running the chain in a constant bath of clean oil, and note also the compactness for a drive of this proportion.

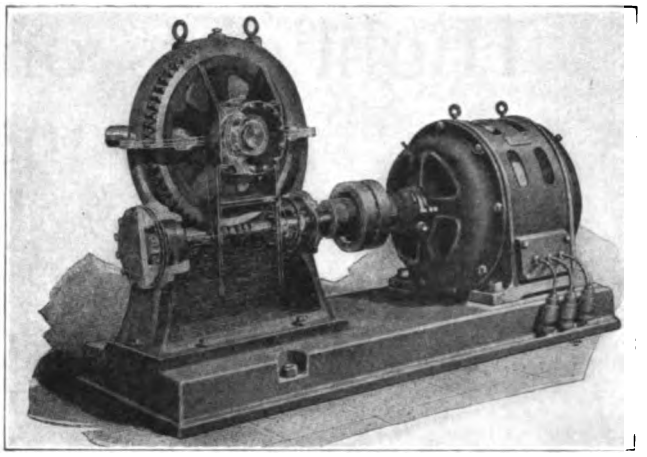


Fig. 6. The above phantom view shows the details of a modern worm gear speed reducer, as arranged for direct motor connection. Such a unit is applicable for a wide variety of machinery drives, and for moderate ratios, where shafts are at right angles, it makes a very compact and efficient unit. Where speed reduction is in the neighborhood of 100 to 1, the worm gear should give place to the spur gear reducer. (See Figs. 7, 10 and 11)

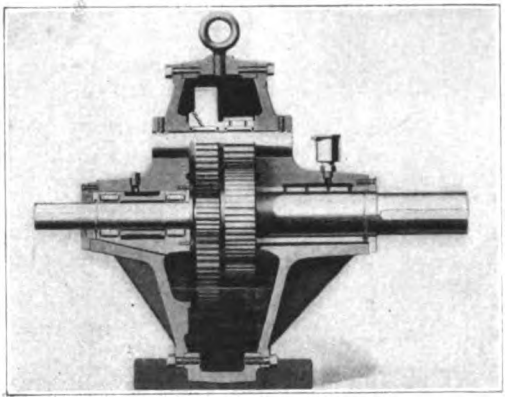


Fig. 7. This is a phantom view of a spur gear speed reducer of very late design. Such reducers have a wide range of reductions—it being as easy to design a 1,000 to 1 ratio as 100 to 1—and they transmit in a straight line; that is, driving and driven shafts are in exact alignment. This makes them particularly applicable to line shaft installations.

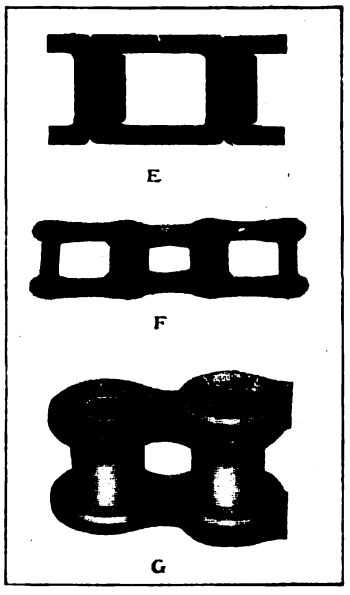


Fig. 8. At the left, are three familiar forms of chain link design other than the silent chain. The original and modern detachable malleable iron chain is shown at "E". It is used extensively for slow and medium speed light driving under gritty conditions. At "F" is the steel-bushed roller chain, designed to meet the demand for efficient, low-priced chain of long wearing quality. At "G" is a finished steel roller chain, a type second only to silent chain.

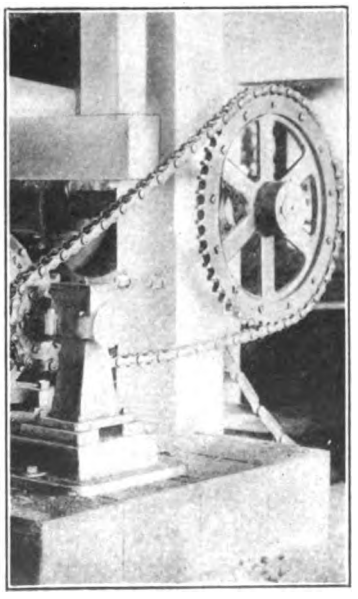


Fig. 9. At the right is a typical installation of the chain shown at "G" in Fig. 8. Such chain is strong and possesses excellent shock absorbing qualities; factors largely responsible for its industrial use in increasing quantities. It is also used on a large scale in motor truck drives and similar work, which speaks well for its endurance.

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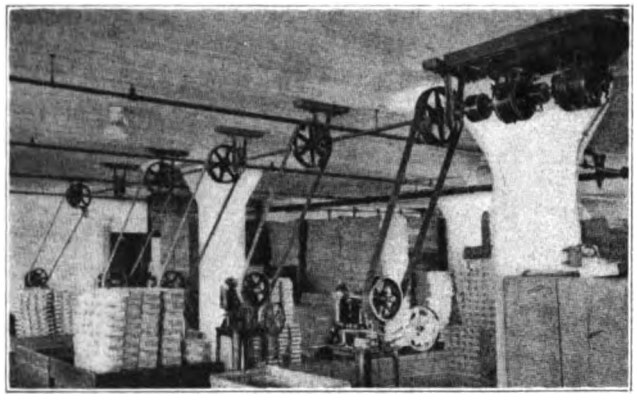


Fig. 10. Above, is shown a spur gear speed reducer unit, flexible coupled direct to electric motor, the two being mounted on a single base. The illustration here shows how compact such a unit is, permitting slow speed line-shaft drive by motor with a minimum of space. Contrast this method with the older space-consuming one of using a large belt and large line-shaft driven on long centers from a small motor pulley.

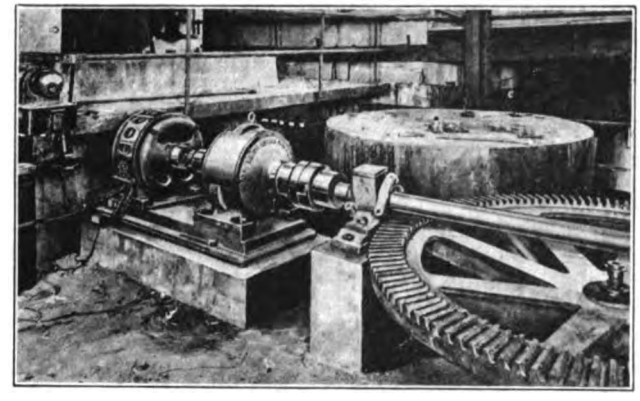


Fig. 11. Here is another application of the same type of spur gear reducer and a motor, mounted on a single base, to give a compact drive unit. In driving a rotary cement kiln, for example, the alternative would be a train of gears, exposed to destructive dust and grit. These reducing units are efficient, quiet, and are fully protected against the entry of any dirt which would tend to injure the gears.

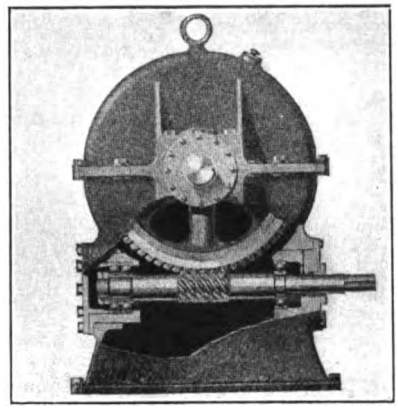


Fig. 12. A cut-away view of the same type of worm gear reducing unit as shown in Fig. 6. The gearing operates in a bath of oil, and the worm is rigidly supported on ball bearings capable of withstanding the full thrust of the worm in either direction.

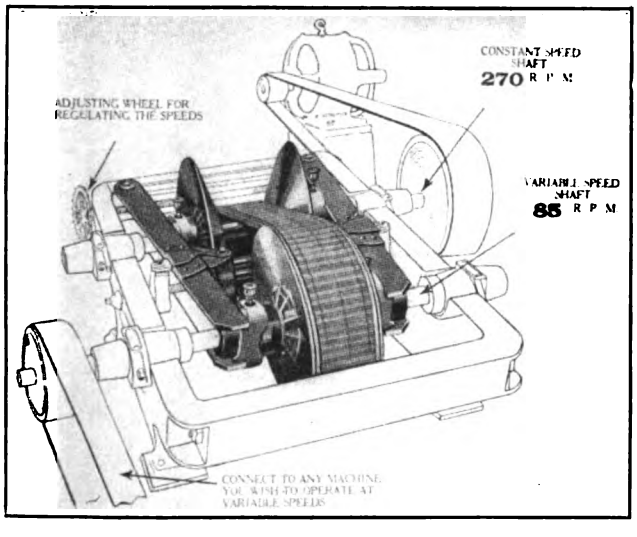


Fig. 13. Phantom diagram of the application of a well known type of variable speed mechanism. In principle, it is a "V" shaped sectional belt operating on four adjustable cones, but mechanically it is a machine in itself. The constant speed motor is belted to the constant speed shaft, and any desired speed is obtained on the variable-speed shaft by adjustment of the cones.

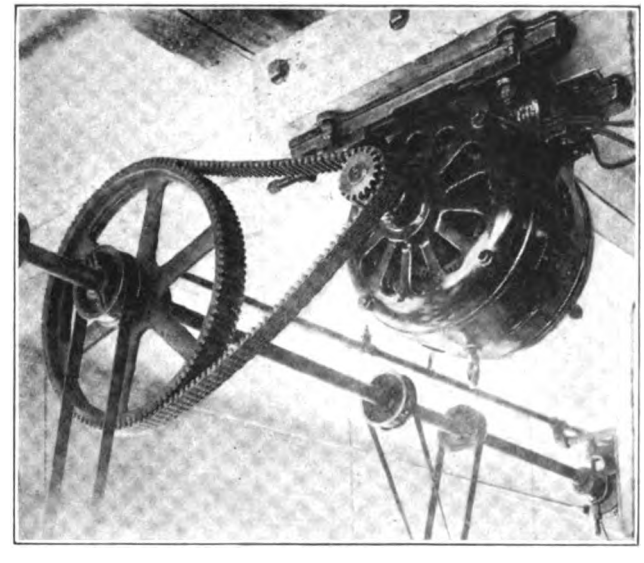
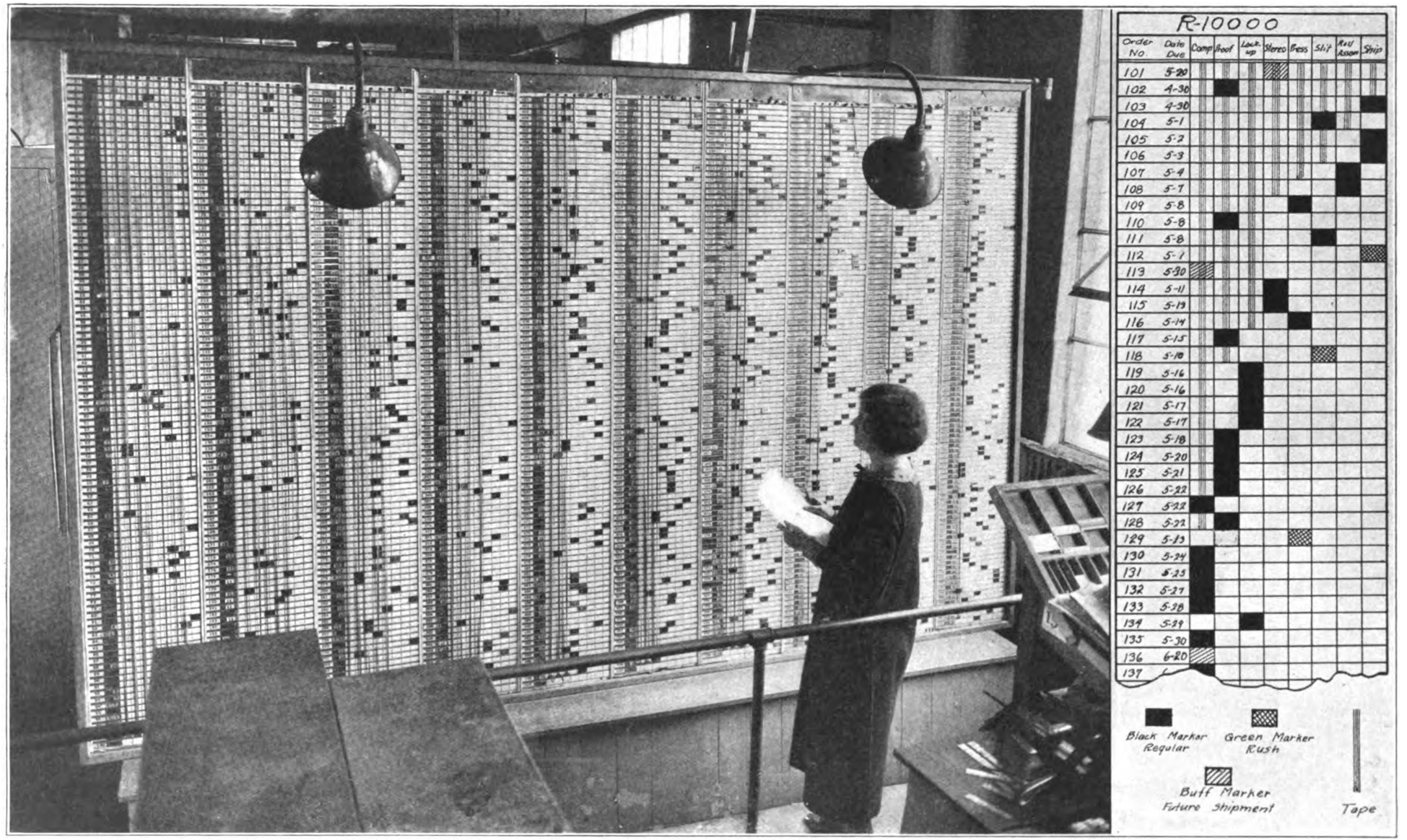


Fig. 14. This shows one of the most efficient and economical applications of the silent chain drive —a short center drive between motor and line shafting. This method has, to a great extent, made the group driving system for production operations practicable. A drive of this kind need not be encased for lubrication, because of the relatively low chain velocity.

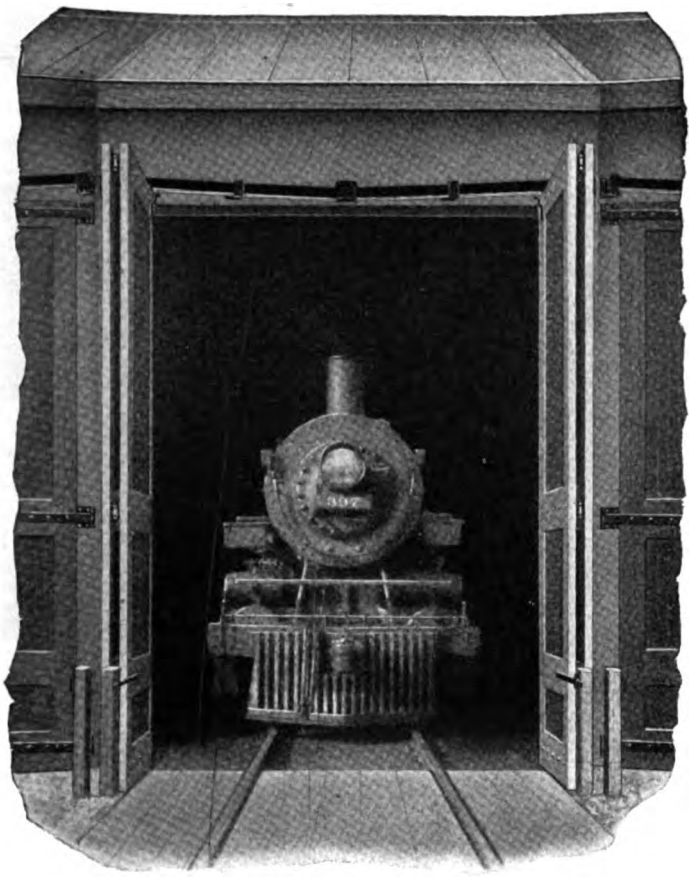
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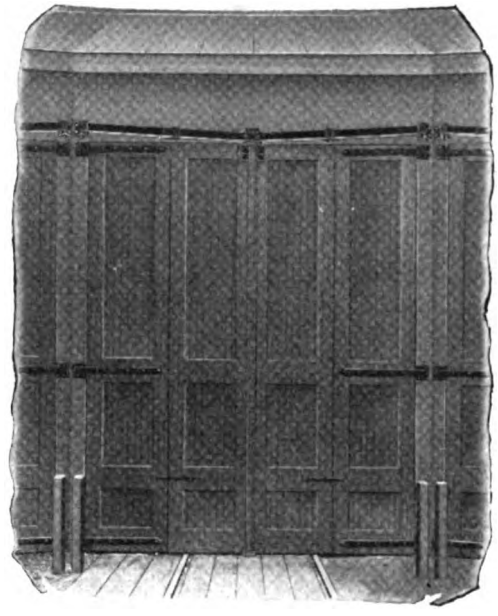
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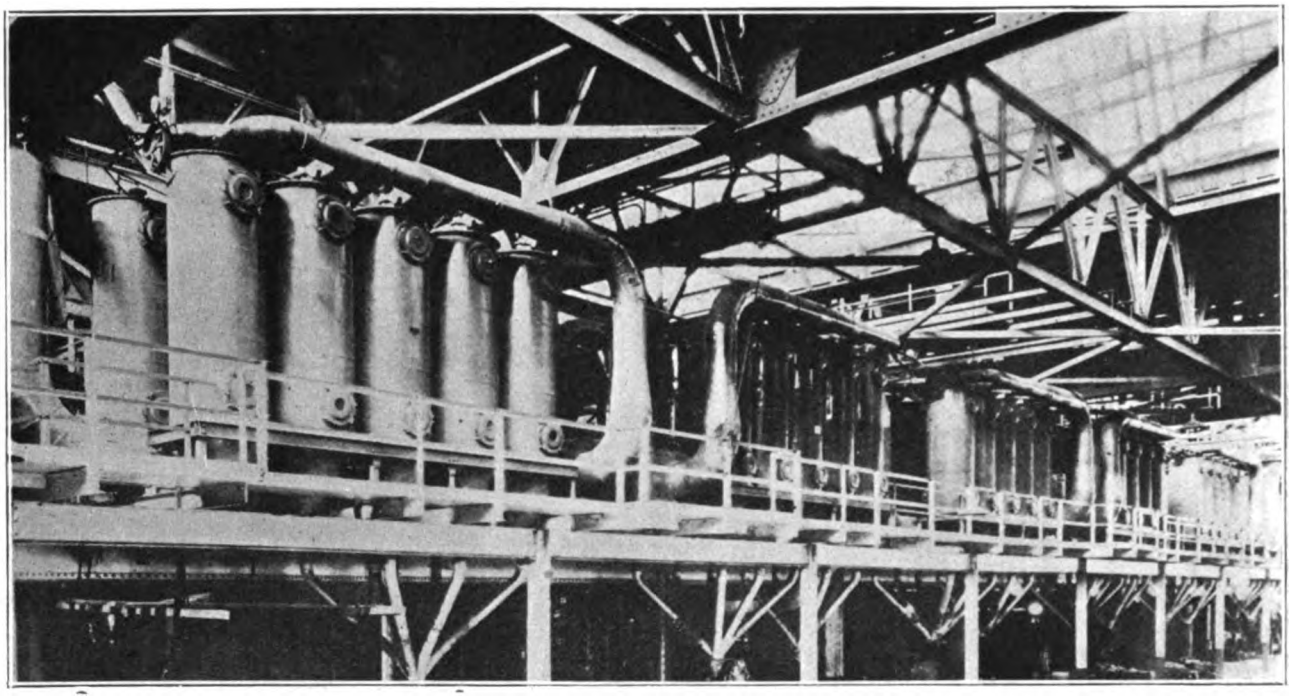
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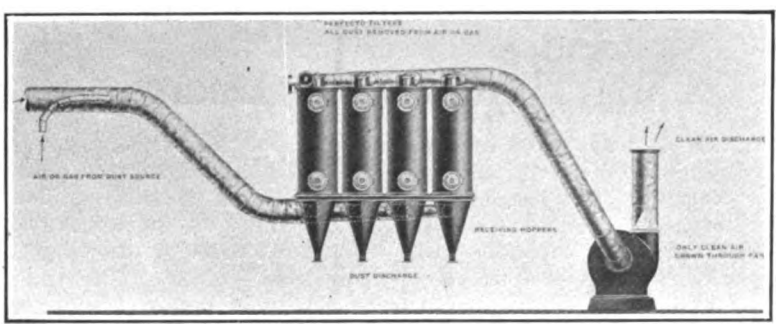
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Handling Materials by Overhead Systems

Equipment That Eliminates Transfer Handlings

By Matthew W. Potts

IN practically every plant it is necessary to handle large quantities of materials, and it is surprising how certain fundamentals are found in varying industries. For example, 75% of industrial plants have to unload raw materials from cars, barges, or trucks and convey them to their respective storage places, either in the yard or within a building. From storage points it is necessary to take these same materials, and again transport them to machines, vats, cupolas, furnaces or other apparatus used in making the finished products. In order to keep all production equipment busy it is necessary to provide a quick and efficient method of lifting and transporting the raw materials, and materials in process, from one department to another. Eventually it is necessary to transport the finished products to the warehouse, shipping room, yard or other point in the plant, where it is again necessary to pick it up for loading to trucks, cars, barges, or other carriers that transport it to the consumer.

What then is the greatest item of production expense? It will be found on the surface, and also after investigation that most of the direct labor expense of any production plant is chargeable to the handling and transporting of raw materials, materials in process and the finished products. Lifting, hauling, and the handling of materials therefore are a big factor in the production costs, and also have a direct bearing on the profits.

With the present array of equipment that can be obtained for the handling of materials, there is no reason for using obsolete methods, but at the same time it is not always easy for the executive to quickly decide on just what type to install so as to accomplish the best results. It has been realized for a long time that transfers from one type of equipment to another were expensive, but it is only recently that engineers have given this point in the handling of materials, its proper atten-

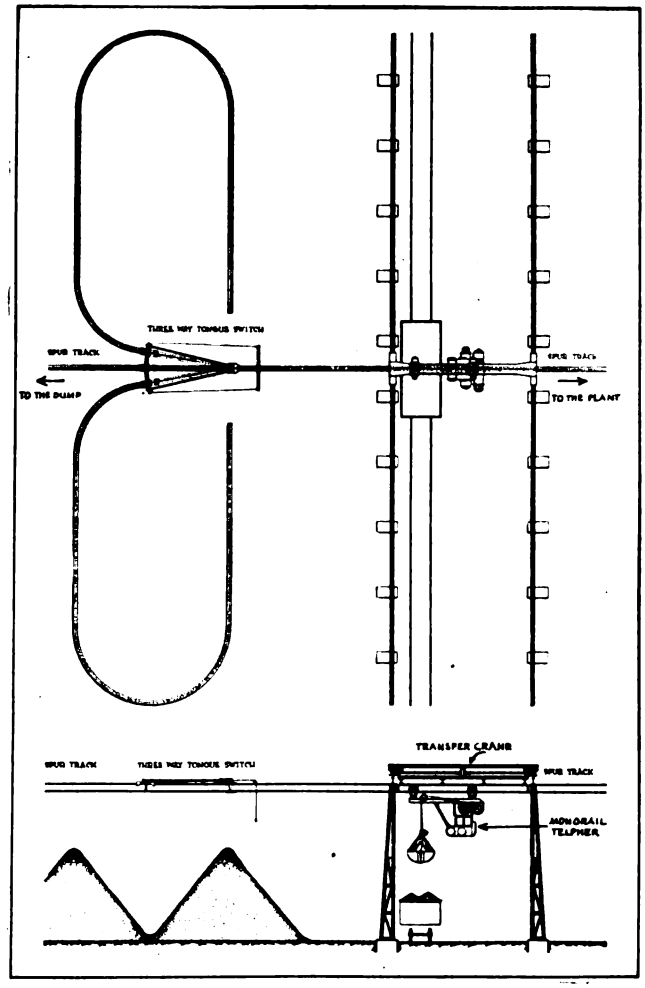


Fig. 1. Layout showing the application of a transfer crane and monorail telpher system for the handling of bulk materials.

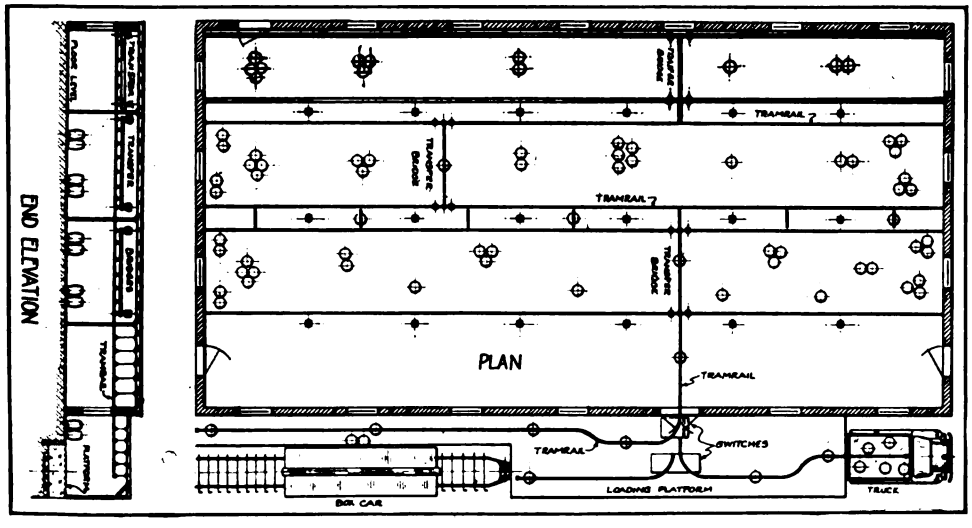


Fig. 2. Barrel warehouse equipped with an elaborate layout of three transfer cranes and monorail track. Note how the entire floor area and shipping platform can be served.

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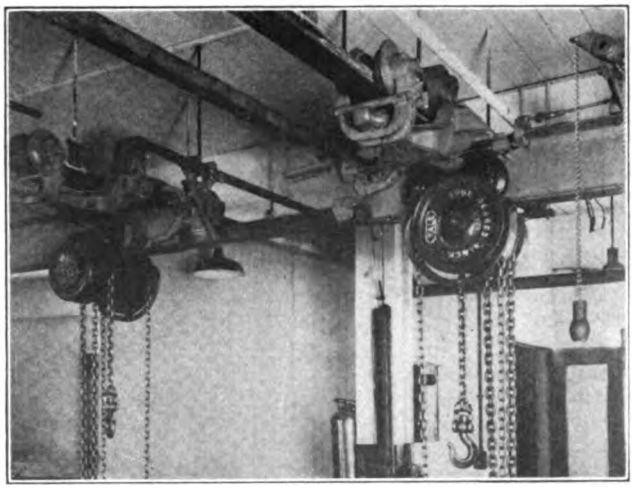


Fig. 3. Close view of two hand operated transfer cranes, showing the method of transfer from one crane to the other. Note the safety stops.

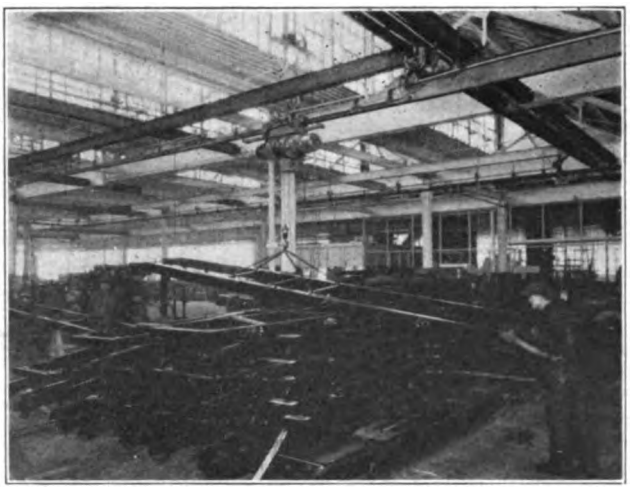


Fig. 4. Simple installation of transfer cranes, tramrail track and electric hoists in an automobile plant.

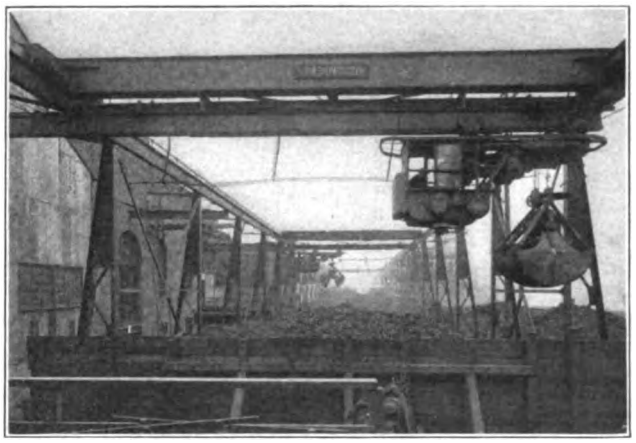


Fig. 5. By using more than one transfer crane a number of monorail telphers can operate simultaneously. It is worthy of note that manufacturers of this kind of equipment are rapidly adopting anti-friction bearings, with resulting lower operating costs.

tion. Now handling engineers are sure that considerable time and money can be saved by eliminating the transfer points. Many attempts have been made to bring about the ideal layout that had no transfer points, but the necessity of lifting as well as transporting, and the plant layouts, has made the problem quite difficult. The subject of Materials Handling is still in its infancy, and for this reason many possibilities of standard equipment have been overlooked, both by manufacturers, and the user's engineers. For example, the layout of a monorail telpher, or I-beam trolley system incorporating an overhead transfer crane for longitudinal travel has not been used to its fullest extent.

This combination of more than one type of equipment makes it possible for the operator to pick up a load, hoist it, and transport it over a wide area. It permits travel in three directions, horizontal, longitudinal, and perpendicular. Thus by considering one or more types of equipment as a unit it is possible to effect the ideal of performing a series of operations without transferring the load. The installation of such equipment is of course dependent upon plant conditions, and plant layout. The accompanying pictures and layouts show conditions that have been, and can be successfully met by the use of such a combination.

A simple layout, and one that can be easily understood is shown in Fig. 1. Here is a complete layout showing the use of a monorail telpher, and transfer crane for

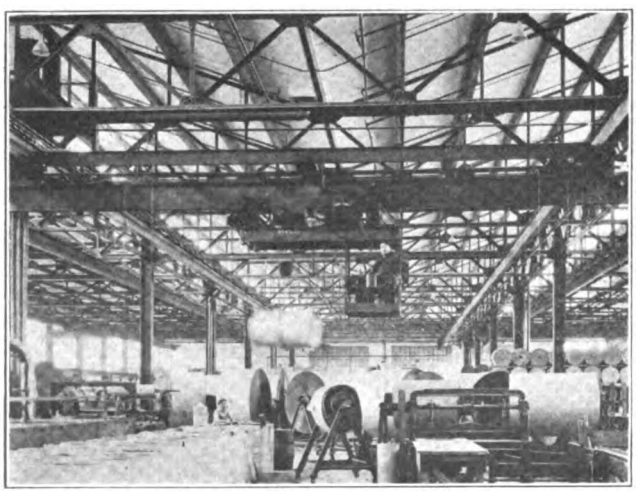


Fig. 6. To serve this manufacturing floor with any other type of equipment would be difficult. Transfer cranes and a monorail telpher performs all handling and hoisting operations.

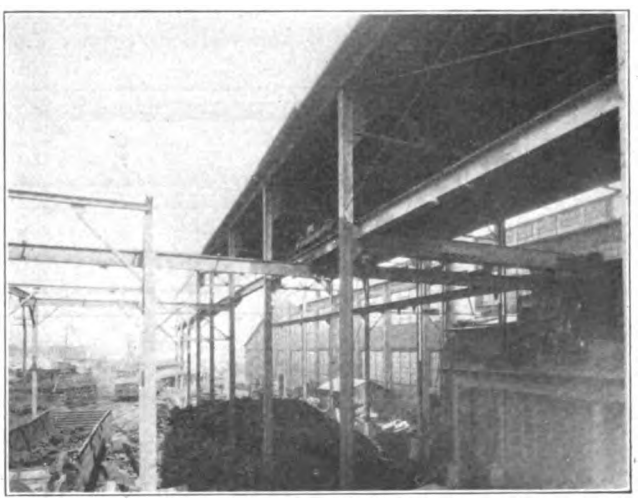


Fig. 7. Transfer crane and monorail telpher serving the stock pile in a large foundry. This is a companion picture with Fig. 8.

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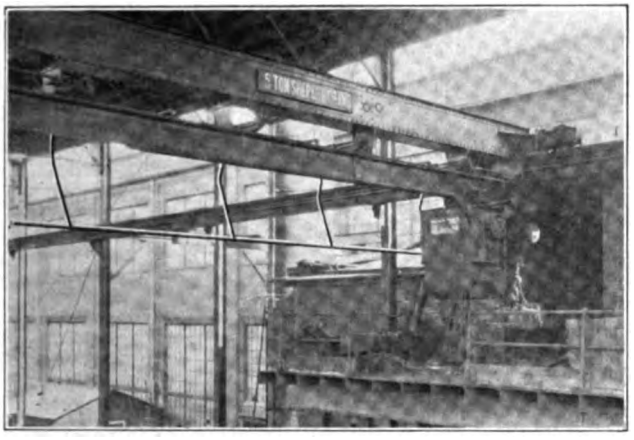


Fig. 8. Monorail telpher leaving transfer crane shown in Fig. 7, and entering to cupola charging floor.

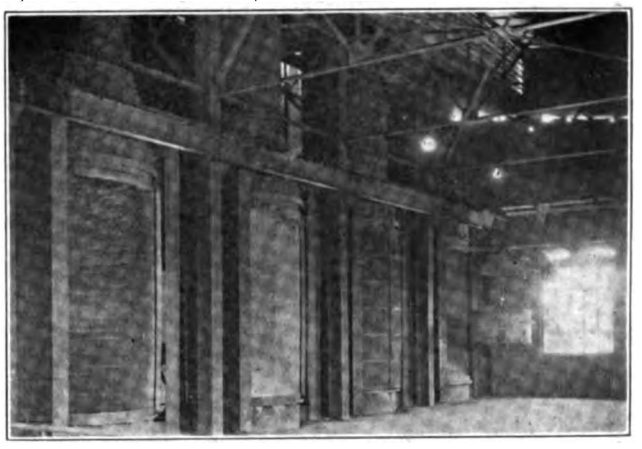


Fig. 9. A second transfer crane located on the cupola charging floor makes it possible for one monorail telpher to serve a number of cupolas.

the unloading of cars of raw materials, placing them in storage, etc. It will be noted that the I-beam track with a three way switch is used for traveling in a forward direction over the storage area, and to the plant, but the entire monorail telpher is carried on an overhead transfer crane for longitudinal travel over the railroad track when unloading cars.

Fig. 2 shows the installation of three transfer cranes and tramrail track in a barrel warehouse. Here a single track with switches permits the serving of both the unloading points, and this same track leads through a doorway direct to the first storage bay "A." If the barrel is to be placed here the operator moves the transfer crane in the desired longitudinal direction. If not the trolley passes over this transfer crane to the one that serves storage bay "B." The illustration shows this transfer crane moved down the bay and depositing a barrel.

An installation where a monorail telpher and three transfer cranes proved of decided advantage is shown in Fig. 5. This photograph was taken in the Hinde & Dauche Paper Company plant at Cleveland, Ohio. This equipment has been in operation for some seven or eight years, giving perfect satisfaction, showing that the combination of two or more pieces of equipment is quite practical. The entire tonnage of paper in this plant is handled by this equipment. The layout has proved to be more flexible and efficient than a single long span crane. To install a long span crane would have necessitated a more expensive and different type of building, as the columns would have to be eliminated. This figure also shows how this equipment is up on the ceiling, thus leaving the valuable floor space for production purposes. It would be difficult to truck this paper on the floor, due to the seeming congested conditions.

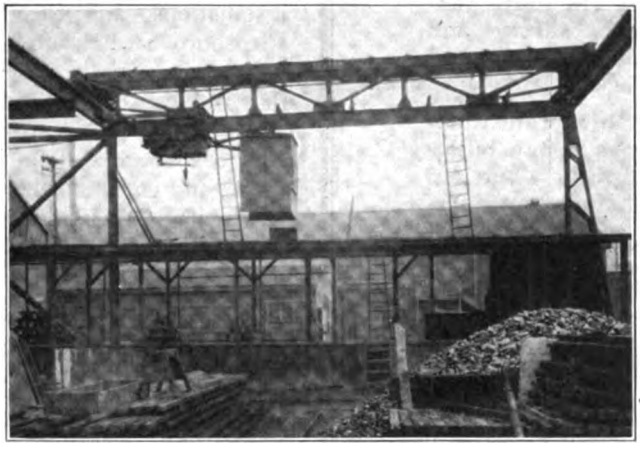


Fig. 10. This installation in a large hardware company's plant carries parts throughout the entire plant and yard.

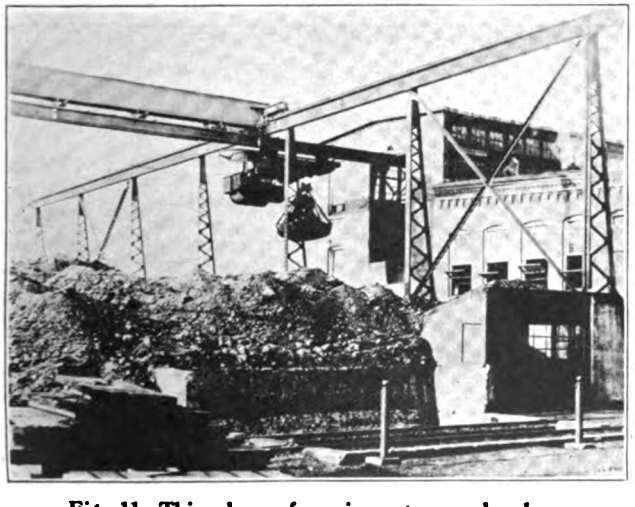


Fig. 11. This class of equipment can also be used for the handling of coal and ashes in power houses.

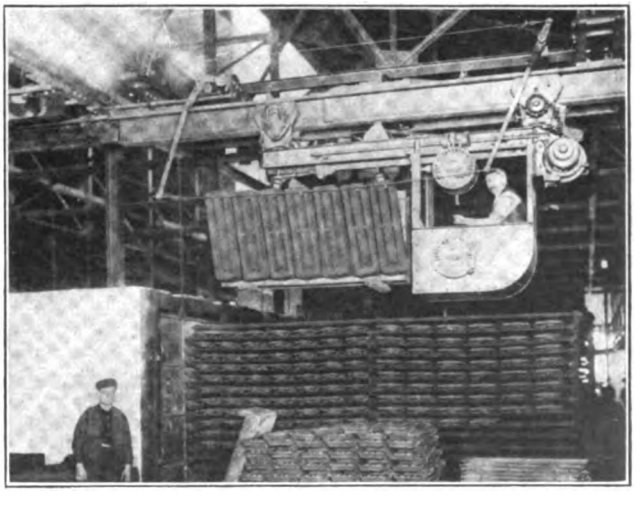
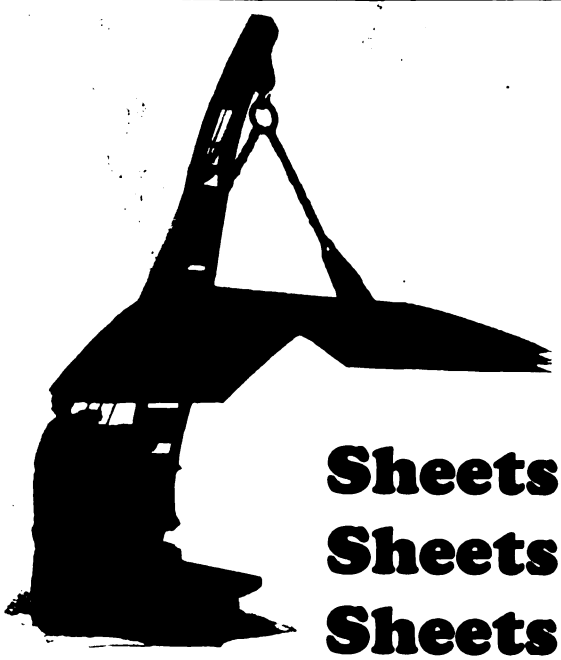


Fig. 12. Manufacturing plants are finding this combination of advantage as shown in this radiator plant.

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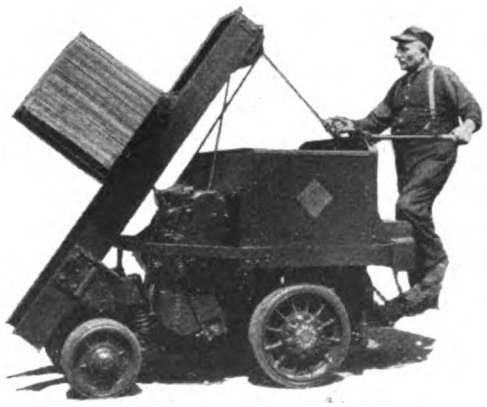


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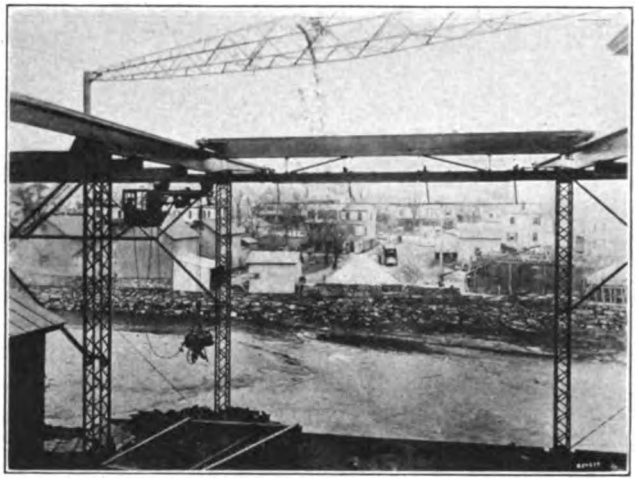


Fig. 13. Note the three spur tracks to the left and the one to the right. Transfer cranes make telpher systems more flexible.

Foundries have for some time been using monorail telphers in connection with the handling of pig iron, coke, lime, etc., both from cars to storage pile, and from storage pile to cupolas. In the last two years, however, they have been shown the advantage of using transfer cranes over the storage piles so as to eliminate switches or the necessity of transfering from a crane to a telpher. Fig. 7 and 8 are typical of the outside layout in such installations, and this equipment is installed in the Birdsboro Steel Foundry at Birdsboro, Pa. It will be noted that spur tracks extend to the left in Fig. 7 so that two cars can be unloaded without the necessity of shifting. The closeup of the transfer crane shown in Fig. 8 illustrates how the monorail telpher leaves the crane, and enters to the charging floor. The rod market with white paint, and extending below the crane is the electric control for the crane, and is placed in this position so that the telpher operator can reach it from the cab.

To illustrate the other part of this new system in foundries we present Fig. 9 taken on the charging floor of the Lynchburg Foundry Co., Radford, Pa. Here the telpher enters into the charging floor from a transfer crane as shown in Figs. 7 and 8, but immediately runs into another transfer crane, which operates longitudinally in front of the cupolas. It will be noted that the cupolas are fitted with high doors suspended from circular

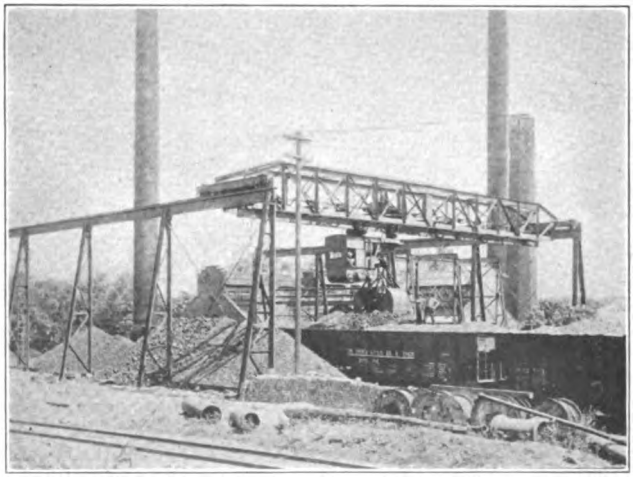
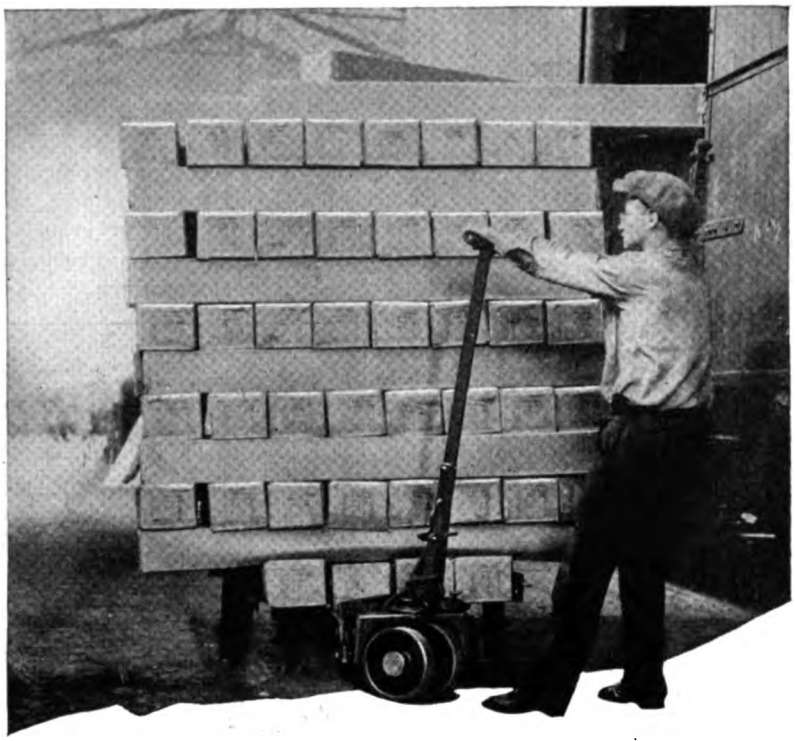


Fig. 14. A heavier built transfer crane for greater capacity.

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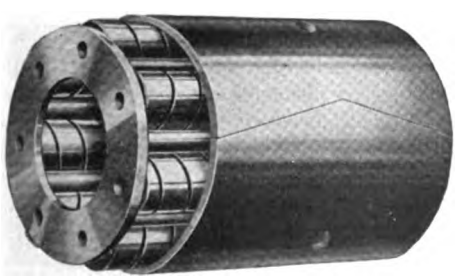
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tracks so that the entire opening is clear for the charging basket to enter. When this type of layout was first introduced foundry men would not consider it, but since successful installations have been made, and the advantages of such equipment proven, the old plants are considering revising old methods, and new plants are being designed around the equipment.

The use of the equipment described in this article is not limited to any one industry or any one operation. The illustrations are taken in a number of plants and show various operations. To say that transfer cranes

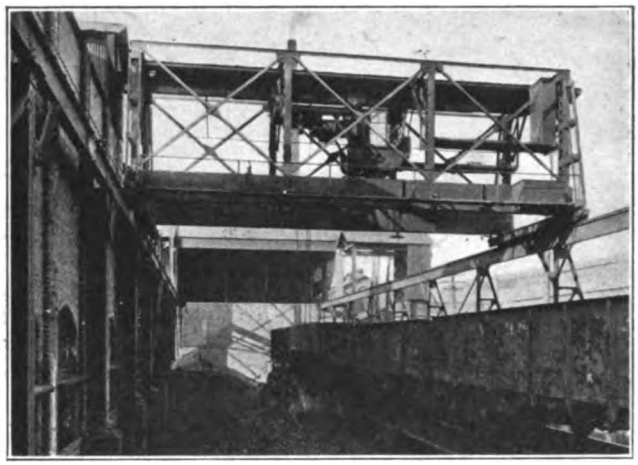


Fig. 15. Another crane design. Note the protective house in the background where the telpher is placed when not in use.

and monorail telphers were the only equipment to install so as to eliminate transfers would be erroneous. For instance, lift trucks and skids when properly applied also permit the handling of materials on the level without the expense of transfer handlings. This equipment, however, lacks the advantage of lifting the materials over eight feet for piling in storage. With the equipment described here the lift at any point is only limited by the height of the track or the crane runway. In addition the track can run over buildings, roadways, railroad tracks or other obstructions that would stop the free passage of a truck.

The handling of bulk materials can be done in so many ways that it is sometimes difficult to make a quick selection of the equipment, and for this reason plant operators and engineers should be more familiar with all of the present standard types of materials handling equipment. They should also consider making up combinations of equipment. A little thought along this line will bring out many places in industrial plants, stone quarries, lumber yards, coal yards, etc., where more efficient methods could be employed. There is no need to wait until some other plant has made the first installation to prove the possibilities of the equipment, for most manufacturers have now learned that it is to their best interests to make only installations that will prove to be successful.

Now more than ever before the necessity of using mechanical equipment in place of common labor, for the handling of materials is apparent. According to all statistics our supply of common labor is decreasing every year, and there is little possibility of the immigration bars being let down. This is not necessary, however, as the cheapest labor is mechanical power. In addition the advantages previously mentioned can be obtained by using mechanical equipment.

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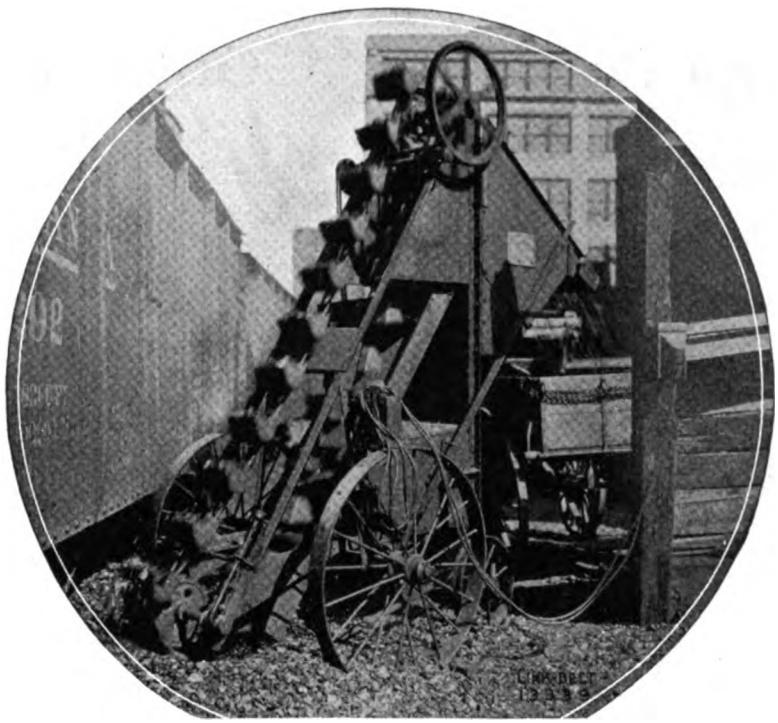
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Stop Building Concrete Walls Inside Your Boilers!

Why Feed Water Treatment Pays

By Francis Juraschek



Fig. 1. An extreme case of scale in a section of tube taken from a water tube boiler. Notice how the rock-like deposit has cut down the effective area of passage.

WATER is H_2O, says the chemist. And that is a correct definition, if you mean *pure* water. But where will you find pure water in Nature?

Rain water almost meets the requirements, but even rain water absorbs dust and waste gases in the atmosphere on its descent to earth. And water from rivers, from lakes, from springs and from wells, is far from pure, no matter how good it tastes, or how refreshingly clear and sparkling it appears.

Water is almost a universal solvent. With very few exceptions whatever it touches it robs. Startling thought, isn't it? And the more surprising because it is not one of your big, bold, heroic robbers whose deeds of amazing daring inspire men to song. Water is just a sly, furtive thief, satisfied with the most minute quantities of plunder—and therefore unsuspected.

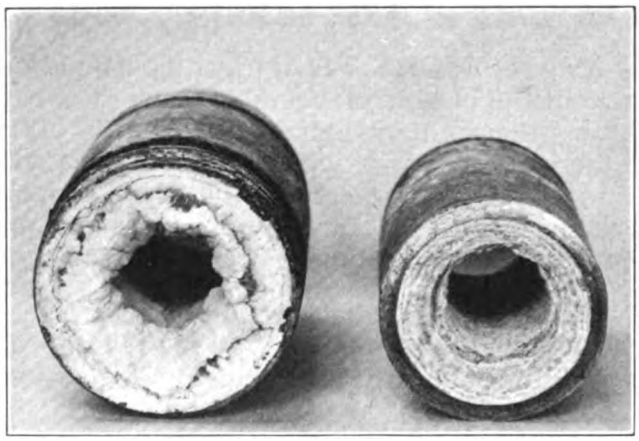


Fig. 2. Two radically different types of scale deposits in boiler tubes: Left, typical carbonate scale; as soft, and as choking, as chalk. Right, typical sulphate scale, as hard as the everlasting hills.

Yet note how the tiniest iota of evil taints the mass and wreaks havoc with one use man makes of water. One grain is the 1/7000th part of a pound, or 1/58.415th part of the weight of a gallon of water. Such a minute quantity is almost too small for the mind to value, and fifteen grains taken together in one lump sum make a little bit of a homoepathic dose. But a very definitely calculated statement found in many conservative power plant engineering textbooks runs somewhat like this:

"In a 100-hp. boiler evaporating 400 gallons of water per hour, water with only 15 grains of scale-forming minerals per U. S. gallon will deposit 20.6 lbs. of scale in 24 hours or 6,180 lbs. of scale per working year of 300 days!"

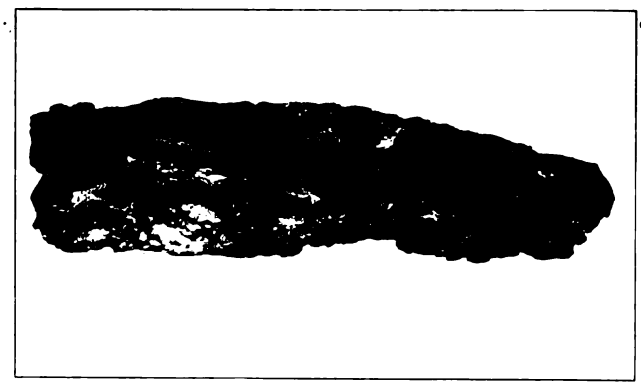


Fig. 3. A lump of scale particles cemented together in a mud-drum after being loosened and thrown down by a mechanical tube cleaner.

Scale is nothing more nor less than carbonates and sulphates of lime and magnesia (the more or less soluble constituents of rock) held in solution but deposited in rock-like form when the water is

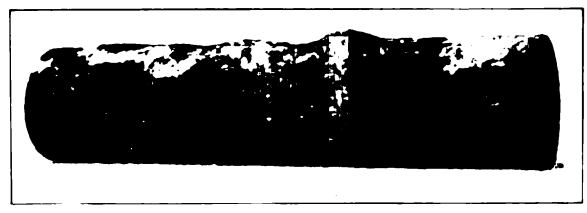


Fig. 4. The effect of heat on a boiler tube when a layer of insulating scale prevents the transfer of the heat to the water. The bulges would have burned through if the tube had not been removed promptly.

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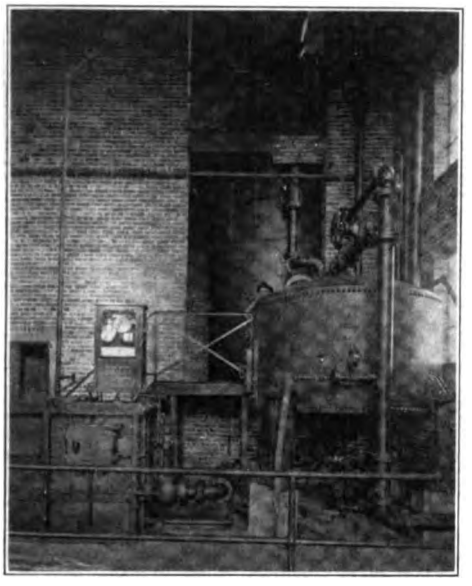


Fig. 5. A hot-process softening apparatus in which scale-neutralizing reagents are added to the heated feed water; turning the soluble salts into insoluble salts, which are readily removed by sedimentation and filtration.

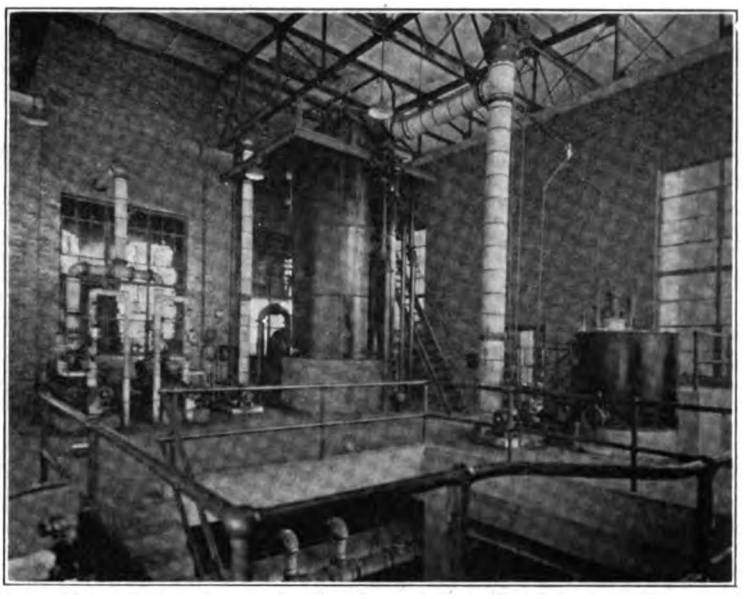


Fig. 6. The complete equipment of a typical hot-process water softening system, together with boiler feed pumps. Capacity, 8,000 gallons of raw water per hour.

evaporated. Scale is one of the finest non-conductors of heat known, and, as it builds up, layer by layer, in boiler tubes, forms an impervious, concrete-like coating that causes a waste of fuel, of labor and money in direct proportion to the thickness to which it is allowed to accumulate. When corroding substances are also carried by the water (such as the chlorides of various metals) the scale formed on the surface of the boiler metal conceals the corrosive action going on underneath, and the gradual disintegration of the metal is not detected until failure occurs.

As everyone knows, the functions of a furnace and a boiler are diametrically opposed. A furnace is designed to liberate the utmost amount of heat possible from the fuel, and a boiler is designed to permit the water to absorb as much as possible of that heat. The furnace must keep the heat in; the boiler must facilitate the transfer of the heat to the water.

Consequently, whatever may serve to obstruct the free passage of heat from the furnace to the water, tends to defeat the purpose of the boiler, or to decrease its efficiency. And permitting raw water to build walls of solid, heat-resisting rock upon the heating surfaces does certainly impair the good working qualities of the boiler.

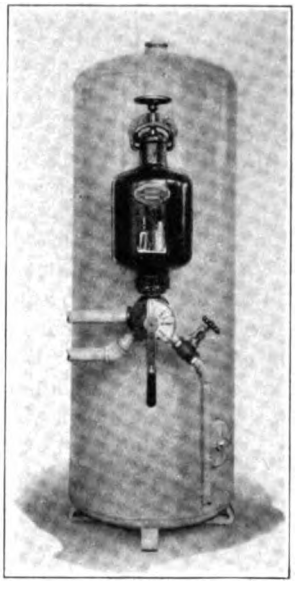


Fig. 7. The simplest form of exchange silicate, or zeolite process water softener, as used in very small boiler plants. The black pot contains the salt used for regenerating the zeolite.

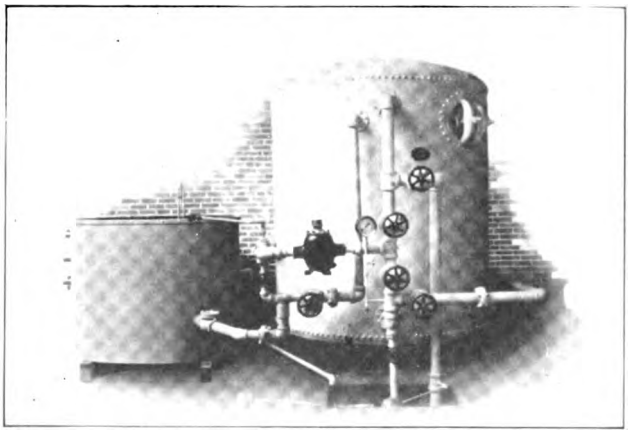


Fig. 8. The commercial size zeolite water softening apparatus, with separate salt solution tank for regenerating.

Aside from the everyday loss of fuel due to presence of scale in a boiler is the serious danger of burning out of tubes, or of boiler explosions due to combined effect of irregular deposits of non-conducting scale, and of corrosion attacking the metal.

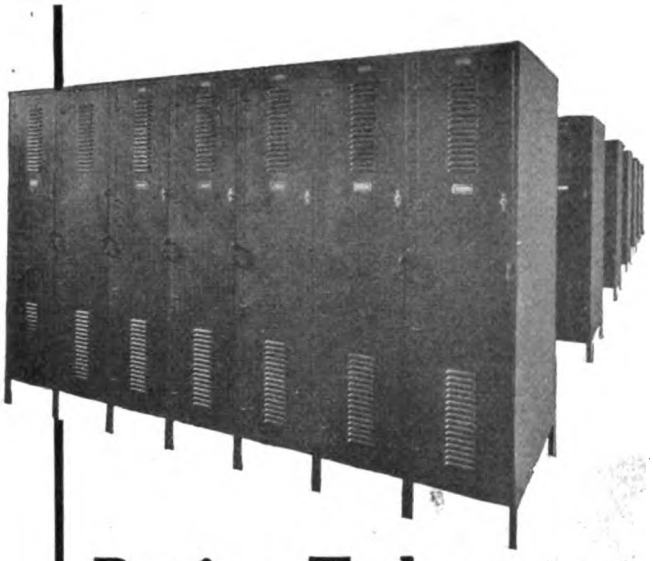
Many of us have doubtless witnessed the very interesting physics laboratory experiment of boiling water in a paper bag over an open flame. This striking experiment is possible only because the paper is thin and a relatively good conductor of heat; so that as long as there is water in the bag to absorb the heat the paper cannot burn.

But if we could separate a section of the paper from the water by means of some non-conducting material, the paper under that insulating patch would almost instantly char and burn, because the local heat could not be transmitted to the water fast enough to keep the temperature below the burning point.

This is what frequently occurs in boilers. Reports of boiler insurance and inspection companies show that more than half the boilers inspected annually are affected by burned plates, defective tubes, leakage around tube joints, scale incrustation and internal corrosion; all of which can be positively traced to impurities in the boiler feed water.

The story of the evils resulting from the impurities

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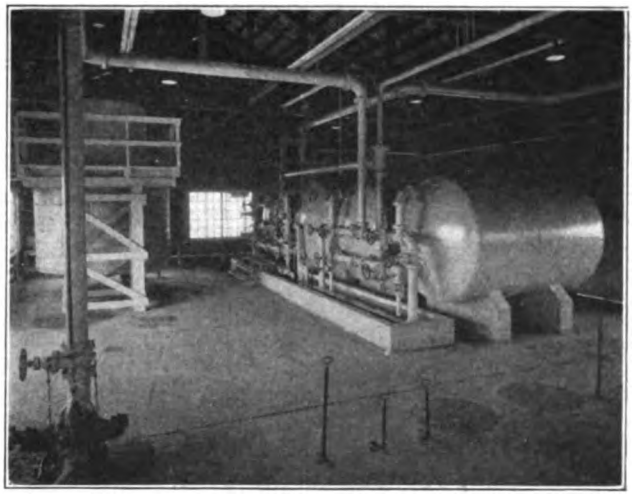


Fig. 9. Typical large installation of horizontal water softeners and filters in a boiler plant of 4,500 b.hp. This plant requires 90% make-up for its boiler feed.

found in raw water as a result of its pilfering instincts might be carried on ad infinitum, for it is an exceedingly rare occurrence to find a natural water that does not contain sufficient hardness to cause trouble. A good natural water may contain six to eight grains of hardness per gallon, and even that small amount is bad for boilers. A poor water containing thirty to forty grains per gallon will not affect the human organism at all, but would be disastrous in the steam power plant.

What can be done about it? And is it worthwhile to do anything about it?

There are four distinct methods of treatment.

1. Boiler compounds may be added to the water in the boiler to precipitate the dissolved minerals in the form of insoluble salts; or to coat the metal surfaces, or the crystals deposited from the evaporating water, with substances which prevent the scale adhering to the metal or forming impervious masses. The net results of any of these effects is the deposit within the boiler of sludge, or mud, which must be blown out frequently.

2. The precipitation method consists in adding to the

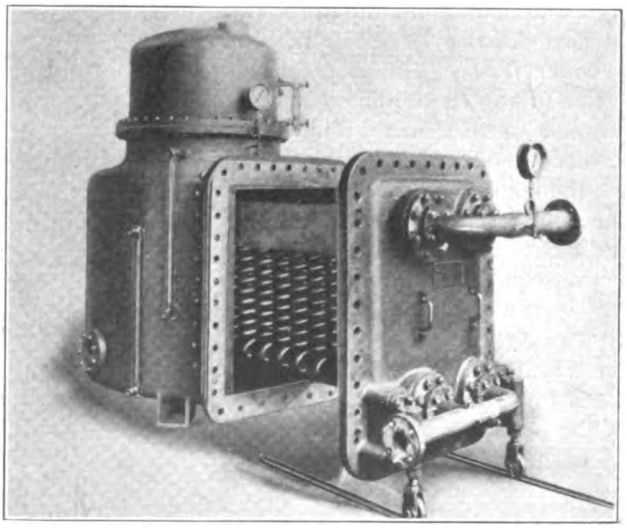


Fig. 10. An evaporator, in which the raw water is distilled before entering the boiler. The multi-coil construction of the tubes in the evaporator facilitates the "cracking out" of the deposited scale.

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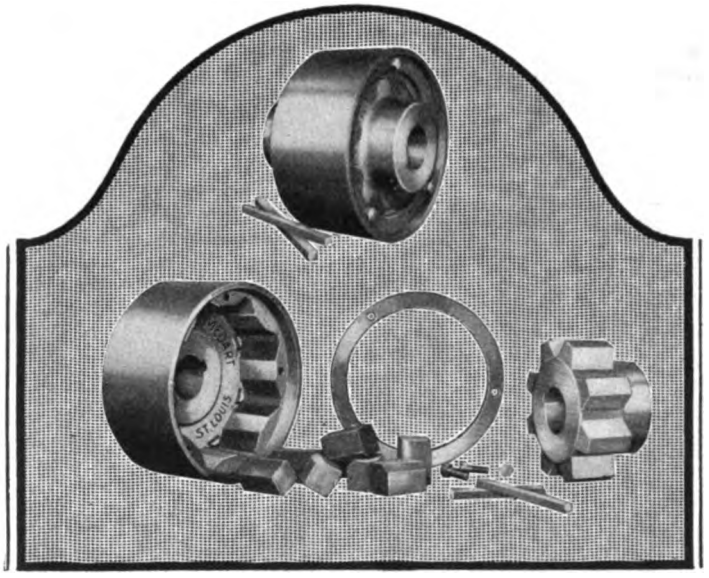
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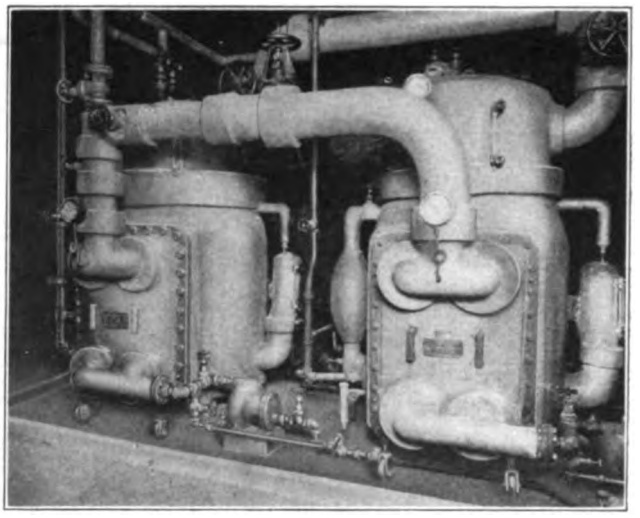


Fig. 11. A typical "two-effect" or double-stage evaporator, in which the steam formed in the first stage serves to vaporize the water in the second stage.

raw water, in apparatus situated outside of the boiler, certain chemical reagents to cause the soluble mineral salts to become insoluble, and then precipitating these insoluble salts in filter beds. Since heat hastens the action of the reagents it is usual to employ the "hot process" method where very soft water in not too large quantities is needed quickly. The "cold process" is better adapted where large quantities of cold, softened water are needed for process work. Either process may be continuous, or intermittent.

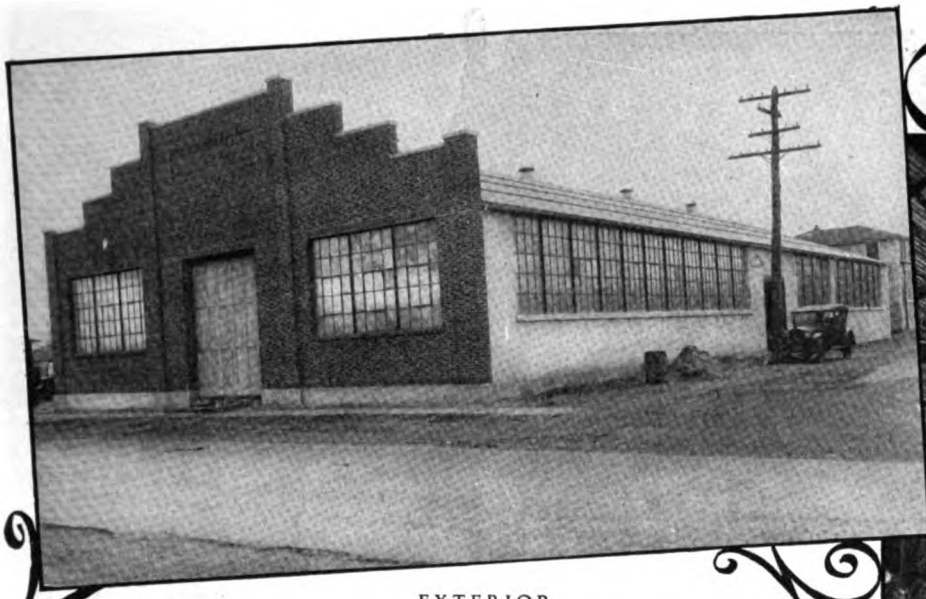
3. The exchange silicate method accomplishes the removal of the hardness in the water containing lime or magnesia by the percolation of the water through a bed of zeolite material; the sodium of the zeolite being given up in exchange for the lime and magnesia of the water. The sodium is not harmful, or "hard." When the zeolite is saturated, and can give up no more sodium, a solution of common salt and water is passed through it in the reverse direction, when the brine gives up its sodium to the zeolite, and takes out the saturated lime and magnesia. In this method there is no sludge to contend with, as the zeolite itself is an insoluble reagent, always remaining in its own bed within the apparatus, and the hardness removed from the water by the zeolite is returned from the zeolite in clear solution by the brine exchange.

4. Evaporating and condensing apparatus actually distills the water before it reaches the boiler, leaving the hardness as scale in the evaporators. These, however, are so constructed as to make the removal of scale a simple matter, either by a continuous washing process that prevents the formation of extensive scale deposits, or by a type of tube construction in which temperature changes cause expansion and contraction sufficient to crack off the scale deposit.

Some of these four methods of combatting the evil effects of hard water *before* it has a chance to deposit scale, should be used in every steam power plant. Literally thousands of cases may be quoted when fabulous returns have come in from the investment required for water treatment; enough to establish beyond any doubt its wisdom and urgency.

Stop building concrete walls inside your boilers; it is wastefully extravagant!

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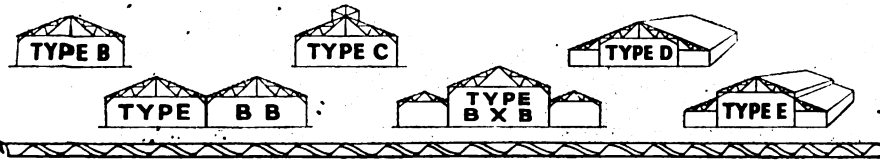
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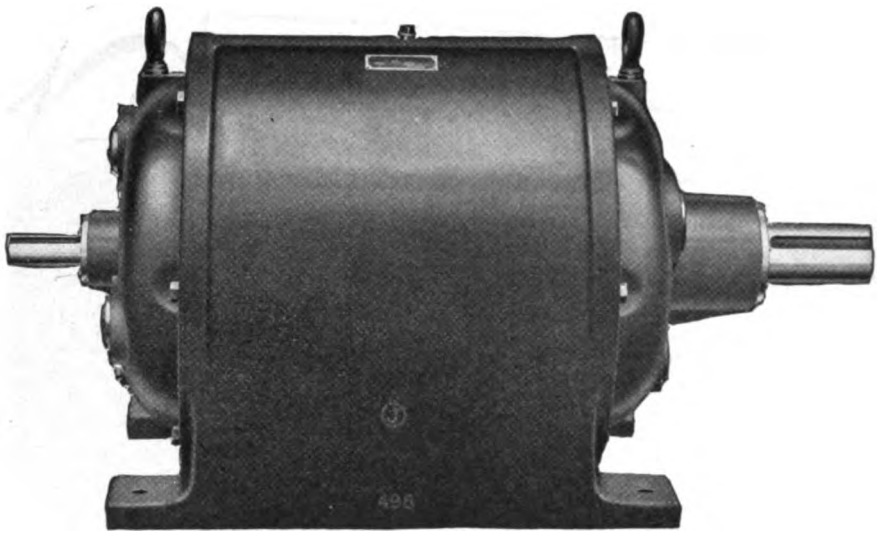
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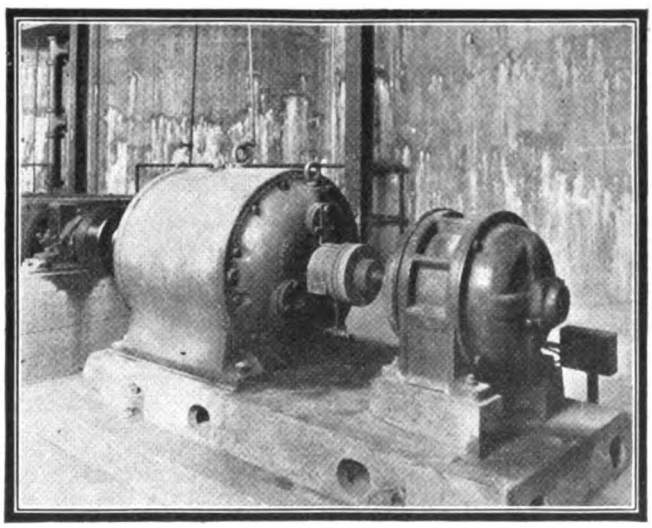
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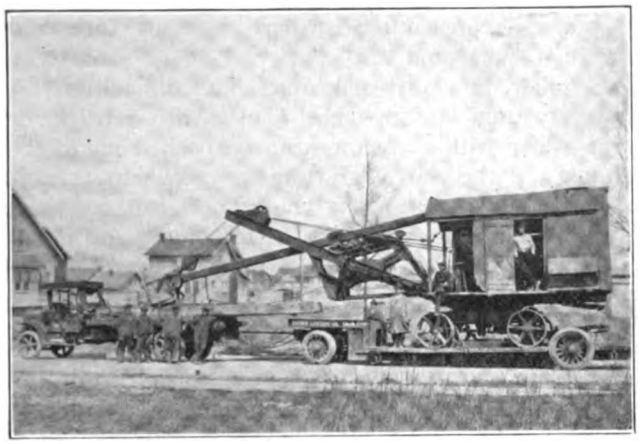


Fig. 1. Transporting a 27 ton steam shovel on a heavy duty trailer. The Brown Cartage Co., of Cleveland, finds this a means to extra work and extra dividends.

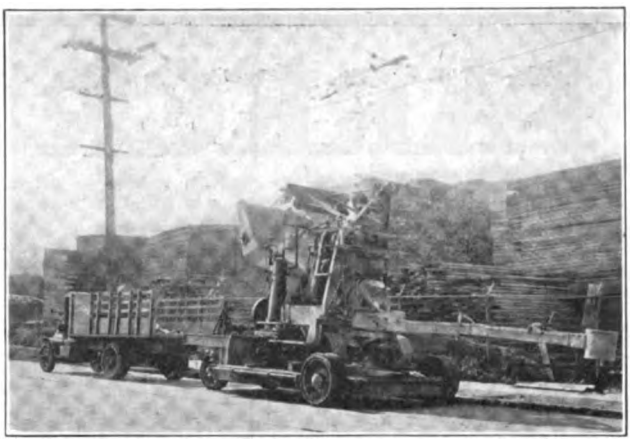


Fig. 2. Emergency repair machinery of the Detroit Department of Street Railways, mounted on a trailer and drawn by truck wherever its services are required.

Moving Extra-Heavy Loads Economically

How the Heavy-Duty Trailer Has Developed to Meet Special Requirements

By H. C. Fruehauf

THE use of the commercial trailer for extra-heavy hauls—loads of thirty, forty and fifty tons—was inevitable, for the conclusive reason that even the best highways could not endure such weights resting on only two axles, especially when the greater portion of the weight was supported on only one—the driving axle. The development of the heavy-duty trailer, however, was stimulated by other causes than the obvious necessity of meeting state and local weight restrictions. The distribution of the pay load over six or eight, and sometimes ten, wheels has proved a time and labor and upkeep-cost saver. It has also given the trailer manufacturer an opportunity to prove his ingenuity in building special models to meet unusual requirements.

In this department the commercial trailer has made a spectacular advance during the last few years. The fact that the trailer, being a carrying unit only without motive power of its own, can be built at far less cost than a truck, has given the trailer engineer a wide scope for the exercise of new ideas along practical lines.

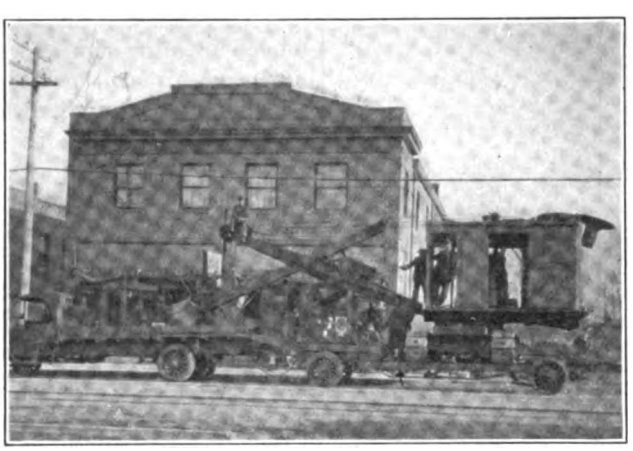


Fig. 3. The Madison Transfer Company, in Richmond, finds its heavy duty trailer in great demand by contractors who require the moving of heavy machinery.



Fig. 4. A 27 ton trenching machine of the J. A. Mercier Co., Detroit, climbing aboard a trailer under its own power, to be hauled to its next job by truck.

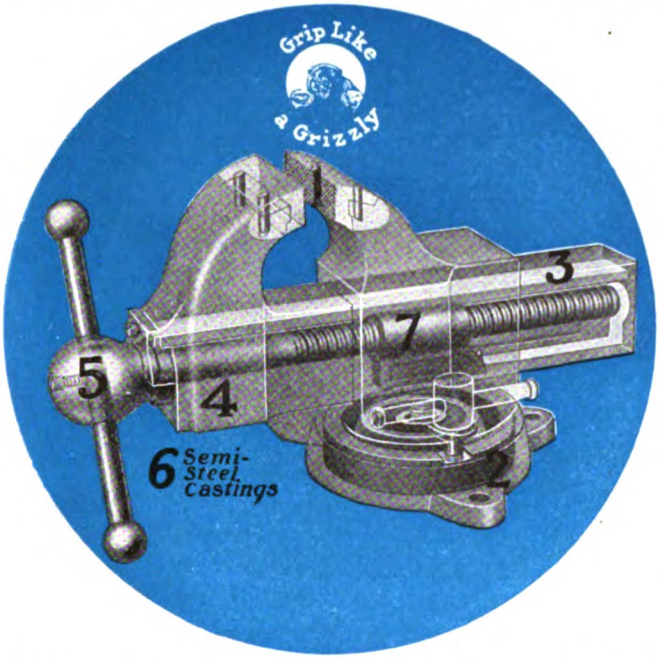
One of these opportunities, and an important one, has come from the extraordinary increase of good roads and the resulting demand for new road construction machinery. Machines of this type are complicated and costly. Even one of them is an important investment, and the contractor is obliged to move his equipment from place to place to get a fair return from his outlay.

It is true that road machinery frequently has motive power of its own. Trenching machines, for example, are equipped with their own caterpillar drives—steam shovels have their own carriers. But two losses—serious losses—result from the use of this power—losses of time, and losses due to wear and tear. Neither of the machines just mentioned can travel fast, and in most cases a piece of heavy machinery of either type—and of any similar type—has to be laid up for repairs after it has traveled any considerable distance under its

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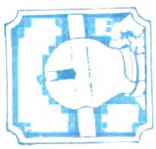
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own power—representing further losses of time and losses due to wear and tear.

The trailer, however, overcomes both difficulties. A heavy duty unit—a four-wheel trailer with a truck, or a semi-trailer with a tractor—can be backed up to the machine, and the shovel or trencher or whatever it is can be run on board. The trailer unit can travel at four or five times the speed of the machinery and it can bring the load to the scene of further activities unharmed and ready to start work. The loss of time due to transit, and repair, and the cost of that repair, are both eliminated.

In this matter of machinery transportation—as in many other heavy-duty cases—the simplicity of commercial trailer construction plays an important part. The trailer can be built low without difficulty because it has no driving machinery. There is no motive power construction problem, and consequently no special construction expense. There is no serious deviation from the normal, which makes standard construction a manufacturing economy. The lower the carrier the greater ease in loading—and the greater security when loaded. The low-slung carrier has a low and safe center of gravity.

One of the problems of extra-heavy haulage arises from the bulk of the load quite aside from the weight. Heavy machinery and most extremely heavy loads require room. The trailer—of the pole type, the four-wheel type, or the two-wheel type—provides just this space without reducing the facility with which the unit may be handled. The modern trailer—about as far removed from its pioneer type as the ox-cart is from the limousine—tracks perfectly with its motive power whether that motive power is a truck or a tractor.

The hauler whose business does not rest solely on the transportation of a single type of load must have equipment for a number of diverse needs. He may have to carry bricks, cement, lead-pipe—any number of various articles, besides the occasional machines, boilers, etc. The unit that is ideal for, let us say, a huge block of stone, will not suit the *carrying* of a complicated trenching machine, although both loads may weigh about the same. But by the use of specially constructed trailers the same motor unit may be used for hauling both because the motive power is *pulling* and not *carrying*.

The illustrations show some of the up-to-date adaptations of the trailer to meet the requirements of modern heavy hauling. The great trenching machine used by the J. A. Mercier Company, of Detroit, weighs twenty-seven tons. By means of a 35-ton, four-wheel trailer, this expensive machine is easily moved from one job to another and kept constantly at work earning dividends. The trailer platform is so low that the trenching machine can be taken aboard and unloaded with ease. The trailer is fitted with rubber tires and the jolts and jars to which the machine would be subjected in traveling under its own power are thus avoided.

A similar trailer model is used by the Detroit Department of Street Railways to move its bulky repair machinery, which is thus enabled to move through the congested streets at a speed that saves time in emergencies when every minute counts.

The Madison Transfer Company of Richmond has found that its low hung four-wheel trailer is in great demand with contractors and other users of heavy ma-

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chinery. The picture shows this trailer, a 30-ton type, carrying a steam shovel. The Brown Cartage Company of Cleveland is another commercial hauler which uses this type of trailer, as shown here supporting a steam shovel.

Among other representative users of heavy-duty trailers, ranging up to fifty tons, may be mentioned the City of Baltimore, the Pennoyer Merchants Transfer Company of Chicago, the O'Brien Trucking Company and Cleveland Trinidad Company of Cleveland, the Board of County Road Commissioners of Wayne County, Michigan, the City of Detroit Department of Public Works, Detroit Edison Company, New Orleans Public Service, Inc., Adirondack Light & Power Company of New York, Union Paving Company of Philadelphia, Douglas Transfer Company of Pittsburgh and the City of Richmond, Virginia.

For such uses the trailer-tractor or the trailer-truck unit serves a very considerable economic purpose. The trailer is a detachable body. When it is not in active service it does not tie up its motive-power—the principal investment for the hauler. It does not waste the time of the motive power. It does not waste the *pulling* power of the motor. It does not necessitate a motor investment for every carrier used. One tractor, for example, can serve two, three, four, and sometimes five trailers. All these facts are of importance to the motor hauler.

CARING for the workers who have grown old in its service is a problem for industry to work out for itself, in the view of leading industrial executives as reflected in a research report on "Industrial Pensions in the United States," just completed by the National Industrial Conference Board, 247 Park Avenue, New York.

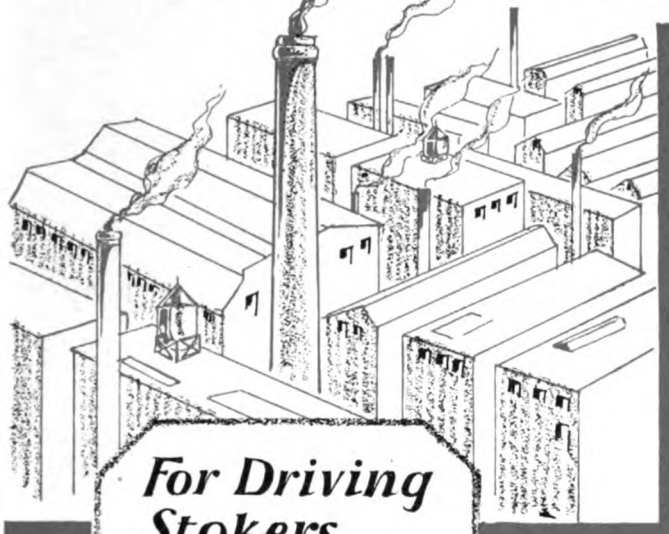
The voluntary assumption by private industry itself of "such responsibility for the welfare of its personnel and the improvement of industrial relations as it is capable of discharging efficiently," is favored as in harmony with American ideals of individual initiative and independence.

The available evidence, according to the Board's report, points to the conclusion that the aims and purposes of pension plans are realized in practice, not in all cases, or in every particular in every individual case, but on the whole. It is sharply emphasized, however, that the industrial pension problem is one of the most intricate confronting industry, and that pension plans to a large extent are "still in the experimental stage." While industrial pensioning is feasible if properly organized and administered, according to the report, the cumulative character and rapidly mounting costs of pensions too often are not properly appraised, and the necessity of funding any pension plan on a scientific basis if future embarrassment is to be avoided is stressed with recurrent emphasis.

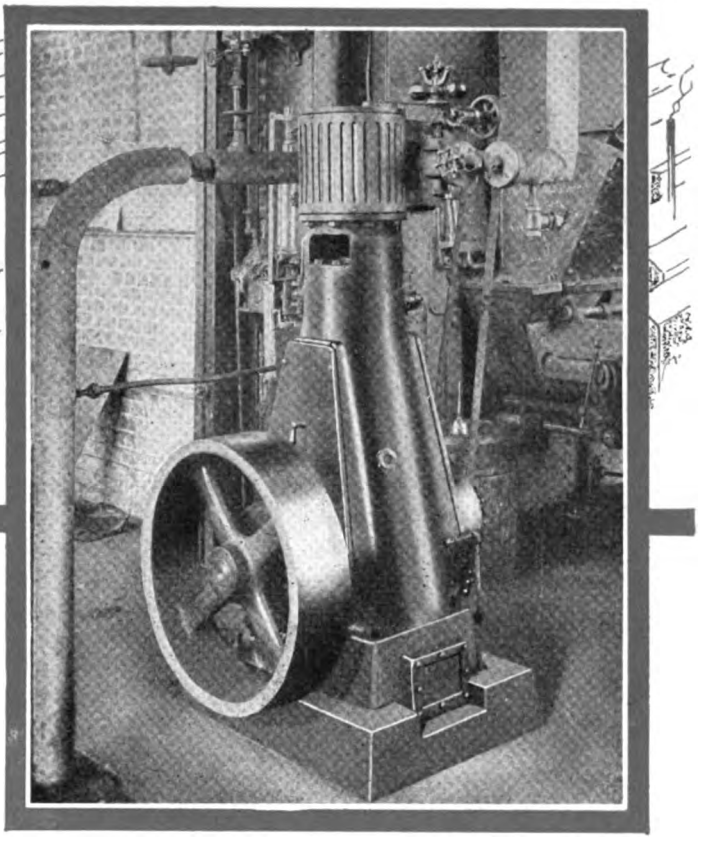
The report offers advice for the organization, financing and administering of pension plans, embodying the principles and practical considerations of the pension problem as illustrated by the study of the experience with 248 different "formal" plans conducted by 245 different firms, and 148 additional "informal" pension plans operated on an individual merit and discretionary basis. The investigation of the Conference Board has aimed to include every pension plan operative in private industrial, mercantile and financial establishments, including those conducted by railroads, public utilities and several semi-public institutions, and the coverage is believed by the Board to be virtually complete within these limits.

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How to Lubricate Trucks and Tractors

I—*Engine and Motor Lubrication*

By Allen F. Brewer

THE age of the trundling hand barrow or horse-drawn vehicle, as the primary media for transportation in the industrial plant, is so relatively recent that the memory of the pertinent inefficiencies is still uppermost in the minds of all who had to contend with the problems of handling materials and maintaining production. To be true, the vast areas so prevalent in industry today did not exist in those days, nor was the need for maximum production the paramount requirement. Labor was relatively cheap, materials usually less bulky, and altogether the procedure of manufacture was oftentimes a "hand to mouth" proposition.

But as production requirements increased, and as the labor problem became more and more of a factor, every effort was made to employ more practicable and economical means for handling materials throughout the plant. Evolution of the automotive engine and its applicability to the tractor and truck solved the problem from one angle; the adaptability of the storage battery paved the way from another. The one to facilitate handling of materials and products throughout the yard, the other to serve extensively within buildings (and oftentimes out of doors). Until, today the tractor and electric truck are as essential to industrial production as their counterparts, the conveyor and elevator. Materials handling equipment has been extensively discussed heretofore from the viewpoint of construction and adaptability of the various equipment. Means of propulsion has likewise been taken up; it is, therefore, fitting to deal with that factor which insures continued and effective operation, regardless of design, or the materials to be handled. In other words, lubrication of the wearing parts involved. Gasoline, kerosene or electric power are, of course, essential to operate such equipment, but without lubrication this operation cannot be continuous or efficient.

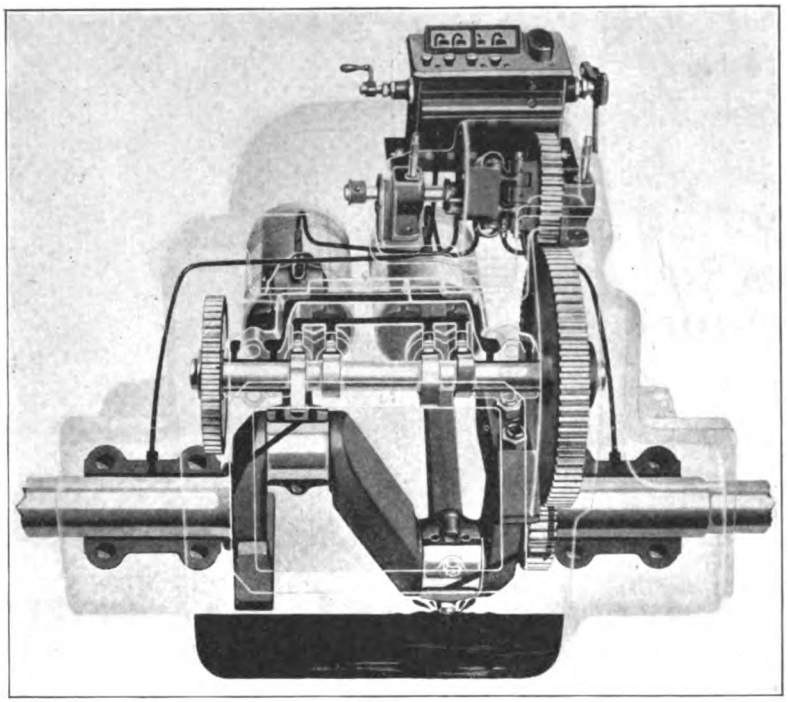


Fig. 1. A modern tractor engine showing details of the lubricating system. Note mechanical force feed lubrication and oil travel.

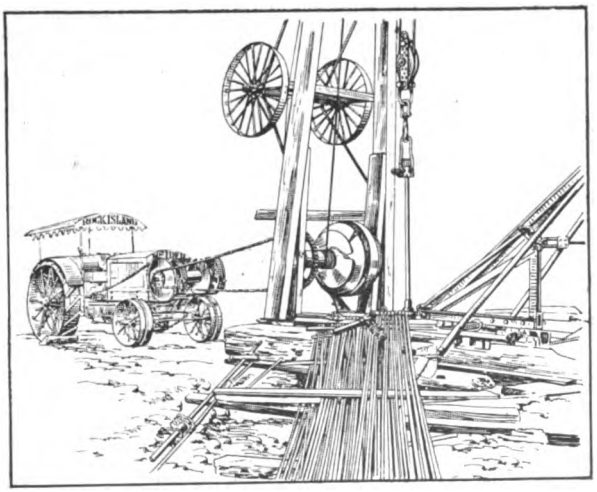


Fig. 2. The tractor in construction work. Pulling rods with a winch attachment. The versatility of the tractor is a well-known fact.

The importance of lubrication is frequently lost sight of by reason of the fact that the essential parts requiring attention are relatively obscure due to their necessary enclosure. In consequence an insight into the lubricating requirements of such equipment will be of decided interest. Lubrication of the automotive engine or electric motor is more than a matter of just pouring oil into a crankcase, lubricator or bearing oil well. The selection and judicious application of lubricants is the insurance against premature bearing difficulties and the best possible means of reducing maintenance costs to a minimum.

The most varied in its lubricating requirements of any mobile materials handling equipment is the tractor. It involves an internal combustion engine, transmission or final drive gearing, and a variety of miscellaneous parts such as axle bearings, link pins, rollers, etc. The engine is probably requiring of the most careful attention.

Tractor builders and the petroleum industry have realized that successful tractor operation is essentially based on successful lubrication. In consequence, such machines have been designed so that

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Fig. 3. The old way—two men—one barrow.

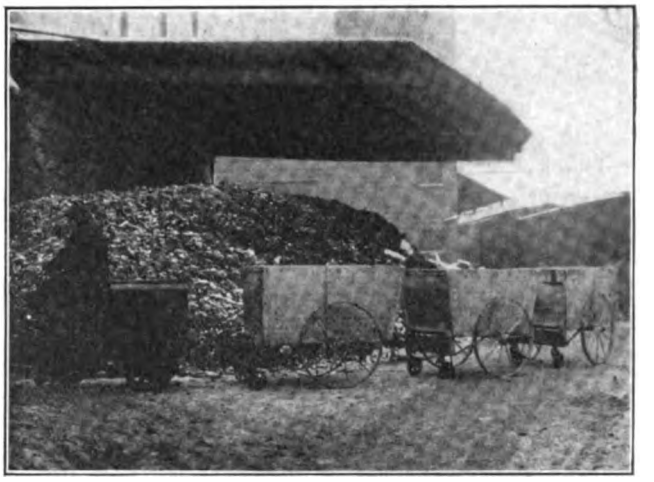


Fig. 4. The new way—one man — one truck — three barrows—and less "cussin"

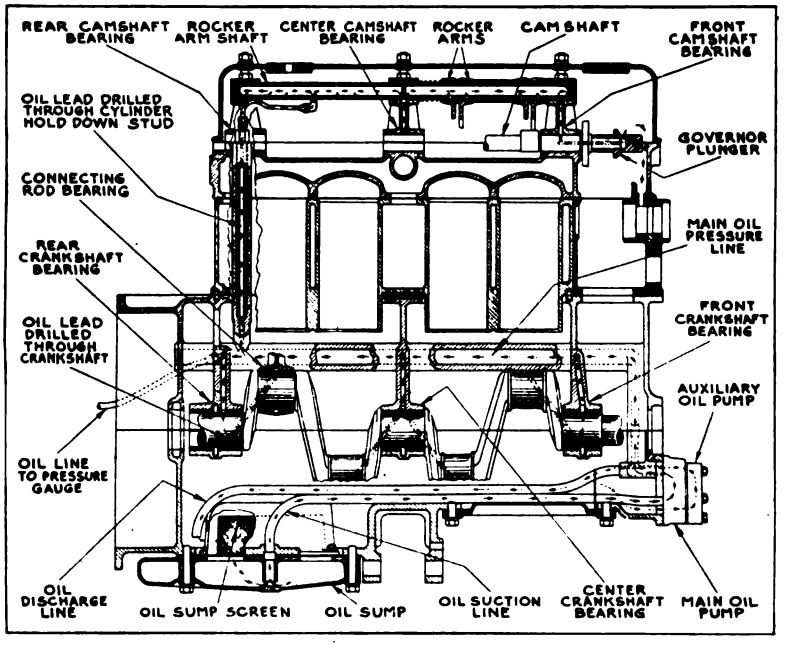


Fig. 5. Side view of a tractor engine showing details of the oiling system, the path followed by the oil, and the essential engine parts.

lubrication of all wearing parts can be carried out in the simplest possible manner. Petroleum specialists in turn have carried on extensive research to develop tractor lubricants which are capable of meeting the intensive operating requirements regardless of the type of machine or method of lubrication. Such operation has been remarkable in that the matter of selection of tractor lubricants has been rendered decidedly simple. No longer need the tractor owner grope around in the dark or tell the storehouse to order "some oil." With tractor builders' and oil companies' recommendations he is offered a wide variety of excellent lubricants according to his preference in trademark. On the other hand, this variety also includes a fairly wide range of prices. In this regard, it is well to mention that shopping for lubricants may be dangerous business; too many dealers are unscrupulous in regard to their claims and their desire to get business. Reputable trademark buying is therefore decidedly advisable, for thereby is quality an assured factor, and quality is as necessary a factor in tractor lubricants as it is in turbine or air compressor oils.

The operating conditions that may be encountered are important, in that the several properties which a tractor oil must possess, to render it satisfactory, require consideration. In other words, we will be interested in the extent to which the oil will carbonize; the operating temperatures which may be prevalent, and the pour test of the oil or its ability to flow under relatively cold conditions; and the viscosity which the oil will possess under full load operation, for on this will depend the extent to which the engine cylinders and pistons will be properly lubricated.

Carbonization is one of the most evident indications as to the suitability of an engine oil during operation. Carbon formations on valves, spark plugs, valve seats, and in the combustion chamber hamper the ability of the engine to develop its maximum power, just as is true with the automobile engine. In consequence, it is of importance to choose an oil that will burn as clean as possible, leaving a minimum of carbonaceous residue. In many cases, however, the so-called carbon formations will consist of other ingredients besides pure carbon. Especially is this true where the machine is operating under dirty conditions or in an atmosphere laden with abrasive dust.



Fig. 6. An electric motor driven combination truck, tractor and carrying crane. The severe duty involved requires careful attention to bearings and their lubrication.

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Operating or atmospheric temperatures are also of decided importance, due to the extent to which the ready starting of the engine may be affected. In this connection, the pour test of the oil is the outstanding characteristic, being, as it is, an indication of the ability of the oil to flow under lower temperatures. Wherever these latter may drop below freezing, or to within the neighborhood of zero, it is of vital importance to choose an oil of as low a pour test as possible, in order that practically immediate flow will occur to all bearings and the cylinders upon starting of the engine.

Viscosity in turn is important, inasmuch as very frequently a tractor or truck engine may function at comparatively higher temperatures than the average automobile engine. These conditions will improve the combustion of the fuel, but also they will tend to reduce the operating viscosity of the oil. On the other hand, higher engine temperatures with more complete combustion will also reduce the possibility of dilution or the thinning out of the lubricating oil. As a result, there will be but relatively little chance of reduced viscosity by temperature alone being a detriment provided the lubricating system delivers an ample supply of oil to all the wearing parts. Where comparatively large engines are involved, or where rings may have become worn, a certain increase in normal viscosity will be advisable; in other words, a heavier oil should be used.

In the electric driven truck, etc., the essential parts of the power plant requiring lubrication are the bearings of the electric motor. In view of the intensive requirements which will usually be imposed upon a truck or tractor motor it is most important that it be capable of operating with the least possible development of friction and heat. In other words, its bearings must be adequately lubricated with an oil or grease properly suited to their constructional requirements.

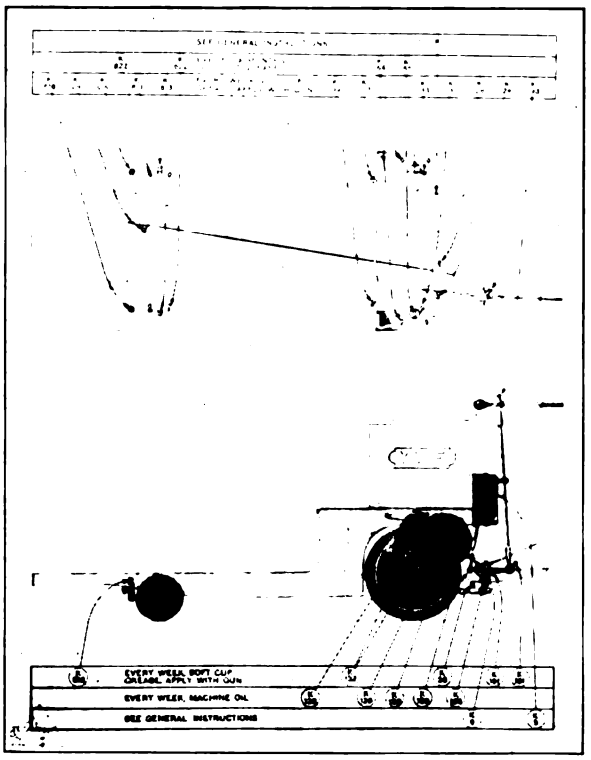


Fig. 7. Lubrication chart for a modern electric industrial truck showing parts requiring lubrication, the grade of lubricant involved and the recommended frequency of application.

The motor in the industrial truck or tractor may be equipped with ring oilers or ball or roller bearings. Ring oilers, as well as those anti-friction bearings in which the housings are oil-tight will require a relatively low viscosity straight mineral lubricating oil. Where anti-friction bearing housings are not oil-tight, however, they will in all probability require a lubricant with sufficient body to resist leakage and insure against premature bearing difficulties through possible lack of lubrication.

Ball and roller bearings are an outstanding constructional feature on many motors designed for industrial truck and tractor service due to the positive and economical degree of lubrication which is assured, the frequent reduction in bearing size which is possible, and the decrease in care and attention required. As has been stated, such bearings can be lubricated either with a light straight mineral oil, or a grease, dependent upon their design and construction. Whatever the lubricant, however, its function is to serve equally as a preventative of corrosion and as a medium for reducing friction. The surfaces of

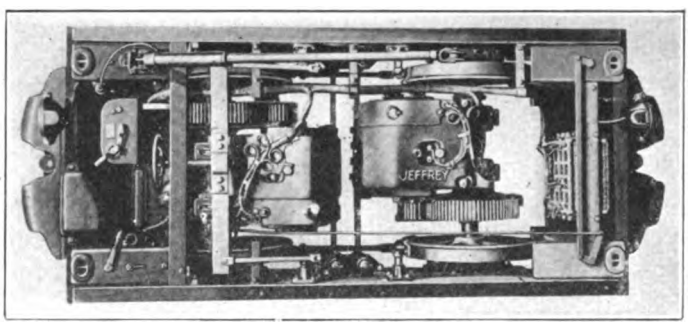


Fig. 8. Top view of an electric motor driven mine locomotive showing accessibility of all working parts.



Fig. 9. Transportation of mail requires dependable equipment. Here the electric truck equipped with tapered roller bearings insures against lubrication failures.

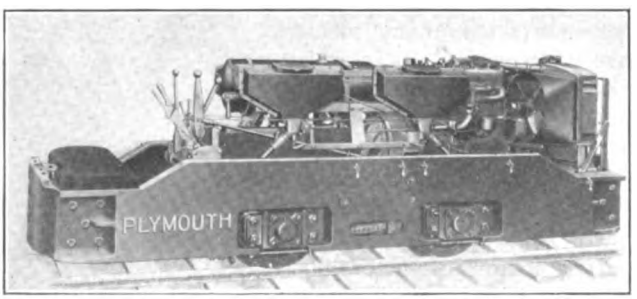
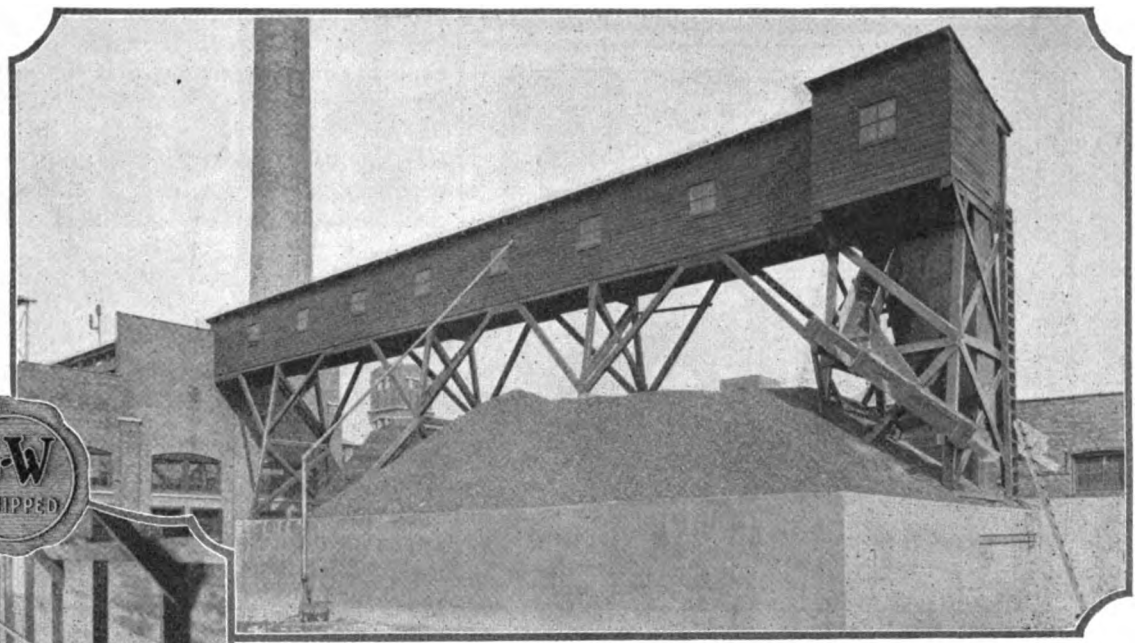
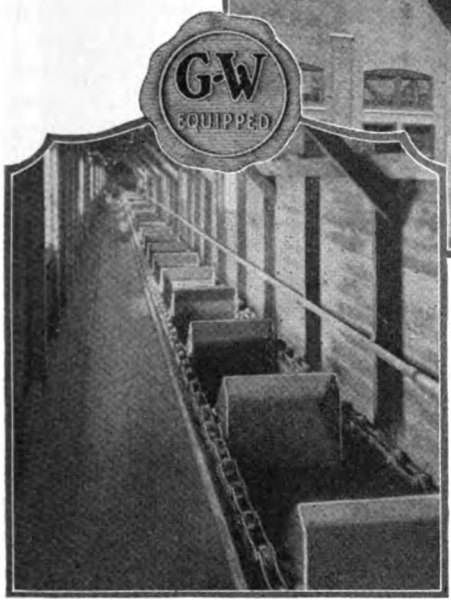


Fig. 10. Partial assembled view of a 4 ton, 4 speed gear drive gasoline locomotive. The adaptability of the internal combustion engine is extensive, and both trackless and track transportation benefit thereby.

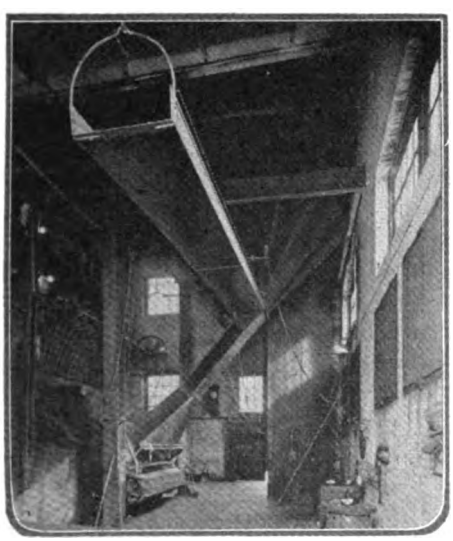
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G-W Elevator-Conveyor for handling coal at plant of Liquid Carbonic Company, Chicago, Ill.



View of G-W Bucket Conveyor at plant of Liquid Carbonic Company



G-W Coal Tank, Gate and Spouts at same plant

1 Man instead of 4— $3000 saved every year

"Our coal handling expense was cut approximately $3,000 a year when we installed our Gifford-Wood Conveyor," writes Mr. A. Ramp, Chief Engineer of the Liquid Carbonic Company, Chicago, Ill.

"Before installing this conveyor we employed four men to handle our coal and ashes, and now one man takes care of the whole thing. Our G-W Equipment has also occasionally been used to unload coke, which is very difficult to handle."

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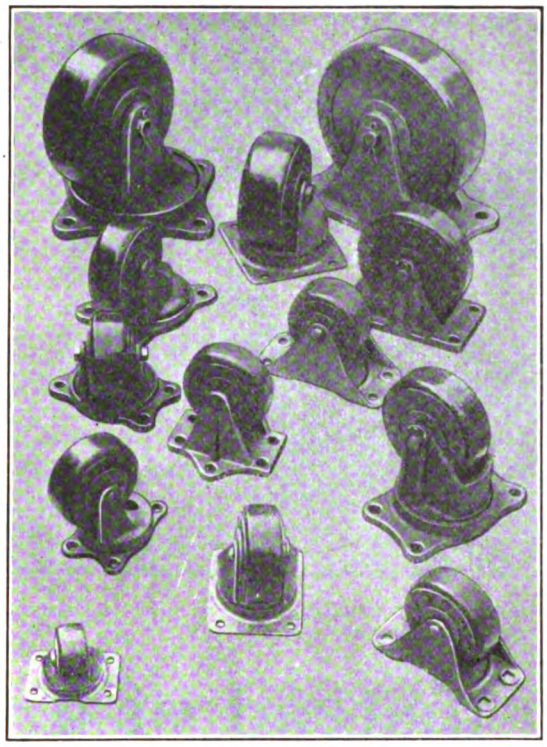
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balls, rollers and raceways or cages in all such bearings are highly polished. Essentially their purpose is to eliminate rubbing contact and the generation of sliding friction, supplanting these with rolling contact and the less appreciable rolling friction. In order to attain this end, all the surfaces involved must, of course, be in a perfectly polished condition at all times. In other words, they must be properly lubricated. The appearance of corrosion, scoring, or pitting may easily give rise to marked increases in frictional temperature.

To reduce the possibility of the development of internal friction, it is well also to keep to as low a viscosity lubricant as possible. The function of the lubricant is largely to serve as a preservative for the highly polished metallic surfaces involved. Where grease is advisable it will have an additional advantage in that it will generally be an effective seal against the entry of dust and dirt. In many plants where atmospheric conditions are bad or a dusty product is being handled this is very advantageous.

But in this connection the matter of acidity must be considered relative to the presence of animal matter or other fatty oils which would be liable to set up acidic reactions. The development of fatty acids is a detriment due to the possibility of ultimate corrosion and pitting of bearings. Straight mineral oils of low viscosity which have been carefully refined do not show this tendency to any appreciable extent, and many engineers feel that they should be used, wherever the bearing housing is capable of retaining fluid lubricants.

In addition we must consider the possibility of oil being drawn into the motor itself, to damage the wind-

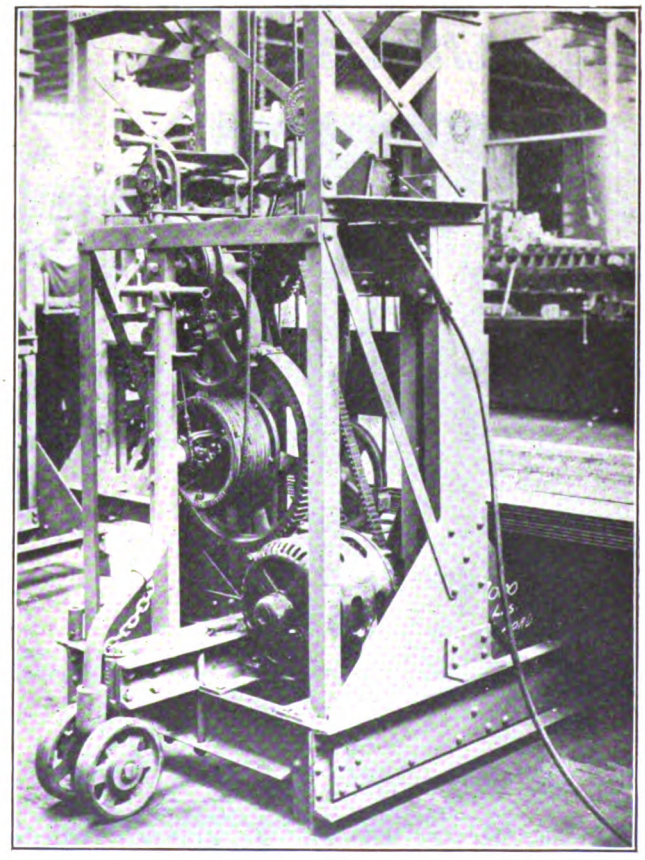
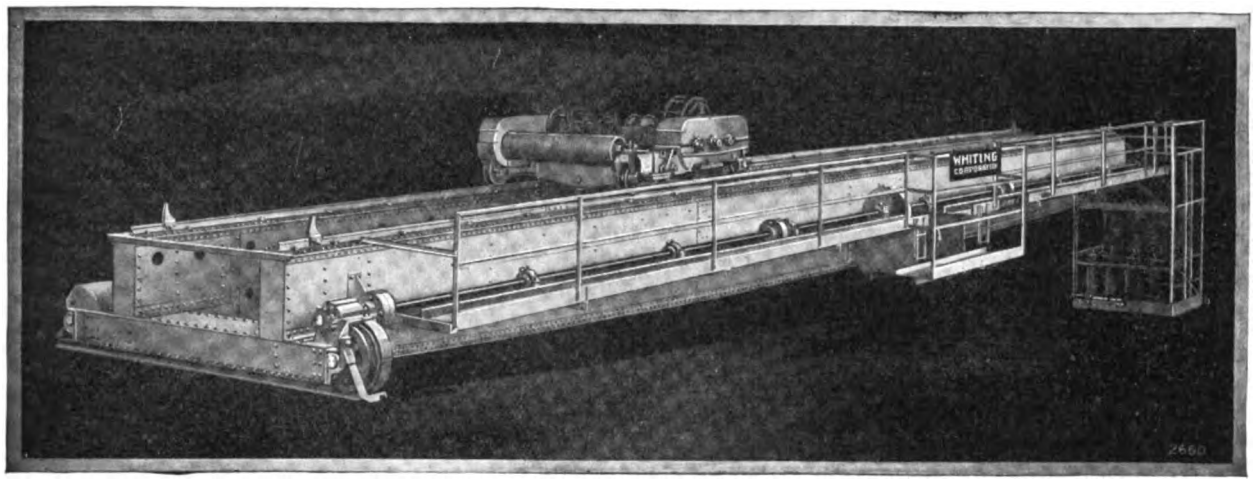


Fig. 11. The electric motor driven truck is also adaptable to lifting heavy loads. Note massive construction of motor, gears and chains. The pressures involved require careful attention to their lubrication.

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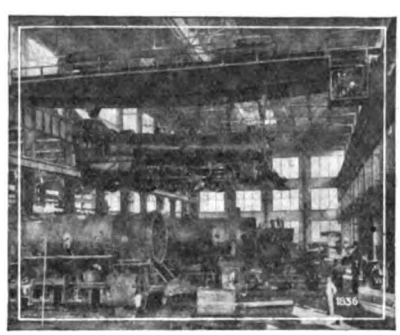
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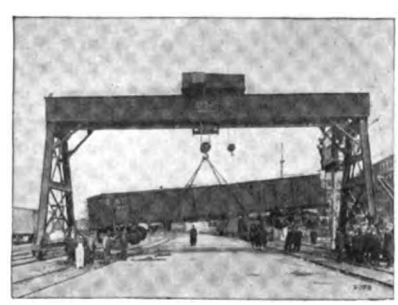
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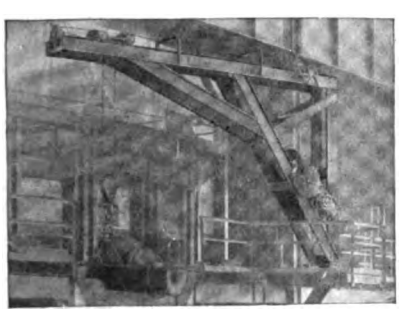
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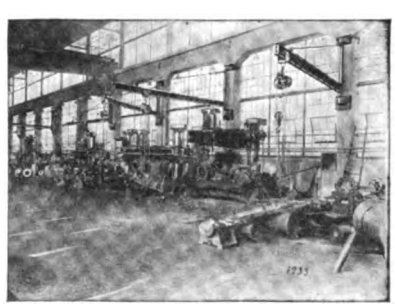
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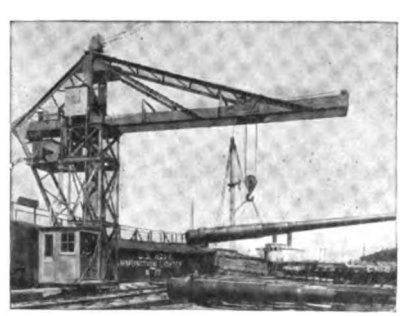
Gantry Crane in freight yard



Electric Jib Crane in steel foundry



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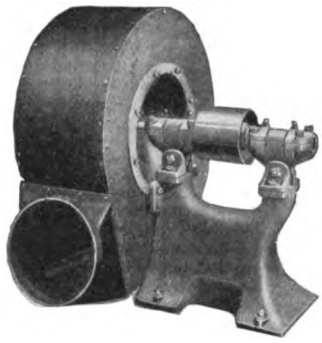
Electric Pillar Crane in Navy Yard

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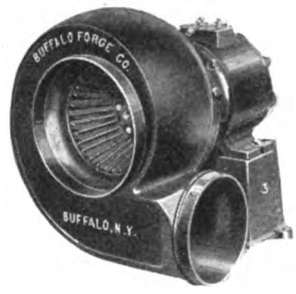
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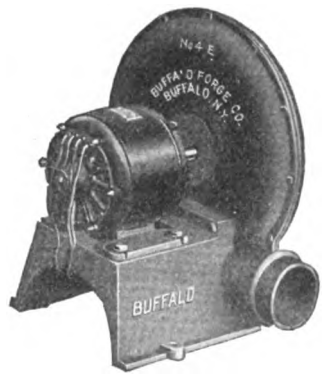


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ings, etc. The fact that anti-friction bearings involve but a relatively low oil volume, however, renders this less of a possibility than in ring-oiled bearings, etc., where more oil is in circulation and where there is greater possibility of the development of spray. In this connection the amount of lubricant used must be noted with care. With light oils, due to their natural fluidity it will only be necessary, as a rule, to submerge perhaps the lowermost elements. Non-fluid oils or liquid

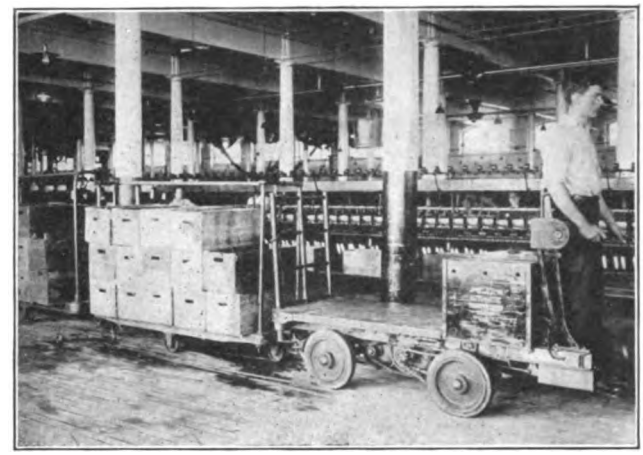


Fig. 12. Showing method of silent chain installation from motor of an electric truck to the drive shaft under the car.

greases on the other hand, due to their greater body and inertness may develop channelling, just as would perhaps occur in a gear case in cold weather. As a result such products should be applied more generously, until the housing is about half full.

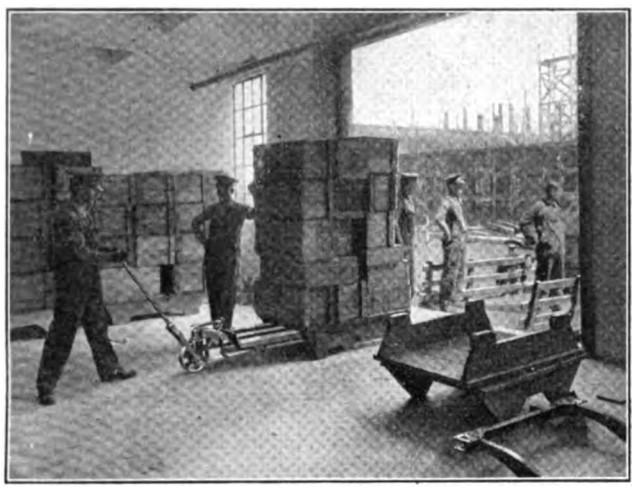
Ring oiled bearings, etc., however, are usually not as exacting in their lubricating requirements. Furthermore they can generally be more readily served by oils of average refinement over a wider range in viscosity. A ring-oiled motor bearing involves continuous and automatic lubrication just as long as the lubricant is in proper condition to accomplish this purpose. Essentially such devices bring about flood lubrication by the continuous delivery of a large excess of oil over the amount theoretically required to give the necessary oil film. As a result the oil serves not only as a lubricant, but also as a cooling medium, reducing operating temperatures in accordance with their intensity. Frictional heat is removed by this flood of oil, being transferred to the oil reservoir below, where the contents should become cooled to the necessary degree by radiation.

The matter of provision for adequate precipitation of dust and dirt and abrasive matter is important in any industrial plant, where this may be prevalent. Truck and tractor motor bearing lubricants will be bound to become contaminated to a certain extent. Therefore, the fact that a ring oiler will automatically serve in addition as a flushing element is a decided advantage. Bearing wear and scoring of the shafts will probably be materially decreased thereby. This cleansing of the bearings in this manner will of course develop contamination of the oil as stated. Provided that the reservoir is of sufficient capacity, however, there should not be any great amount of difficulty involved in the separation of this foreign matter from the oil.

To prevent any abnormal accumulation of such matter it is advisable to drain, wash and refill such bearings with new or properly reclaimed oil at periodic intervals.

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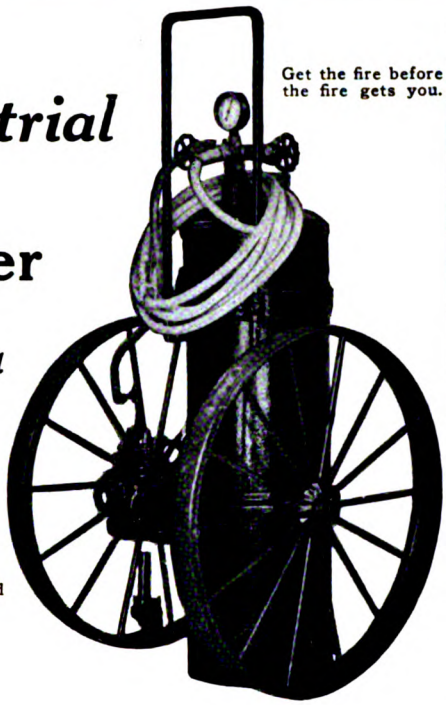
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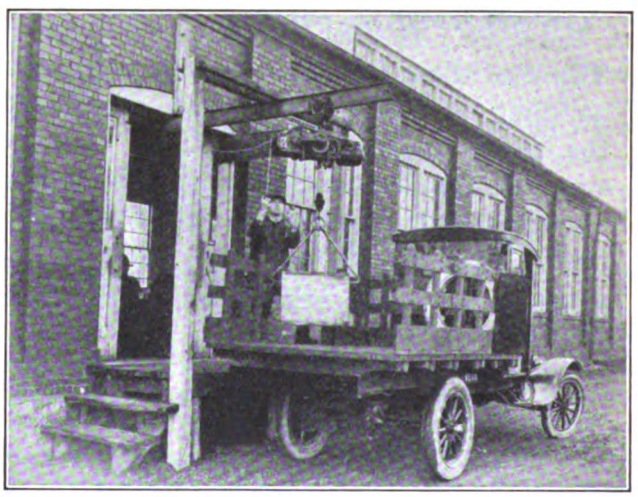
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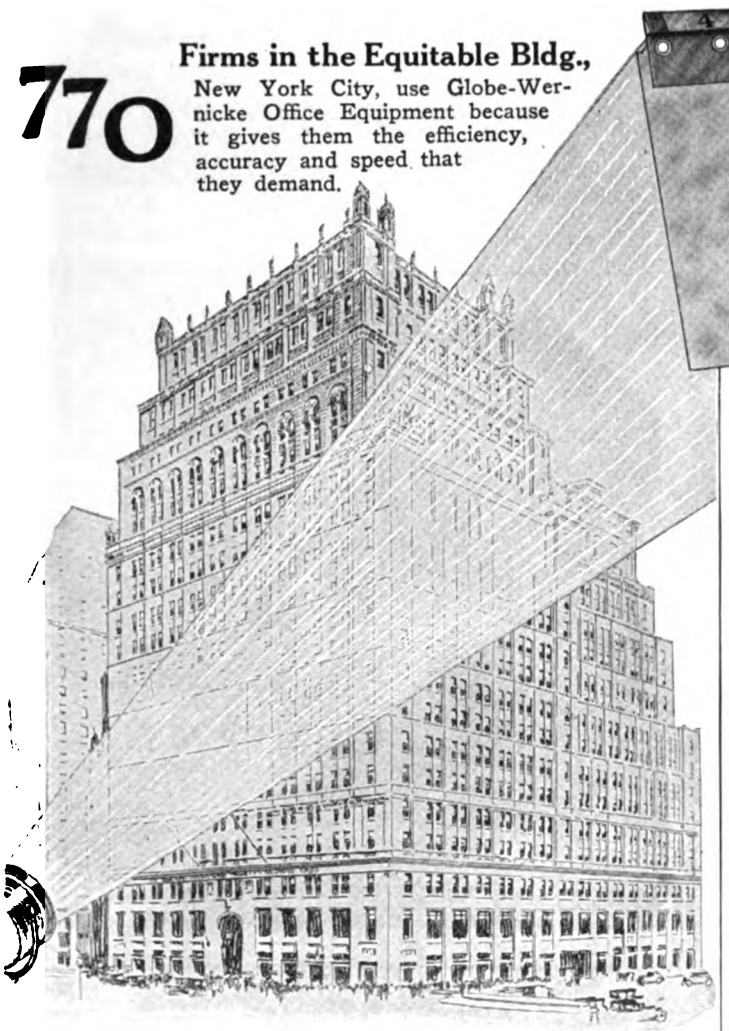
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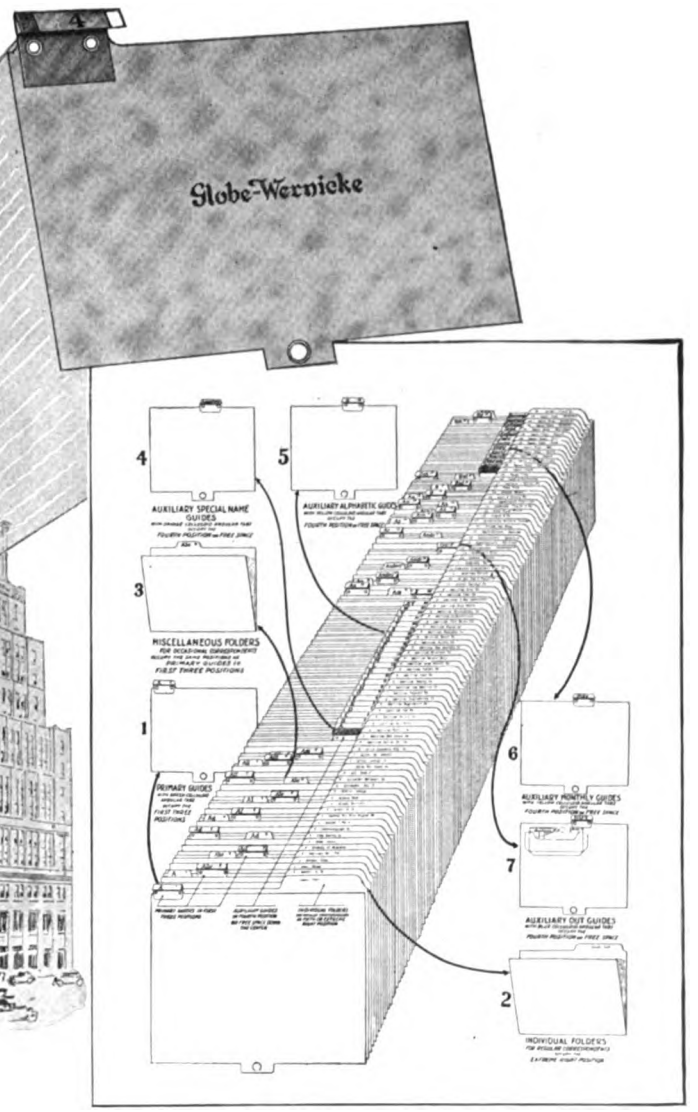
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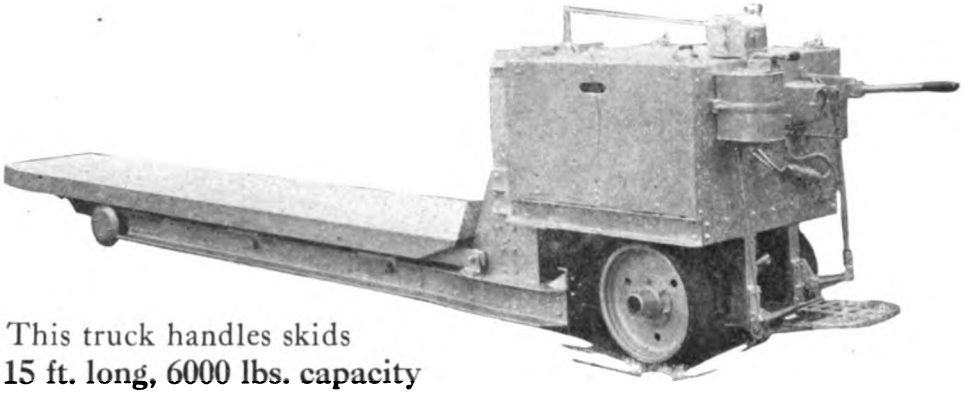
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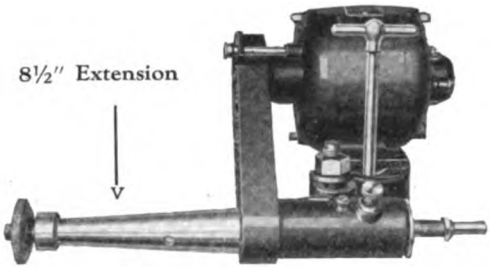
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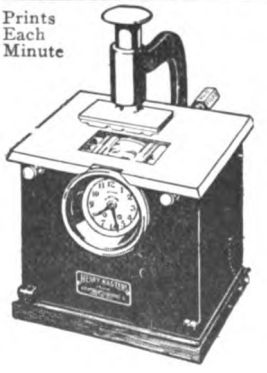
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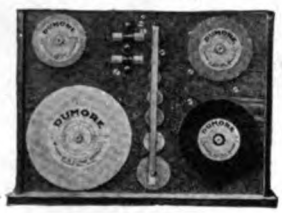
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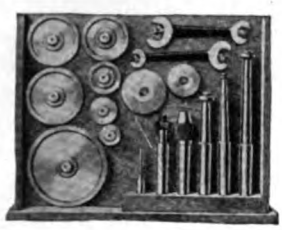
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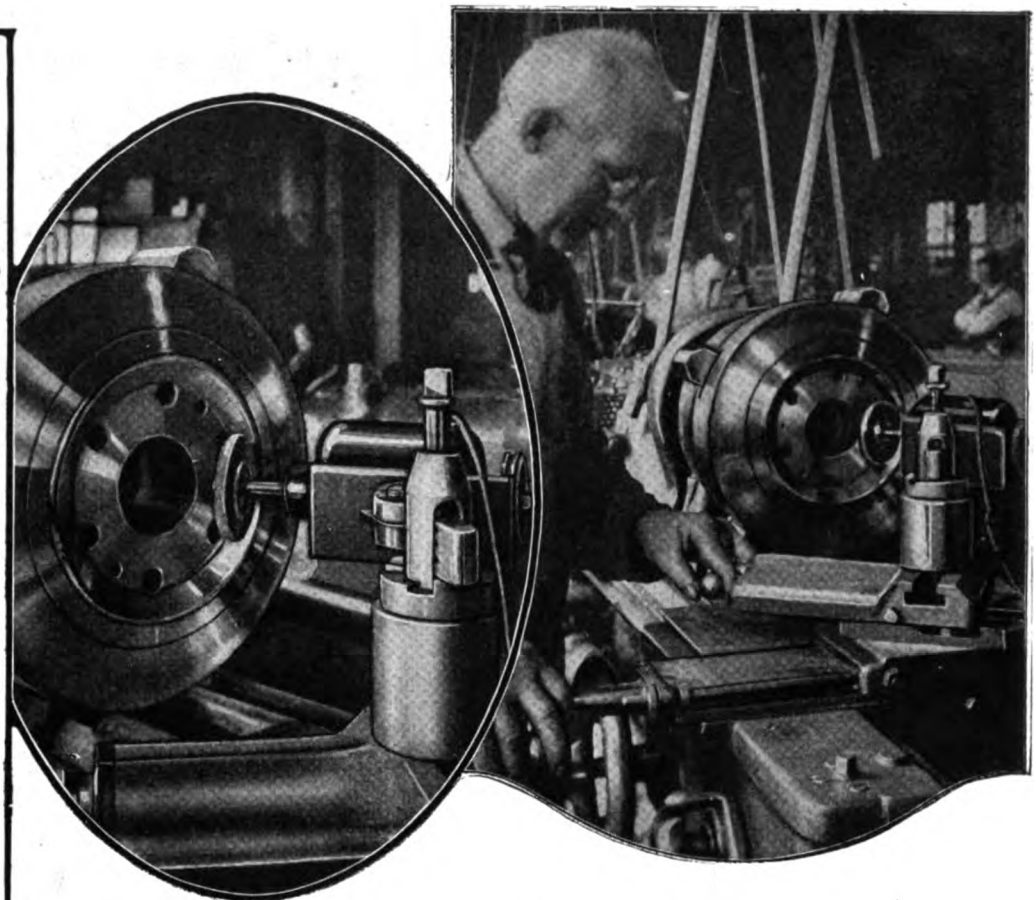
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Mechanical Inspection of Raw Materials and Finished Products at Schenectady

By W. W. Wagner

Chief Inspector, General Electric Company, Schenectady Works

THE Inspection Department at the Schenectady plant of the General Electric Company might be called a clearing house for rejected materials received from outside suppliers, and for defective work done within the plant.

The first classification is practically self-explanatory and needs little elaboration. Under this heading come all raw or finished materials which are purchased from outside vendors. Should any of these prove unfit for use in the process of electrical manufacture, they are rejected and are either returned to the vendor or an adjustment of some kind is made.

In cases of defective work done within the plant, the inspector is of invaluable aid to the foreman in charge of that work. The relationship between the two is a novel one. The mechanical inspection department, while a part of the manufacturing organization, reports directly to the general superintendent and is purposely kept independent of the management of the local manufacturing sections.



Fig. 1. Inspecting cable for proper diameter at Schenectady.

It is not planned, however, that this relationship shall affect in any way the coöperation which exists between foreman and inspector. Rather it is the object to keep these two persons in close contact and to bring the foreman to feel that the inspector, instead of a chronic faultfinder, is a real asset to his organization.

It is expected, of course, that each foreman will give sufficient attention to mechanical details to make rigid inspection trips to some extent unnecessary. In other words, it is a part of the foreman's duties of supervision to make some inspection of his own and to instruct his men how to perform each operation with neatness and precision.

A beneficial influence

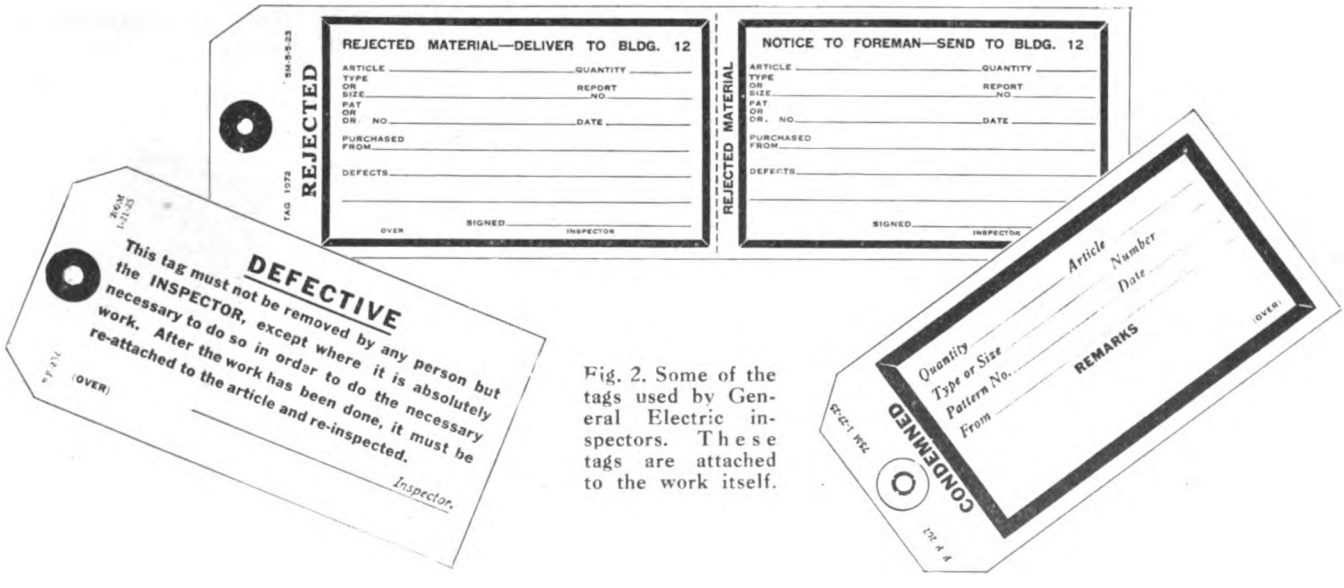
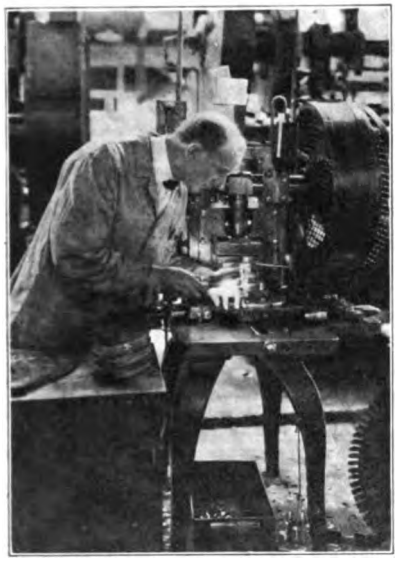


Fig. 2. Some of the tags used by General Electric inspectors. These tags are attached to the work itself.

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Fig. 3. An inspector checking a punch-press set-up at Schenectady.



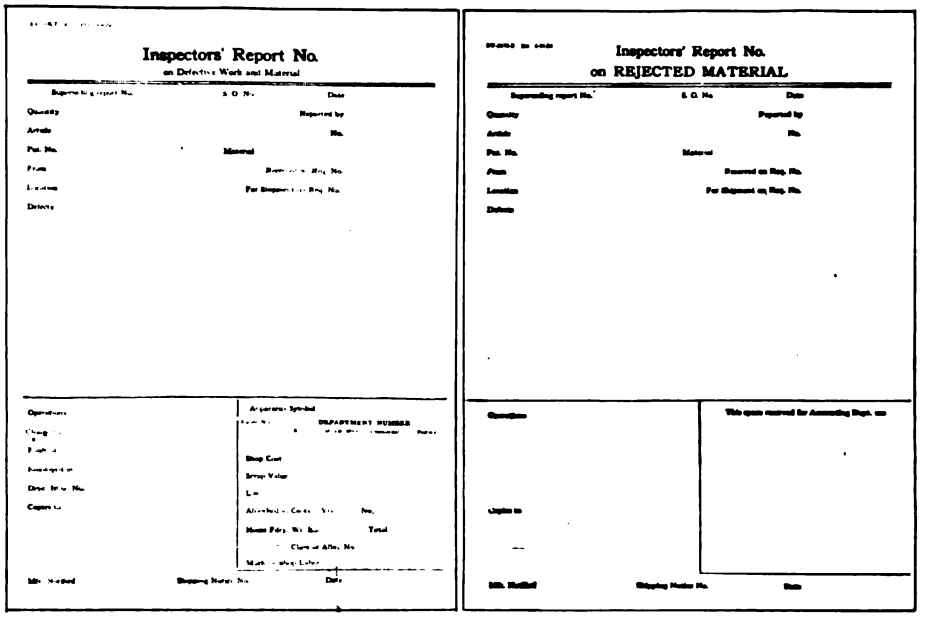


Fig. 4. Two of the reports made out by the General Electric inspection department. One covers defective work in the plant and the other, material ordered from the outside and rejected, because of its failure to live up to G. E. specifications.

is thus exerted on the workman himself. He is taught to exercise care and diligence in the performance of individual tasks. His skill and usefulness tend to increase and the grade of his work is raised generally, possibly fitting him for an eventual transfer to work requiring a higher degree of skill and a wider range of experience.

In shops where it is necessary to maintain a regular force of inspectors, men are selected for this work who have had a broad mechanical training. In the performance of his routine duties, the inspector finds many opportunities to suggest changes in the construction of apparatus, hoping to obviate some of the difficulties or defects which develop during the process of manufacture, and thereby saving unnecessary labor operations with a resultant tendency to decrease manufacturing costs. In making such suggestions he works in harmony with the engineer, the foreman and the assistant foreman.

In all such cases it is expected that the inspector will keep in close touch with the situation, keeping himself supplied with first-hand information on the method of making such corrections and satisfying himself that repairs or corrections are made in a good, workmanlike manner. He is thus enabled to present an accurate picture of the situation in his final report.

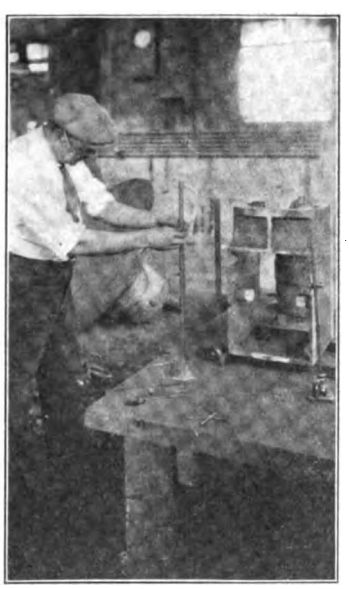


Fig. 5. An inspector at work on a casting made in the General Electric iron foundry at Schenectady.

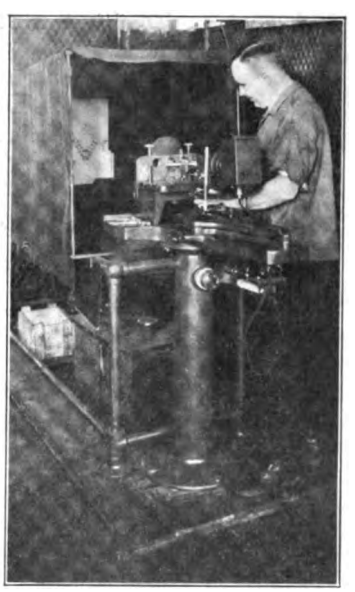


Fig. 6. An inspector checking the threads on a large nut with a hand gauge. A number of master gauges are shown in the box on the table and various inspectors' equipment, on the table itself.

Condemned Work

When, as a result of mistakes by the workman, a piece of work is unfit for use, this work must be condemned. When such action is necessary, it is the duty of the inspector fully to explain to the workman the defects in question, that the latter may understand why his labor is rejected and thus avoid mistakes of the same nature in the future. The inspector must do this in a painstaking and courteous way in order to gain the workman's interest and coöperation in striving to raise the quality of work to as high a standard of excellence as possible.

It is the constant aim of the inspector to make his attitude toward the foreman and workman one of friendly helpfulness, and all his decisions must be made with impartiality and justice. The ideal inspector is not too ready to condemn work for defects which may be insignificant and relatively unimportant and which may be easily corrected without an undue expenditure of time and material. Good inspection does not necessarily involve the wholesale condemning of detail parts that do not exactly measure up to the drawing. Small variations frequently do not affect the mechanical efficiency or sale of apparatus, and it is here that the inspector must employ wisdom and judgment. On the other hand, he must strive to hold the

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HOW many times have you wished for a paint that would really eliminate constant ordering of "special paints for special purposes?" Almost every time you have need for paint.

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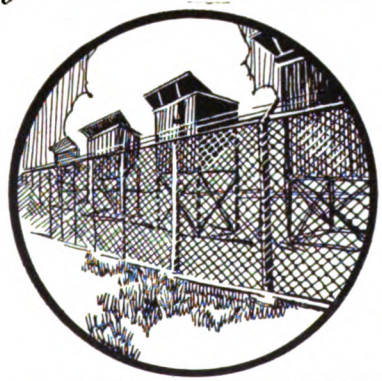
¶ In VALDURA you will find a paint that is made especially to suit your purpose. It is a paint of extraordinary preservative qualities—a paint you can rely upon to give you the right kind of service—even under the most difficult conditions.

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¶ For the hard places—for those conditions which rapidly break down other paint, use VALDURA. If it will not solve your problem, no other paint will!



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for FENCES *and* POSTS



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¶ There is no coal tar, oil asphalt, or other inferior ingredients used in the manufacture of VALDURA.

¶ It is supplied all ready for use—put up in convenient sized metal containers—flows easily under the brush—and is the only *real* asphalt paint you can get in colors.

¶ VALDURA is absolutely waterproof and weatherproof, acid and alkali resisting, and is the ideal paint for industrial plants. You can use it anywhere on almost any surface with equal satisfaction, inside the plant and outside.

¶ There are many places about your property where you have need for a paint the nature of VALDURA. It is a mighty handy paint to keep on hand at all times.

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for STEEL *and* WOOD TANKS



for SCOWS *and* BARGES

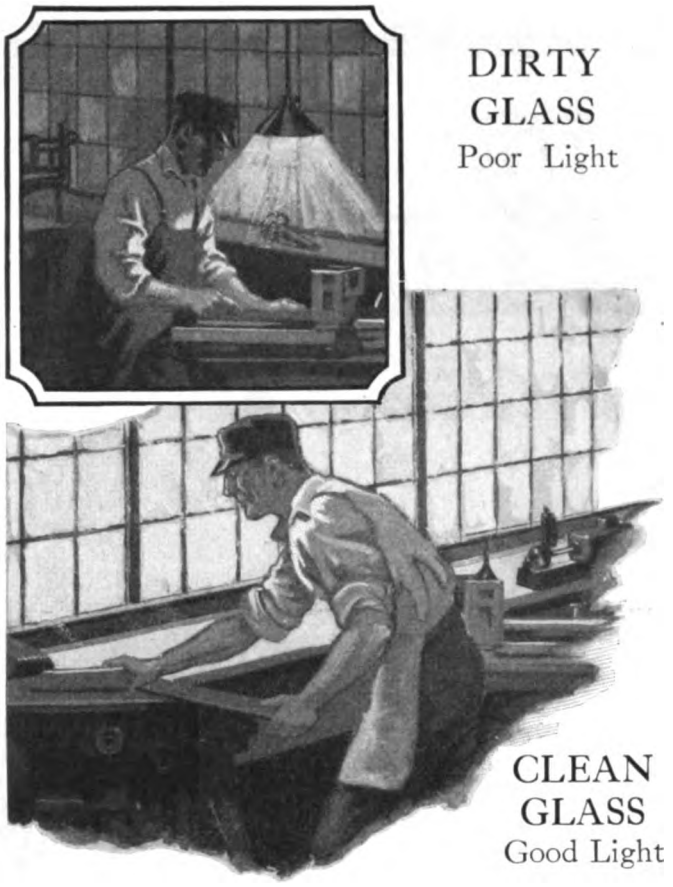


for TRUCKS



for Refrigeration Equipment

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An unskilled laborer coats the dirty glass with SKYBRYTE. The hardened crust of carbon scale, rust, soot and grease is dissolved. Flush off with water and glass is clean.

Now used by hundreds of great manufacturing plants, steel mills and foundries. Just try it.

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You may ship us five gallons of Skybryte on trial and one regular 75c Skybryte brush FREE. We will use enough to make a thorough trial—enough to clean several hundred square feet. If we are not fully satisfied we will return the balance to you within 30 days return charges collect and you will cancel invoice. Otherwise we will pay your invoice for five gallons skybryte at $3.00 per gallon, F. O. B. Cleveland.

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work close to the drawings and engineering instructions and, in this respect, maintain accuracy and finish.

Reports on all apparatus are issued daily by each inspector and copies are sent to the superintendent and all department heads interested. These reports give the designation of the apparatus with detail and also full particulars relative to the nature and cause of defect, labor operation done and, if possible, the person responsible for the error.

Cases arise where defective work is held up by the inspector, the defects being of such a nature that he cannot take the responsibility of either passing or rejecting. In this event, a report is issued recommending that the work be "held for instructions." The matter is then referred to either the superintendent in charge of the section, should the trouble be the result of errors in the factory, or to the engineer, when the trouble is caused by errors in design, defective castings or other material used in which consideration must be given to strength, stresses, etc.

In either case, before the work is passed or rejected, the superintendent or engineer advises the chief inspector in detail how corrections are to be made. If satisfactory, these recommendations are passed on to the interested inspector, whose duty it is to see that those corrections are made.

It is rarely necessary for the chief inspector to go any further than this, agreements between superintendents or engineers and the chief inspector usually being sufficient to settle the point at issue. Should it be impossible, however, for the chief inspector and engineer or superintendent to come to a satisfactory agreement, the chief inspector has the privilege of appealing to the general superintendent or the manager of the plant for a decision.



Fig. 7. An inspector operating a special machine which automatically inspects and checks threads on screws, bolts, taps, etc.

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Five Proved Ways

to cut your maintenance costs

1 Protect your concrete floors against dusting and wearing. You can do this easily with Lapidolith, the original concrete-floor hardener described below.

2 Keep your wood floors from splintering, rotting, or drying out. A treatment of Lignophol will do the trick. See the complete description below.

3 Protect your roofs against leaks. Stormtight, a rubber-like, adhesive liquid, stops leaks instantly and permanently. A further description is given below.

4 Damp-proof your walls with a treatment of Hydrocide Colorless. It will permanently waterproof and damp-proof your buildings. See full description below.

5 Cut down your painting bills. Cemcoat is a paint that sticks to brick, wood, or concrete. It stays white long after other paints turn yellow, and may be washed again and again. Further details are below.



LAPIDOLITH

a liquid, chemical compound, is the original concrete-floor hardener. It may be applied like water. A floor treated at night is ready for use by morning. Lapidolith penetrates the porous cement, binds the loose particles together, and fills up the voids. The result is a fine, close-grained surface that will not dust or wear.



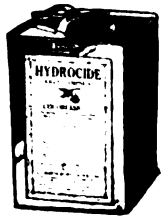
LIGNOPHOL

is very easily applied to wood floors. It penetrates the wood fibres and restores the natural gum and oil. It gives you a wood floor that is hard, smooth, and sanitary. It does away with the use of floor oils that only lay the dust and have to be applied again and again. One treatment will last for years.



STORMTIGHT

is an adhesive, rubber-like liquid, ten times thicker than paint. It will protect your roof against leaks quickly and permanently. Stormtight quickly stops leaks that have already started. It is very easy to apply. It is not a temporary makeshift, but has saved the cost of new roofs again and again.



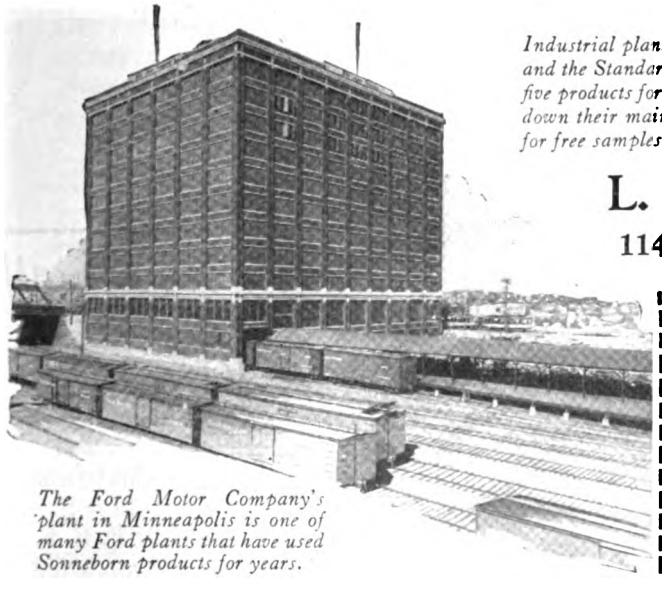
HYDROCIDE COLORLESS

applied to the exterior of a building, penetrates the brick and effectively keeps out all moisture. As it contains no paraffin it will not run in hot weather. It will permanently water- and damp-proof your buildings, and yet since it is invisible it does not detract from the natural beauty of the walls.



CEMCOAT

a gloss, eggshell, or flat enamel paint, comes in white and colors. It may be used on exteriors as well as interiors. Because of its heavy body it usually requires one coat less than other paints. Even on brick or concrete walls it will not crack or peel. Cemcoat is especially noted for its remarkable wearing qualities.



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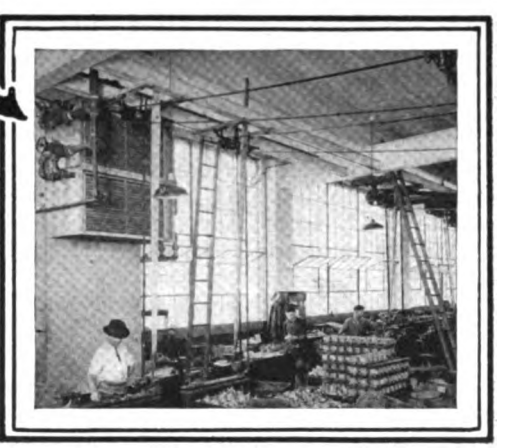
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A Truck Which Sets Telephone Poles

By Charles W. Geiger

THE Pacific Telephone and Telegraph Company in Oakland are now employing a truck equipped with boom, winch and cables for setting poles, thereby doing away with the services of five men, as it formerly re-



quired seven men from 15 to 20 minutes to set a pole. By the new method two men handling 45 foot poles are able to set a pole in 10 minutes. Poles that are fifty feet or longer required three men.

The poles are carried to the holes on a trailer attached to the truck carrying the boom. From 16 to 18 poles of 45 feet in length are carried at each load, the front ends of the poles resting on the rear of the truck.

The accompanying photos show how the equipment is used in loading the poles. The truck towing the trailer



is driven alongside the pile of poles and the boom moved outward. The cable by means of a chain is then attached to the pole so that it will just about balance. The boom is then swung back so that the pole will be brought to the position shown in Fig. 2, and then the pole is lowered into position on the trailer. The boom is moved to the right or left by means of a worm gear hand operated.

In unloading the poles and setting same, the cable is attached to the pole so that the pole will balance vertically. The boom then moves the pole to the side of the truck, when the boom is raised and the butt of the pole is lowered down to the hole.

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Tray Elevator Handling Bags.



Portable Stacker Handling 340 lb. bags in Warehouse.



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JEFFREY
MATERIAL HANDLING EQUIPMENT



Wood Apron Conveyor Handling Barrels in Warehouse.



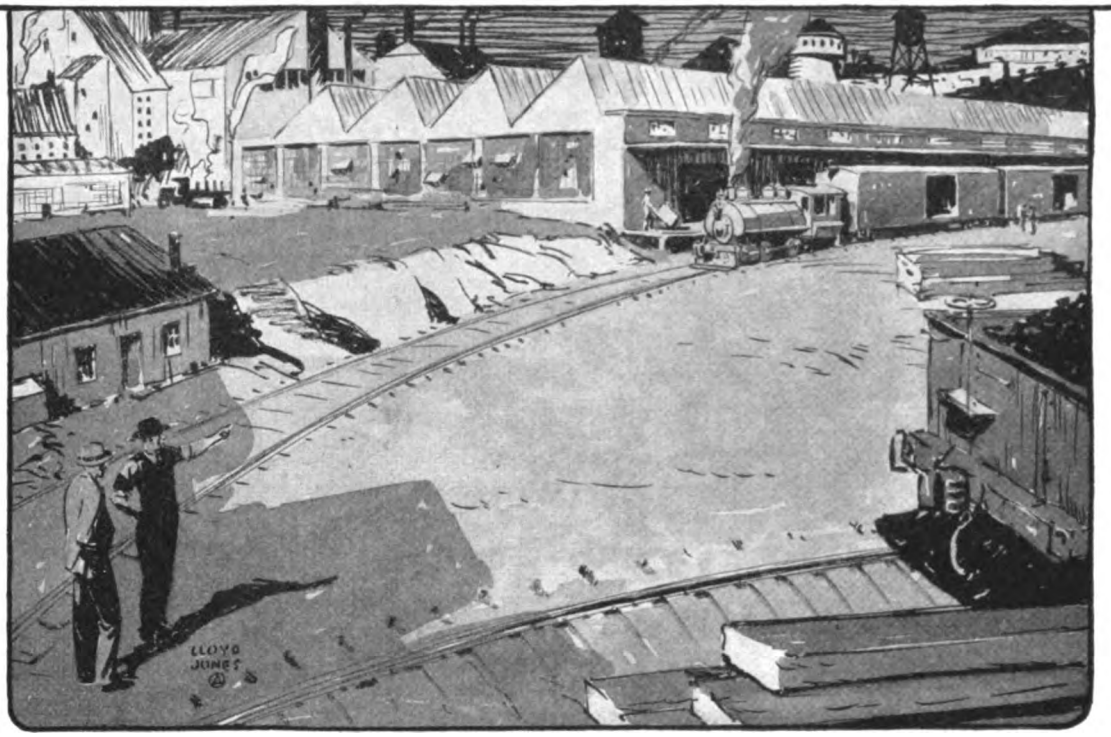
Wood Apron Conveyor Handling Bundles of Rags for Paper Company.



Handling Bundles in a Wire Manufacturing Plant.

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How Large Must the Plant Be?



EFFICIENT car movement is extremely important to a factory of any size, large, medium, or small. It is even more vital to a small plant, because outside switching service for them is generally spasmodic and the cars are seldom moved as soon as they are ready.

Plant size alone, however, is not the determining factor. Many factories formerly thought too small to own private locomotives are now finding it a profitable investment.

Shipments are hastened, more raw materials are unloaded, and inter-plant hauling is accomplished more promptly. In many cases, the saving in switching charges alone shows the Davenport to be a revenue producer.

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Our engineers, with twenty-five years' experience in fitting the right locomotive to the particular job, are ready to study your requirements and to make an unprejudiced recommendation. Their assistance implies no obligation.

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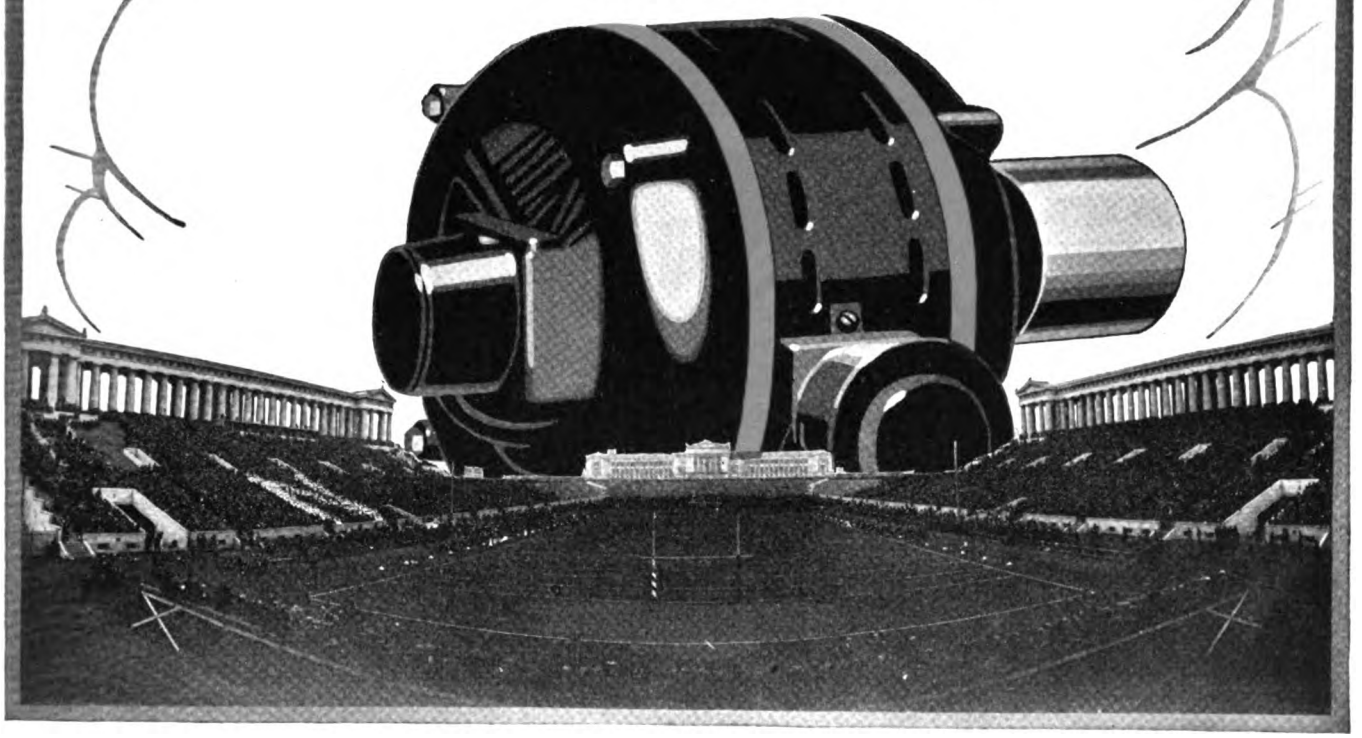
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Howell Red Band Motors are made in all types and sizes from ½ H.P. to 100 H.P. Howell Representatives located in all the Principal Cities are practical men on every type of motor and motor application. It will pay you to consult with them.

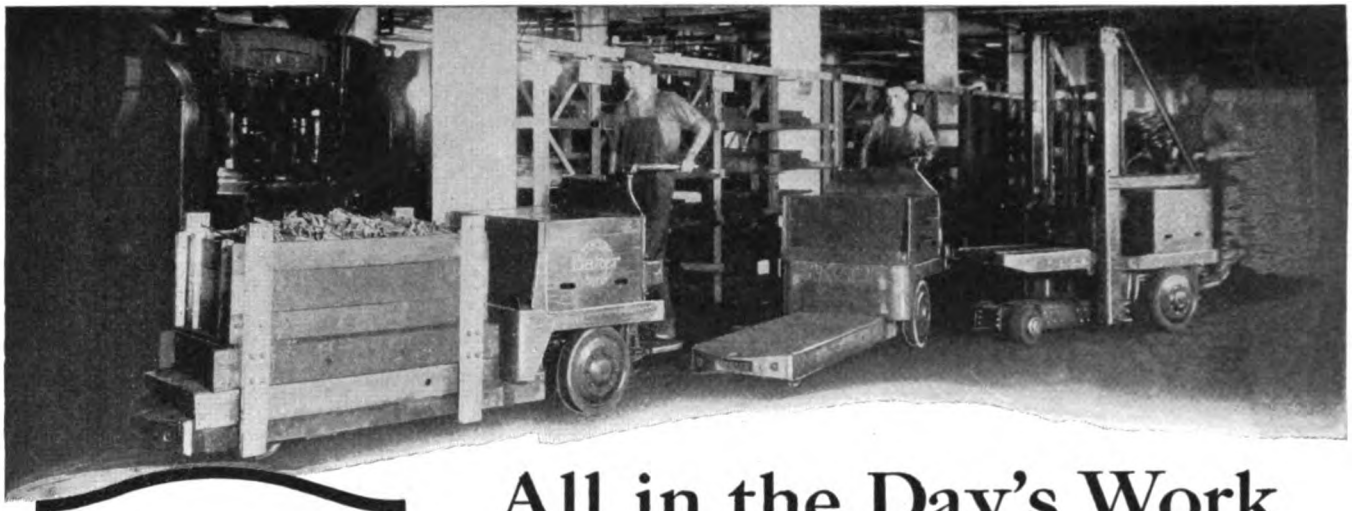
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Howell RED BAND ELECTRIC Motors

Make Good on the Hard Jobs

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"I DO not know of any other piece of equipment we have ever put into our plant that has given us the satisfaction we have gotten from the operation of these trucks. The two low lift trucks easily paid for themselves in four months' service."

All in the Day's Work

IF you were to look over the day-to-day record of Baker correspondence it would not be difficult to understand why 60% of all Baker tractors and trucks go to concerns that have already demonstrated their economy by actual service.

This particular letter from the Simmons Bed Co. refers to the machines illustrated above. Every type of Baker, however, will operate at higher overload over longer periods of time than any other motor vehicle equipment.

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TRADE MARK REG. U.S. PAT. OFF.
Baker

THE BAKER-RAULANG COMPANY, Cleveland, Ohio

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Magneto Type Watchclock System

The Detex Boston costs less in the long run than any other watchclock system—and, properly installed, it will last as long as your buildings. Installations in the General Electric plant and many others have been in continuous use 25 to 40 years without interruption and at incredibly low up-keep cost. Detex Boston offers several distinctive advantages over all other systems.

One unit permits any number of watchmen (up to 60) to register simultaneously, *on one record*.

A supervisor or foreman of watchmen can tell by a glance at the record just where any or all the watchmen are at any time—or annunciators can easily be connected which indicate registration without opening the clock.

There is nothing for a watchman to carry but a small crank. There are no batteries, transformers nor current, except what is generated to make the record when the watchman turns the crank.

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One night of faithful watching may prevent months of non-production. DETEX Watchclocks insure faithful watching every night



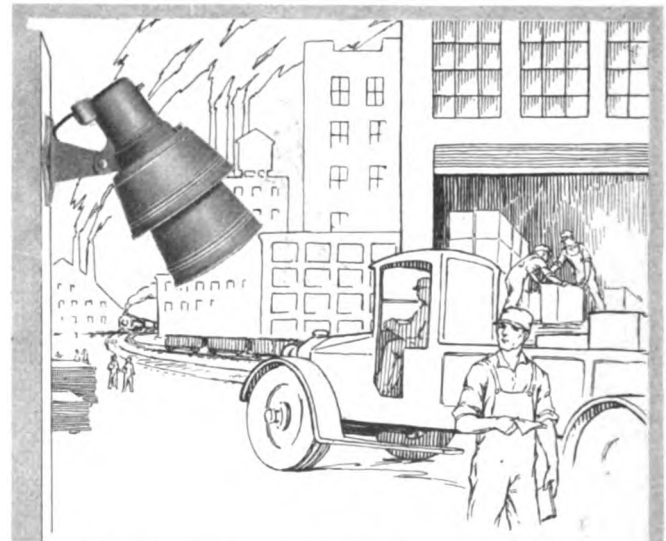
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PATROL Portable **— The latest and most versatile of all portable watchclock systems. Equally satisfactory for 1 or 100 stations.**

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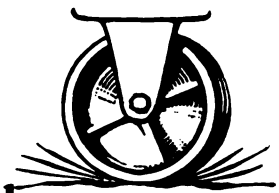
"Give and Take" is the principle of the new Bassick Ruboid Wheel

Reg. U. S. Pat. Off



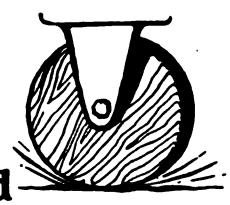
Iron

Something's *got* to *give* —the floor does!



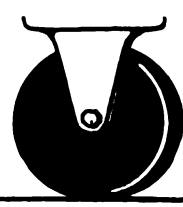
Steel

Something's *got* to *give* —the floor does!



Wood

Something's *got* to *give* —the floor does!



Ruboid

Something's *got* to *give*—the Ruboid Wheel does! Quietly, easily, noiselessly, it rolls without harm to floors. No wonder—look how it is made.

RESILIENCY with rigidity! That's what a truck caster wheel should aspire to and that's exactly what the Bassick Ruboid Wheel has attained.

Look at it! See those laminations of tough, sinewy wood held fast in a solid mass of vulcanized rubber. Ply by ply, Ruboid Wheels are built. Rubber, then wood—rubber then wood—and the whole mass solidified by vulcanizing.

Strength? Yes, burden-bearing strength. Sizes for heavy loads—sizes for light loads—and all roll easily, roll smoothly.

Wear? Yes, Ruboids will outwear most any other truck caster wheel but they won't wear out your floors . . . they believe in taking the bumps—not giving them.

Silence? Well, what is more silent than rubber—what is more resilient than rubber—what is easier on floors than rubber—and yet no other wheel rolls easier. Resiliency with rigidity—Bassick Ruboids.

"Give and take." If you believe in it, "give" Ruboids a trial—they'll "take" the bumps out of *your* trucking problem forever.

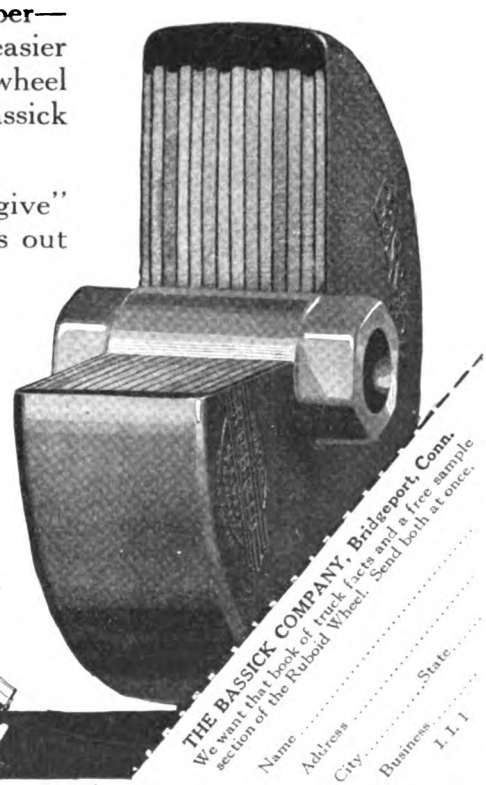
We want to give you this book—will you take it?



Full of facts about truck wheels you have every right to know. Send for it and a free sample section of Ruboid Wheel.

SEAMLESS RUBOID RUB-WOOD
PAT. 1458 379 REG. U.S. PAT. OFF.

THE BASSICK COMPANY, Bridgeport, Conn.



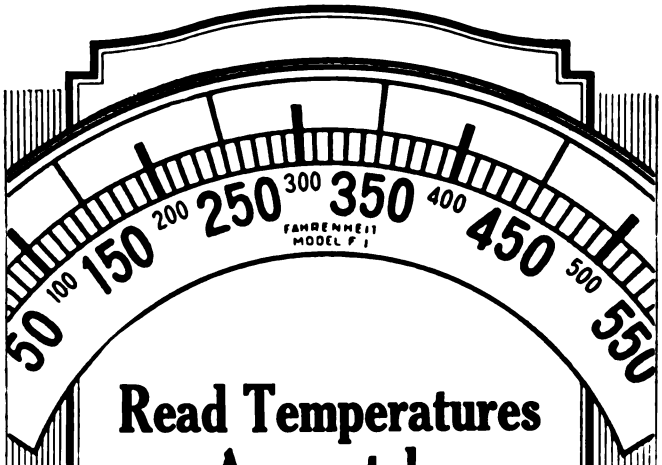
THE BASSICK COMPANY, Bridgeport, Conn.
We want that book of truck facts and a free sample section of the Ruboid Wheel. Send both at once.

Name .....
Address .....
City ..... State .....
Business .....



Ruboids Roll Easily ~ ~ Silently!

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Read Temperatures Accurately At a Glance

There's no excuse now for reading temperatures inaccurately—no need of straining the eyes trying to see the mercury through a greasy, dirty, glass tube. The Motoco *Dial* Thermometer can be read *accurately* even 20 feet away.

Note the large black figures with deep graduations on the above facsimile of the big Motoco dial. These, with the red pointer, make accurate reading easy with a

MOTOCO

INDUSTRIAL THERMOMETER

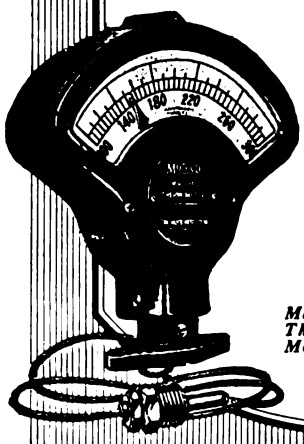
By means of the capillary tubing the dial can be mounted in the light as far as 50 feet from the sensitive bulb.

Simple in construction. Nothing to break or get out of order. Guaranteed accurate.

The Motoco costs no more than high-grade armored glass-tube thermometers—about one-third less than other dial types.

Made for temperatures from minus 40° to plus 750° F. Supplied with tubing or straight or angle stem.

Free catalog No. 10 fully describes the Motoco. Send for a copy.



The
MOTO METER CO.
Inc.
Industrial Thermometer Division
10 Wilbur Ave.
LONG ISLAND CITY
N. Y.

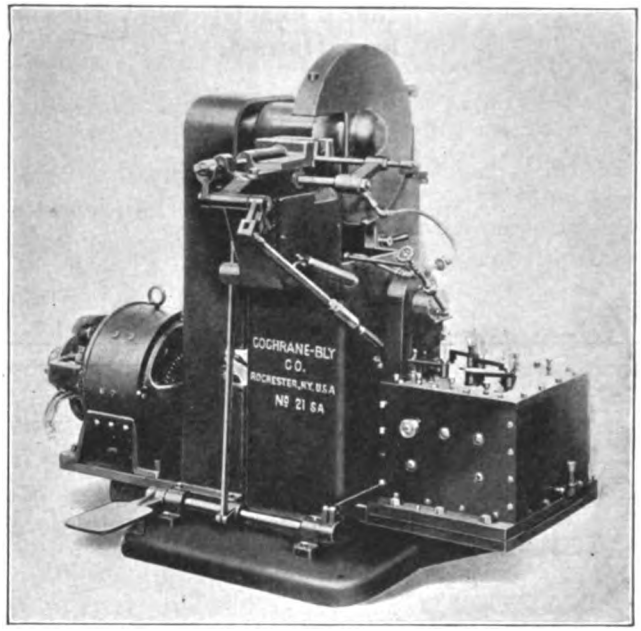
Manufacturers of Industrial Thermometers and Boyce Moto-Meters exclusively

A New Automatic Cut-Off Saw

THIS machine, developed by The Cochrane-Bly Co., Rochester, N. Y., and known as their No. 21-SA is designed primarily for cutting bars, tubes and extruded sections of non-ferrous metals but can also be used for cutting wood, fiber, hard rubber, bakelite, etc., or by using an abrasive disc it will cut magnet steel, hardened drill rod, tool bits, porcelains, etc.

The machine illustrated has a pump and tube connections to blade housing and will deliver a jet of oil or compound on each side of blade and close up to the collars. Centrifugal force distributes the lubricant, thus cooling the entire blade and lubricating the teeth. A reservoir in column holds a liberal supply of the desired liquid.

The carriage has an adjustable travel of ½" to 4¼" and a speed range varying from 1 to 30 strokes per minute, with 18 changes. The carriage is also adjustable



with relation to the vise so as to compensate for wear of blades and for varying position of work in the vise.

The vise is operated automatically in time with the movement of the carriage and will accommodate work 4" in diameter. The movement of the vise jaw can be varied from nothing up to ½".

Spindle runs in Timken Roller Bearings mounted in dust proof cases.

The machine has an automatic positive clutch, which is engaged by means of the foot treadle. If treadle is released the machine will make one stroke and stop with blade in back position. If treadle is held or locked, machine runs continuously. The operating cams are susceptible of change to give speeds up to 120 strokes per minute and automatic feeds can be provided for special jobs.

The machine arranged for belt drive weighs about 2,150 pounds net, and occupies floor space of about 48" x 50".

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"Pushers" or not, as you wish

Two lift-trucks—one a Stuebing—standing side by side. They look alike—operate alike—same size, capacity and weight.

Why is the Stuebing priced higher?

One reason is that it requires no "pushers."

Stuebing has never used pin bearings, for instance, and never will. Hyatts are cheaper for you than "pushers."

Similarly, foundry parts cannot give that even, rigid, easy rolling motion that comes only with a perfectly machined product. To make the easy rolling action of the Stuebing even more pronounced, Timken Thrust bearings now are used in the head to take all the whip, bind and friction off the handle.

It would be easier to sell lower priced trucks and let you pay the "pushing" difference, but Stuebing had rather build the only truck that you can buy which needs no "pushers." Let us demonstrate the difference under your loads. No obligation.



Stuebing Steel-Bound Platforms match the Stuebing Lift Truck in strength of build and adaptability of service. They won't wear down or wabble

Stuebing Truck Company
Cincinnati, Ohio

StueBing
LIFT TRUCK SYSTEMS

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THE LENIX DRIVE

(TRADE MARK REG.)

"Elimination of Waste" through improved methods of manufacture was the watchword of Industry in the year just past.

For twenty years the Lenix has been eliminating the wasting of power in belt drives caused by slipping belts. The short pulley centers not only possible but preferable with the Lenix result in saving of floor space as in the installation of a 90 KW engine driven alternator illustrated below.

Wherever belts are used to transmit power from one pulley to another the Lenix will improve the operating conditions. Thousands of Lenixes are in operation on installations ranging from 1 HP to 1400 HP. These drives are horizontal, vertical and some are quarter turn.

The Lenix is not an idler. It is a "belt wrapper" scientifically applied to belt drives for the purpose of saving floor space, eliminating belt slippage and improving the general capacity of the drive.

Booklet *Saving Slippage and Space* contains the facts that have induced the sale of thousands of Lenixes and it may be had on request.

5 Points

1—The LENIX increases the arc of contact between belt and pulley.

2—The LENIX maintains constantly and accurately the proper tension in the slack side of the belt.

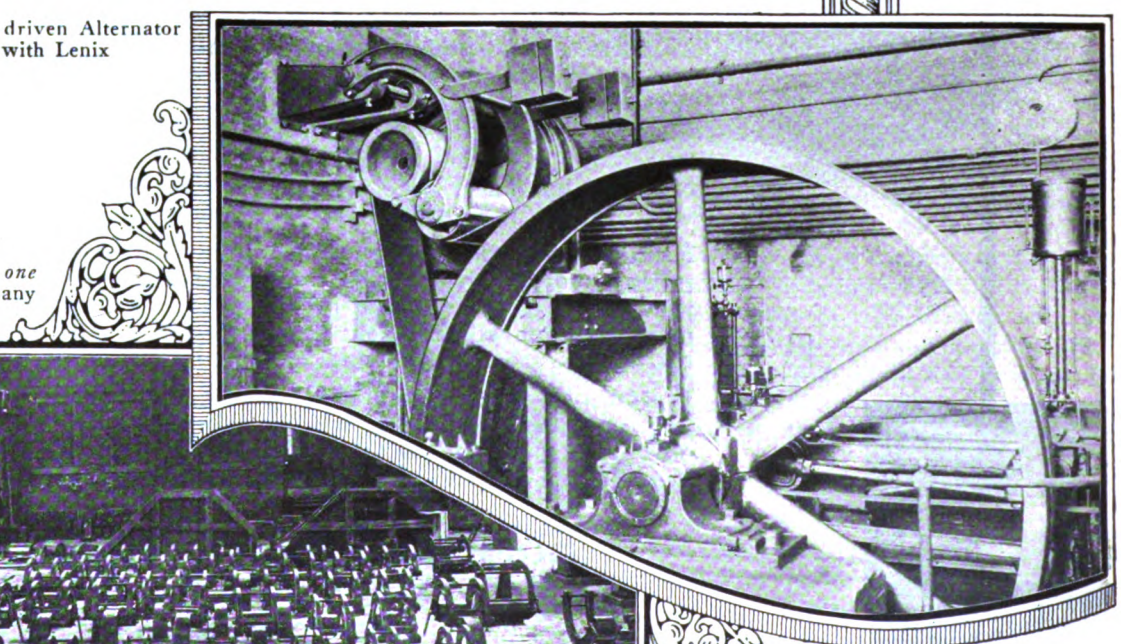
3—The LENIX saves floor space, building space and belting because of freedom in pulley locations.

4—The LENIX saves in bearing friction, lubrication and renewal of bearings because of reduced bearing pressure.

5—The LENIX permits the use of less expensive, high speed and high efficiency motors or generators because of the higher pulley ratios.

F. L. Smidth & Company, Engineers
50 Church St., New York, N. Y.

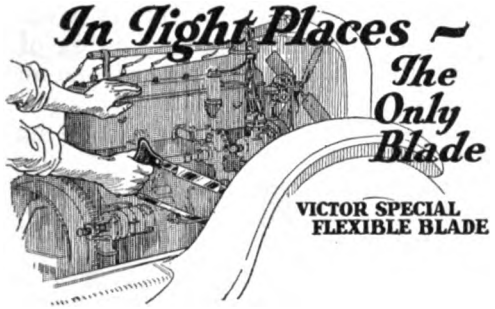
Engine driven Alternator with Lenix



90 LENIXES on *one order* to *one* company



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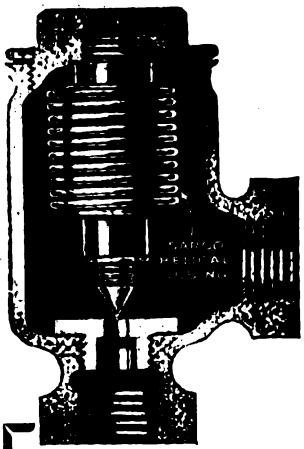


When an automobile mechanic needs a cutting done in close quarters as is usually the case on motor car work, the Victor Special Flexible Blade renders invaluable service.

This blade is practically unbreakable, and affords cutting of tough materials at awkward angles.

Write for Sample Blades

VICTOR SAW WORKS, Inc.
Middletown, N. Y.



Pay No Money—Take No Chances

You can be absolutely certain that the Sarco Steam Trap No. 9 will give you *entire satisfaction* before you pay us one cent—before you even obligate yourself to buy it.

We are so sure that the Sarco will do your work at least as well as any other steam trap at one-third the cost, that we will gladly send one on 30 days' free trial. Use it in your own plant—away from the influence of salesmen. Then if you are willing to part with the Sarco, send it back and we will thank you for making the test.

Hundreds of thousands of Sarcos have been sold on this "show me" basis. Surely, it's worth your while to find out, under the protection of this buy-it-only-if-you-like-it basis, whether the Sarco will save you money. You can't lose on this straightforward offer. *We* take all the risk.

Mail the coupon while you think of it.

SARCO STEAM TRAP

SARCO CO. Inc.
236 Broadway, New York City

Boston **Buffalo** **Chicago**
Detroit **Cleveland** **Philadelphia**

FREE TRIAL

SARCO CO., Inc., 236 Broadway, New York

Send one Sarco Steam Trap on 30 days' free trial as follows:

☐ Size..... for pressure of.....lbs.
☐ Send Booklet R-262.
Firm .....
Street .....
City ..... State .....

Interchangeability



MASTER GUARANTEED MOTORS are *interchangeable* in principal dimensions and many parts for the same horsepower rating and speed.

This accomplishment means that manufacturers can, by the use of Master Motors, standardize their mounting dimensions and handle changes in the field with the utmost ease.

Let Master Engineers tell you how this feature will cut your cost.

THE MASTER ELECTRIC COMPANY
Linden and Master Aves. Dayton, Ohio

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MASTER GUARANTEED MOTORS

⅛ TO 7½ H.P. Dayton THE MASTER ELECTRIC CO. Ohio Less than 40°

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HAUCK Venturi
Low Pressure Oil Burners



Save Over 12,000 Dollars
Annually in One Plant

Six Hauck Venturi Low Pressure Oil Burners are used for firing the annealing furnaces at the Michigan Steel Casting Company, Detroit, where high quality steel castings are produced.

A survey by the A. C. Nielsen Company showed that the savings in oil, labor and decreased loss of scale paid for the cost of Hauck burners in 6 days operation.

Here is a tabulation of the annual savings.

from a Nielsen Survey

Annual saving due to decreased labor and fuel— 7.344 tons x $ .88.....	**$6,462.75**
Annual saving due to decreased loss from scale, approx.	**$6,000.00**
Total Annual Saving...	**$12,462.72**

Hauck Oil Burners are made in types and sizes for various industrial purposes. Nielsen Survey No. 31, together with the Hauck Catalog will be sent on request. Simply mail the coupon with your name, address and company.

Hauck Manufacturing Co.

148 Tenth Street, Brooklyn, N. Y.

HAUCK HIGH AND LOW PRESSURE OIL BURNERS

HAUCK MANUFACTURING CO.,
148 Tenth Street, Brooklyn, N. Y.

Mail us a copy of Nielsen Survey No. 31 and the Hauck Catalog.

Name .....

Company .....

Address .....

Promoting Better Belting Service

THAT the New York Power Show does not confine itself to new developments in power production alone, is evident from the wide range of exhibits dealing with the more efficient transmission and use of the power produced.

Transmission losses are today an item of major con-



cern in every plant, and the list of this year's show exhibitors is but a reflection of that fact.

Among the exhibitors in the latter classification is the Clipper Belt Lacer Company, of Grand Rapids, Mich., which is showing its regular line of belt lacing



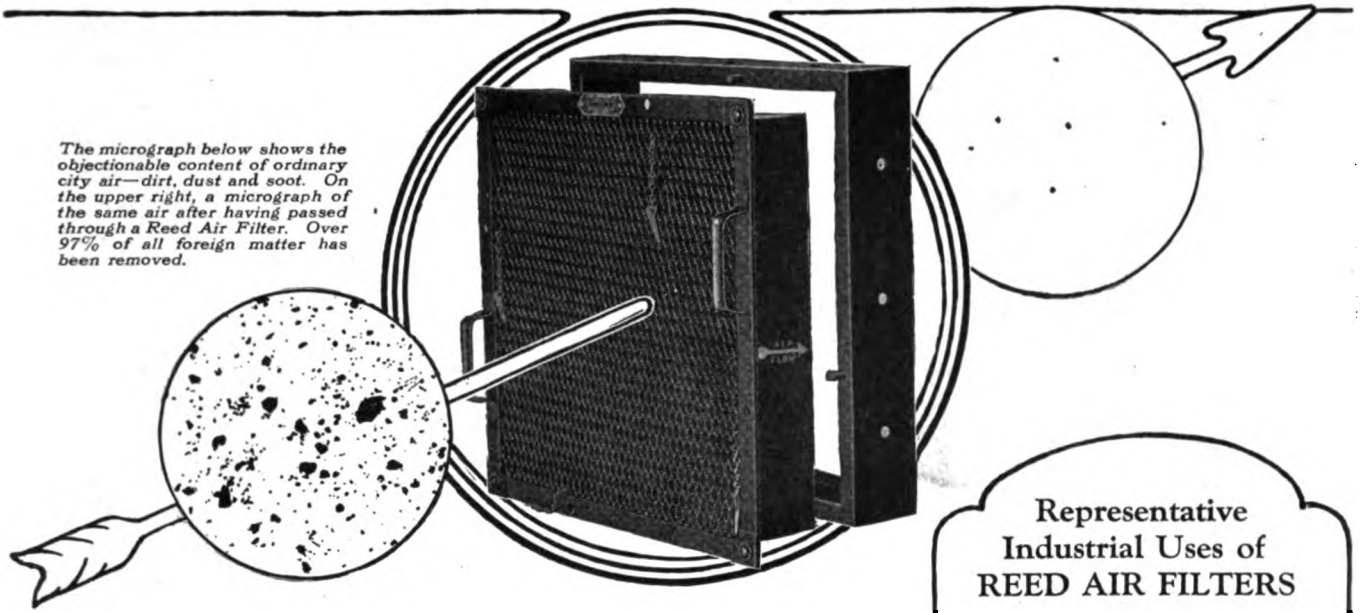
devices and belt cutters; the latter for squaring belt ends preparatory to joining.

This company points with pride to the fact that it has built up a world-wide organization on the merits of a device whose design has undergone no changes since its introduction many years ago.

AUTOMOBILE factories, textile mills, steel mills, equipment manufacturers of all kinds, and hundreds of lesser industries are all working on production schedules that reflect, directly or indirectly, a steady and an apparently healthy consumer demand. Merchants in all sections of the country now realize that the active buying power of the people in their localities gathers momentum as virtually full employment at good wages continues through the early winter months.—*La Salle Extension University.*

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R E E D A I R I S C L E A N A I R



The micrograph below shows the objectionable content of ordinary city air—dirt, dust and soot. On the upper right, a micrograph of the same air after having passed through a Reed Air Filter. Over 97% of all foreign matter has been removed.

How much are *you* spending for unclean air?

DIRT, in one form or another, is costing individuals and industries millions each year. How much is it costing *you?*

Wherever fine materials must be kept from the ravages of dust and soot, wherever perishable foods must be safeguarded against bacteria, wherever delicate machinery must be protected against harmful dirt and grit, Reed Air Filters can remove these costly elements from the air with highest efficiency and lowest cost of operation and maintenance.

A few representative industries in which Reed Air Filters are dispensing with the *unnecessary* cost of unclean air are listed on the right. Use the coupon for obtaining helpful information regarding the economy of Reed Filters for *your* business.

REED AIR FILTER CO., *Incorporated*
211 Central Avenue, Louisville, Kentucky
Offices of Principal Cities

Reed Air
TRADE MARK
filters ALL METAL

Representative Industrial Uses of REED AIR FILTERS

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CHICAGO UNION STATION
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Textile
A. STEIN & CO.
CHENEY BROTHERS

Electrical
WESTERN ELECTRIC CO.
WESTINGHOUSE ELECTRIC & MFG. CO.

Chemical and Film
ABBOTT LABORATORIES
EASTMAN KODAK CO.
E. I. du PONT de NEMOURS

Food Products
NATIONAL BISCUIT CO.
SWIFT & COMPANY
WASHBURN-CROSBY CO.

REED AIR FILTER CO., Incorporated
211 Central Avenue, Louisville, Kentucky
Send, without obligating me, bulletins: No. 106, The Reed System of Air Filtration; No. 107, Data, Tests and Specifications; No. 108, Reed Air Filters for General Ventilation.

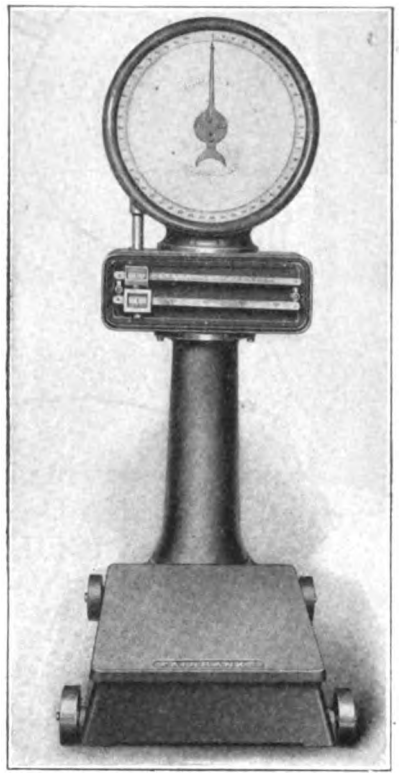
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FAIRBANKS SCALES



Accuracy and Speed in Weighing

The Fairbanks Automatic Dial solves the problem of quantity weighing with accuracy and speed. The dial is so arranged that the weight is read without additions or calculations.

Weights are read at a glance and errors are practically impossible. Fairbanks Scales represent the highest development of almost a century of specialized experience. In hundreds of applications they are giving flawless service—are speeding up production, eliminating errors, saving labor, paying for themselves in countless ways.

Write for bulletin information on the various types of Fairbanks Scales.

FAIRBANKS SCALES

NEW YORK
Broome and Lafayette Sts.

CHICAGO
900 South Wabash Ave.

And 40 other principal cities —each with a service station.



Embody 90 years of Scale Making

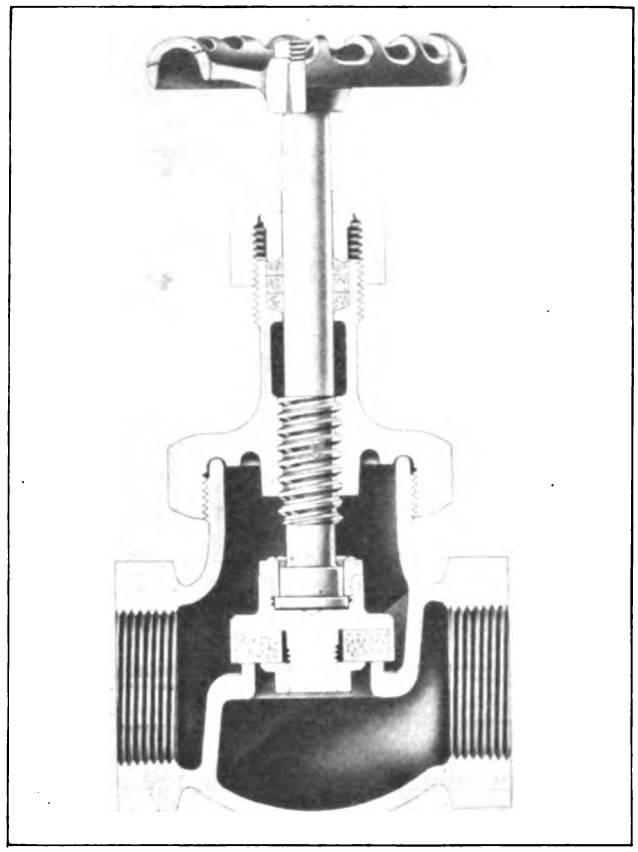


An Addition to the Line of Jenkins Valves

A LINE of Medium Pressure Bronze Globe and Angle Valves for 225 pounds working steam pressure is announced by Jenkins Bros. They have been designed to fulfill a need for a valve with the renewable disc feature which will satisfactorily meet higher pressures than recommended for standard pattern valves.

An important feature of these valves is the bonnet and union, made in one piece to screw on to the outside of the body threads. This construction is said to give added strength to the body end, the bonnet hexagons being made especially large, allowing easy removal of the bonnet without distortion.

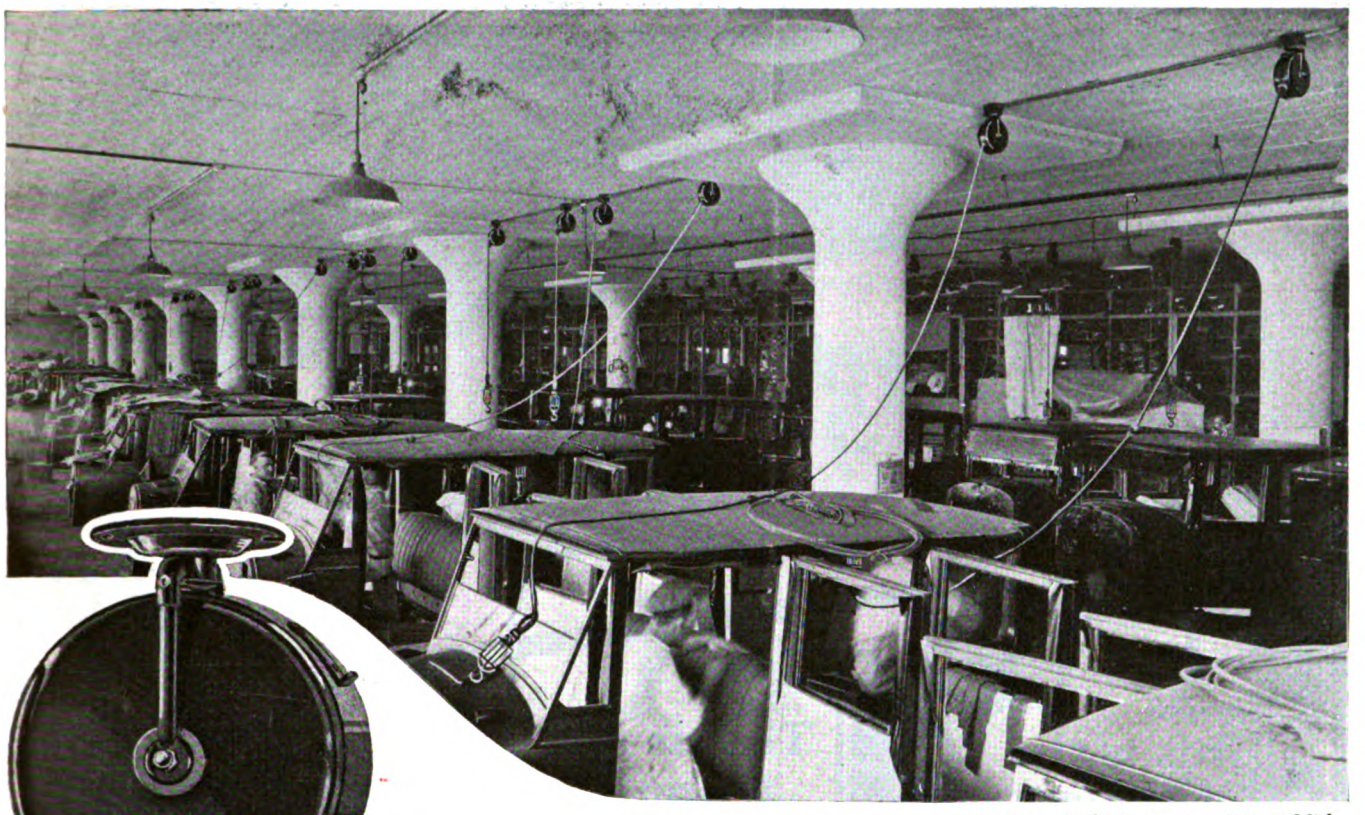
Of special interest is the "ball joint" formed when the bonnet and body are screwed together. This is a new feature, designed by Jenkins Bros., which they claim makes a very strong, though easily removable, joint.



The valves are regularly fitted with the Jenkins Special No. 800 composition disc for high pressure work. The manufacturers point out that composition disc for a high pressure valve will appeal to those who recognize the superiority of such a disc over a metal-to-metal seat. No regrinding is necessary to insure a tight valve. The spindle is made of manganese bronze, with large, powerful threads which are all in contact when the valve is closed. The stuffing box is deep, with plenty of asbestos packing which is compressed by means of a bronze follower. A ventilated hand wheel of malleable iron is used.

The valves are furnished, Globe and Angle with screwed or flanged ends, in sizes of ¼ in. to 3 in.

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Murray Body Corporation, Detroit, Mich.



Out of the Way When Not in Use

WHEREVER careful consideration must be given industrial lighting problems, there the Reelite is a logical solution.

For the Reelite, with its unkinkable cord, automatically reeled and unreeled, saves space, saves the wear and tear on cord and, above all else, is instantly and easily available when needed, which saves time.

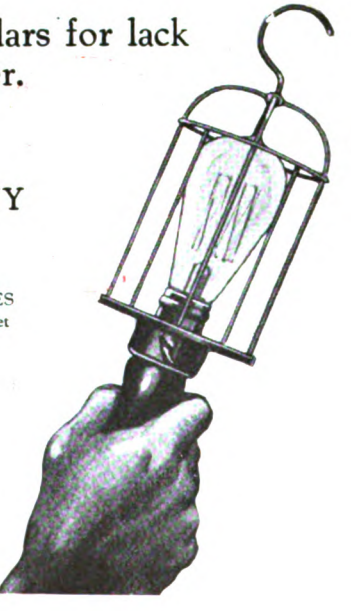
Can your industry afford to lose dollars for lack of Reelite installation? Think it over.

For further information, write

APPLETON ELECTRIC COMPANY
1716 Wellington Avenue
CHICAGO, U. S. A.

NEW YORK
265 Canal Street

LOS ANGELES
340 Azusa Street



Reelite

The Handy Light on a Reel

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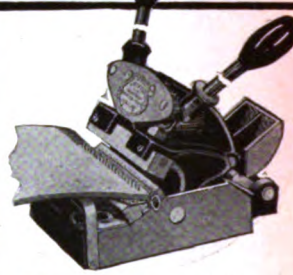
Getting down to



ENLARGED

This is the Clipper Hook

This is the Clipper "Special" Pin



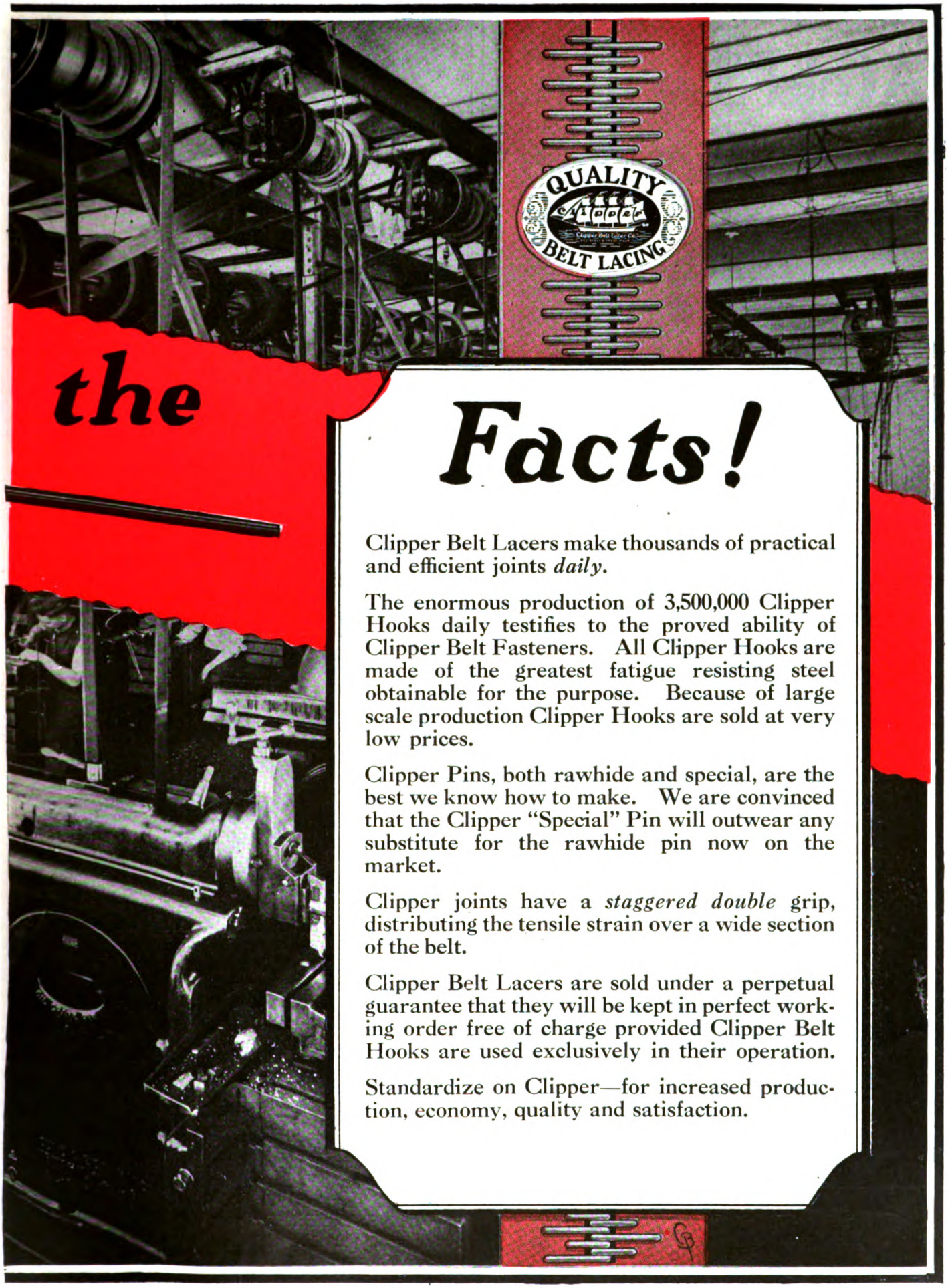
This is the Clipper Belt Lacer

Clipper

Clipper Belt Lacer Company

GRAND RAPIDS MICHIGAN

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A Cold Saw to Cut *Satisfactorily*



THE selection of a metal saw that will give the most service at a minimum maintenance cost should be based on quality of steel and ability to resist wear. Qualifications like these recommend Simonds Solid Tooth Saws for use in metal-working industries.

These Saws are made of high-grade steel produced in Simonds' own steel mills, scientifically tested and tempered to a degree that proves up in performance.

SIMONDS SAW AND STEEL CO.

FITCHBURG, MASS. CHICAGO, ILL. BOSTON, MASS. DETROIT, MICH. NEW YORK CITY LOCKPORT, N.Y. MEMPHIS, TENN. NEW ORLEANS, LA. LONDON, ENGLAND PORTLAND, ORE. SAN FRANCISCO, CAL. SEATTLE, WASH.

SIMONDS CANADA SAW COMPANY, LTD.
MONTREAL, QUE. ST. JOHN, N.B. TORONTO, ONT. VANCOUVER, B.C.

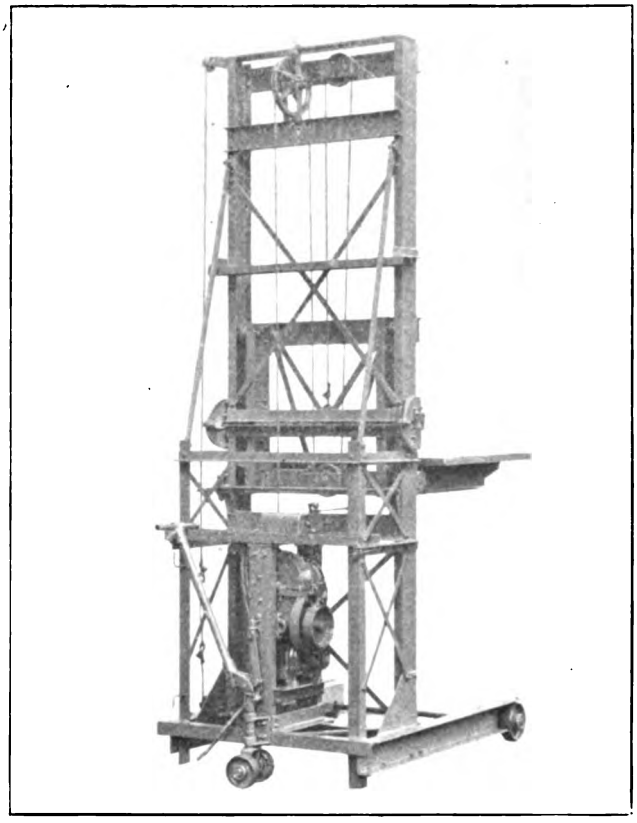
Makers of

Hack Saws, Metal Band Saws, Inserted Tooth Metal Saws, Solid Tooth Metal Saws, Slitting and Slotting Saws, Files, Tool Bits.

A New Type of Stacking Machine

THE Lewis-Shepard Co., of Boston, in announcing their new type PB Stacker, state that it is a marked advance in its field, because it is the first Portable Elevator to be made on the work-drive principle. The worm runs in an oil bath. There are no exposed gears. Operation, both up and down, is through a controller.

This machine is used principally for the piling and



unpiling of various kinds of stock and merchandise, and also reduces the expense of handling.

A high-torque, elevator type motor of 2½ hp. is used, and operates from a power line. A one thousand-pound load can be lifted at the rate of forty feet per minute. This stacker is made up to a one-ton capacity.

IN every period of prosperity there comes the stage when captains of industry become concerned regarding the possibility of over-production. Just now there is a good deal of talk about overbuilding; also about overtrading in connection with instalment sales. The fact that a given industry is working at full capacity, however, does not necessarily indicate over-production. Over-production is a relative term. Capacity production may not constitute over-production until there is a slump in demand; and demand is always related to the credit situation. When money becomes tight enough to restrict demand, a continuation of capacity production leads to over-supply.

At present we are in an intermediate stage. Money has been tightening but the money market is not yet restrictively tight. The total loans and investments of the Federal Reserve Banks are $1,382,000,000 as compared with $1,193,000,000 a year ago. That is a negligible increase for a country of 115 million people with a spending power of $70,000,000,000 per year.—*Alexander Hamilton Institute.*

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Ball bearing boxes keep fans and blowers running in perfect balance

Requiring no attention other than occasional lubrication, Fafnir Ball Bearing Boxes are being used more and more in blowers and fans.

These machines are often located in out-of-the-way places. Because of the difficulty in getting at them, weekly oiling, as called for by plain bearings, is invariably neglected. On the other hand, with Fafnir Ball Bearings a greasing every three or four months is all that is necessary.

Then, too, Fafnir Bearings do not wear. As a result, fans are kept running in perfect balance. Speed is always up to rating. The shaft is stabilized against end movement, because the extra deep grooves of the races enable the bearings to carry safely the considerable axial thrust brought about by the intake of air.

Write for sizes, dimensions and prices.

THE FAFNIR BEARING CO.

Makers of high grade ball bearings—the most complete line of types and sizes in America.

NEW BRITAIN, CONN.

Chicago Newark Cleveland Detroit

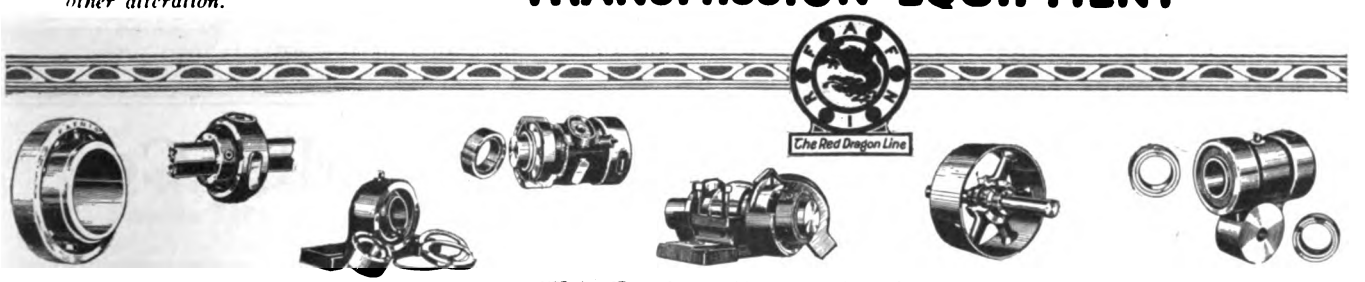


Single Row Pillow Block for exhausters, showing long inner ring, self-locking collar, two pressed steel dust caps, and retaining wire.

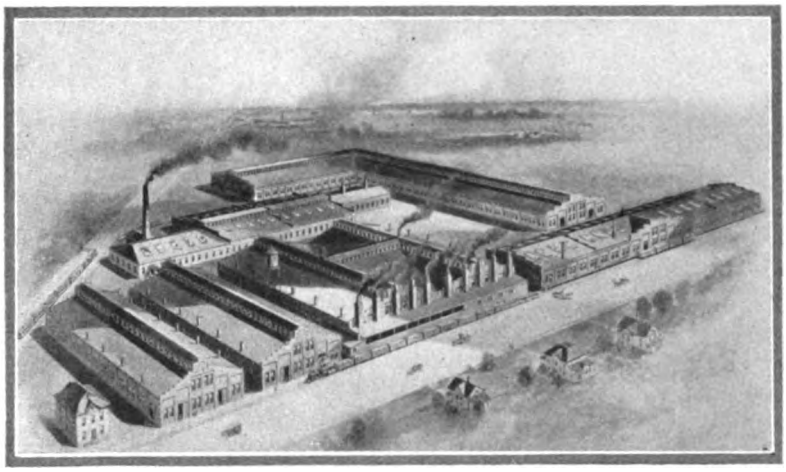
Fafnir knee-type boxes and single pillow blocks fit all standard blowers and fans. In ordering, merely mention the make and size of blower, and a box will be supplied that will fit your frame perfectly without requiring any machining or other alteration.

FAFNIR

BALL BEARING UNIT-ALIGNING TRANSMISSION EQUIPMENT



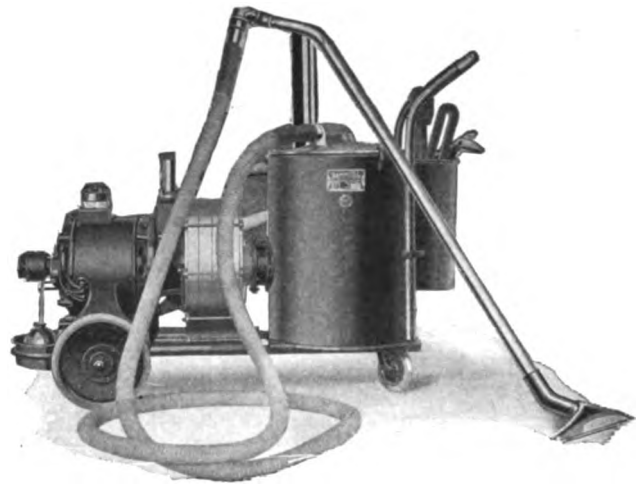
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An Invincible Portable Vacuum Cleaner

paid for itself 20 TIMES in the last 5 YEARS

At the Belmont Stamping & Enameling Co.



H. W. Judkins, Treasurer and General Manager, Belmont Stamping & Enameling Company, New Philadelphia, Ohio, says:

"A clean enamel shop is half the secret of success in making our product—good enameled kitchenware.

"Five years ago we saw an 'INVINCIBLE' portable vacuum cleaner at work cleaning another kind of a shop. We bought one to try to lessen the troublesome enamel dust that was causing so much spoilage and high cost of our product.

"Ever since that time, this one sturdy vacuum cleaner has enabled 1 man to do all the work formerly done by 3 men with brooms and brushes. Our cleaning is now done better than ever before.

"Our service is particularly hard on a vacuum cleaner. The enamel dust is so gritty and abrasive that it would destroy an ordinary vacuum cleaner in no time, yet the 'INVINCIBLE' portable vacuum cleaner has done, and is doing our work with ease.

"We have 175,000 square ft. of floor space to be cleaned with our vacuum cleaner. 250 operators work in this space. . . . Even if there were no labor to be saved, we would use the 'INVINCIBLE' because it betters our product.

"But the labor saving is well worth while also. We save $2,000.00 a year in labor alone, because one man now cleans our entire plant, where before it took 3 men to sweep it.

"Our cleaning costs on 300,000 pieces a month, formerly was 9c per hundred pieces. Since using our 'INVINCIBLE' portable vacuum cleaner, this cleaning cost has been cut to 3½c per hundred pieces, or a saving of 5½c per hundred pieces. During our rush production season, we have saved $4,000.00 a year by working our 'INVINCIBLE' on a night shift also.

"*Our 'INVINCIBLE' vacuum cleaner has paid for itself in net savings 20 times over the last 5 years,* or in other words it pays for itself every three months. It is in perfect condition today, and is good for many years more. Maintenance and current, added to a depreciation and an interest charge, would total only about 86c a day, while the labor saving alone is $6.66 per day. 'INVINCIBLE' Hose lasts over a year, even with our hard service.

"Our 'INVINCIBLE' vacuum cleaner removes the dirt even from the cracks in our matched maple flooring, instead of merely transferring a large part of it, as sweeping used to do.

"On account of its portability, our machine is used all over the shop, in the isles and warerooms where work in process is kept. It also cleans the roofs of our dry houses and ovens."

Tell us your cleaning problems—we can help you solve them.
No obligation. Write today.

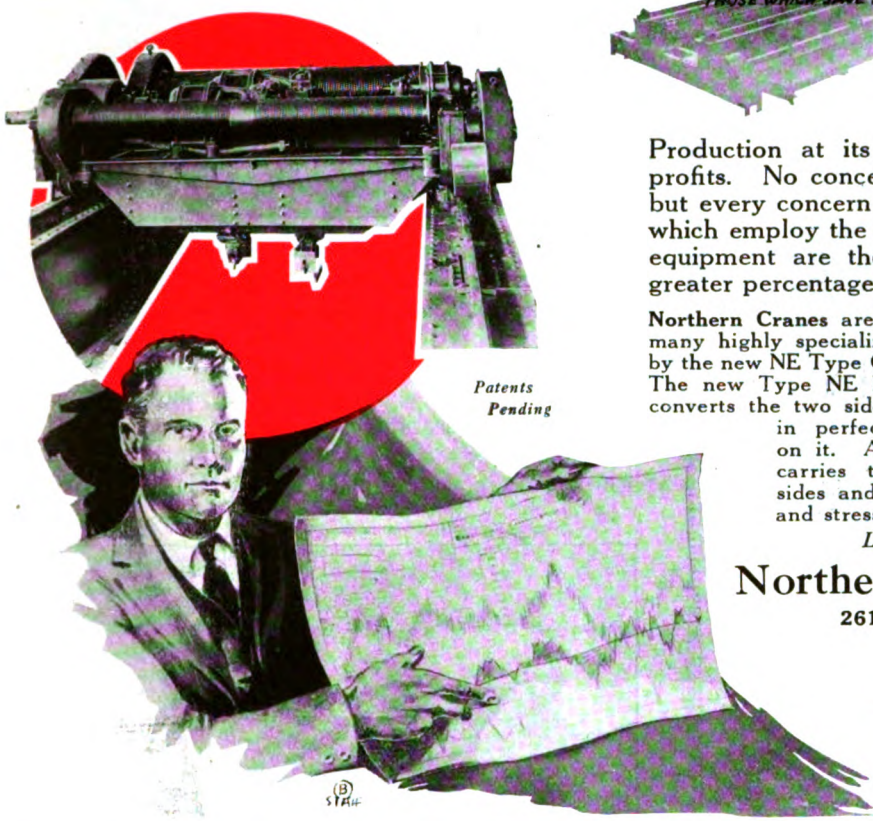
Invincible Vacuum Cleaner Mfg. Co.

Dover, Ohio

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Would You Keep Your Net Profits at the Peak? —





Production at its peak does not always show net profits. No concern prefers the former to the latter, but every concern is striving to enjoy both, and those which employ the most modern labor and time saving equipment are the only ones which are realizing a greater percentage of profits.

Northern Cranes are varied to meet varied conditions. Our many highly specialized types have been lately supplemented by the new NE Type Crane—the crane with the two Load Girts. The new Type NE has a rigid cast steel girt that securely converts the two side frames and holds the trolley rigid and in perfect alignment. There is no live stress on it. A structural steel compensating load girt carries the live load directly into the trolley sides and is free to adjust itself to varying loads and stresses.

Let us tell you more about it

Northern Engineering Works

2611 Atwater St., Detroit, Mich.

Standardized NORTHERN TYPE-NE CRANE

NITROSE

.....a metal coating that can be put on right over rusty and sweat or grease covered surfaces.....and that resists very high temperatures. It sinks through the rust and grips the metal itself. It gives a black, shiny long-lived surface. Nitrose is low in price.....since very little surface preparation is necessary.

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Smoke Stacks	Boiler Fronts
Condensers	Coal Bunkers
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Locomotive Fronts	Ash Bunkers
Steam Piping	Water Piping

Stocks of drums and cans carried in principal cities

NITROSE CONQUERS CORROSION

THE NITROSE COMPANY

Peoria Life Bld'g, Peoria, Ill.

III-C-RTG



New Low Prices DO/MORE HEALTH CHAIRS

Let us make a careful survey of your seating problems and submit recommendations. A trained Do/More representative will gladly undertake this at no cost to you. Do/More chairs are now standard equipment in many of the nation's finest plants. They conserve health through right posture and keep your employees happy, contented and better able to do the day's work.

Volume production now permits surprisingly low prices on this practical, enduring seating. Write for complete information.

DO/MORE CHAIR COMPANY

Dept. 104 **Elkhart, Ind.**

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LIFT- TRUCK

Barrett Handling Equipment



50%
speedier handling
with
Barrett Lift-Trucks

The Williamson Candy Company is one of the large number of manufacturers who are cutting material handling time in half with Barrett Model F Lift-Trucks.

50% speedier handling is the usual record of Barrett users, because the Model F Lift-Truck lifts the load with a single stroke of the handle, lifts it easier than any other single-lift truck, and lifts from an angle as well as from the front.

Write for FREE booklet which describes material handling savings.

"Steeleg" Platforms for Lift-Trucks

Barrett "Steeleg" Platforms increase the speedy operation of trucking systems. Strongly built with rigid steel legs and maple top-boards — every board end steel gripped — nothing to become wobbly. Built in all sizes to fit all lift-trucks.

BARRETT-CRAVENS COMPANY—1321 West Monroe Street, Chicago, Ill.—Grand Central Palace, New York—Sole Licensee for Canada, Riley Engineering & Supply Co., Ltd., 360 Dufferin St., Toronto—Paris, Factory, Barrett-Cravens Co., 9 Rue de Rocroy. Distributors in all principal cities of the world.

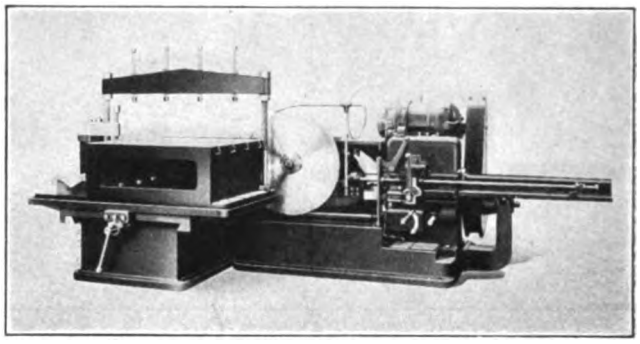
EASIEST LIFT—BY ACTUAL TEST

A New Combination Cold Saw

IN the cutting of I beams, channels, etc., at 45 degrees and other angles, it is necessary to have either a large blade or a long carriage travel. The Cochrane-Bly Co., Rochester, N. Y., have developed a machine with 48" saw travel and preserved the special feature of their standard machines; having the feed screw mounted above the ways and close up to the saw blade, in which construction the feed thrust is nearly in line with the blade resistance.

The manufacturers point out that, in sawing an I beam or channel on the top table as shown, the carriage passes under the work and the cutting resistance is nearly in line with the feed or carriage travel instead of at right angles as is the case when the work is on a level with the saw arbor. The position of the feed screw therefore tends to eliminate cant of the carriage and accompanying vibration.

In the cutting of light sections only one tooth is engaged in the metal at one time and this tends to cause



chatter and vibration and to dull the blade rapidly. To eliminate this, the saw arbor is geared to a band brake which is said to take up all slack in gear teeth and hold the blade steady.

The upper tables can be removed and machine then has capacity for cutting 21" I beams in vertical position, or round bars up to 10" diameter.

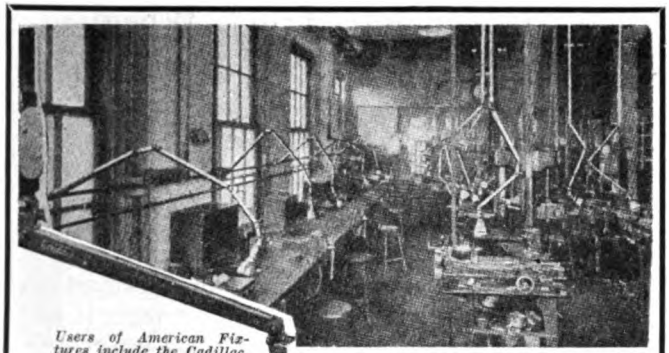
The machine is driven through a friction clutch and sliding gear transmission with hardened nickel steel gears running in an oil bath and giving cutting speeds of 30, 40 and 50 feet per minute.

The feed is geared and positive and provides 11 changes varying from ½" to 2½" per minute, and in addition the machine has rapid power traverse to carriage in both directions.

The friction clutch, feeds and rapid traverse are under instant control from either front or rear working positions.

DURING the first half of 1926 the volume of trade should compare favorably with 1925. There will be a good rate of activity in iron and steel and building and therefore good employment and satisfactory retail buying.—*Alexander Hamilton Institute.*

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Users of American Fixtures include the Cadillac, Dodge, Chevrolet and Packard Motor Car companies.

Give Your Employes Better Light for Less Eyestrain—Less Fatigue

which means greatly increased production. That is what American Fixtures will do for you. These fixtures throw the light where it is most needed, directly on the job.

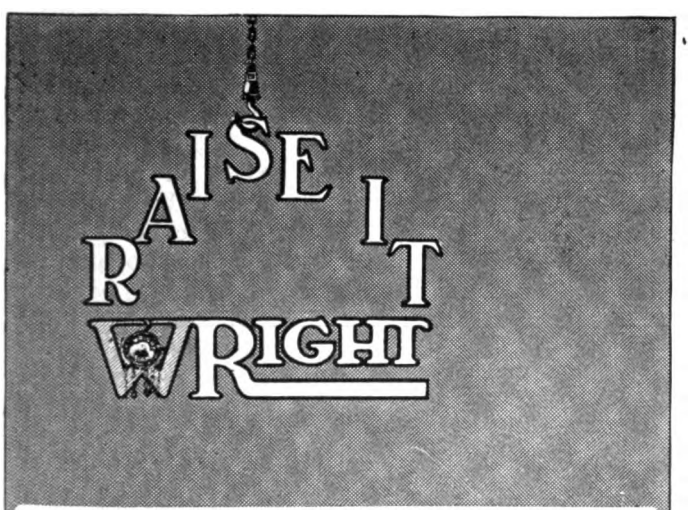
It is concentrated lighting and the production increase through the use of American Fixtures runs as high as 20% to 60%.

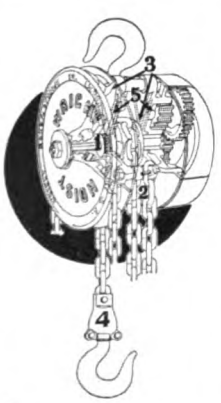
Let us explain the advantages in detail. Write for information.



American patented full universal joints used on all connections in the arm.

American Fixture Company
230 W. Water Street Milwaukee, Wis.





No matter what your lifting problems may be, there is a **Wright Super-hoist** for doing that particular job cheaper, safer and quicker. It's an unusual hoist with many exclusive and superior features in construction. Ask us for details on the Hoist with 21 points of engineering supremacy.

WRIGHT MANUFACTURING COMPANY

LISBON, OHIO

A National Organization



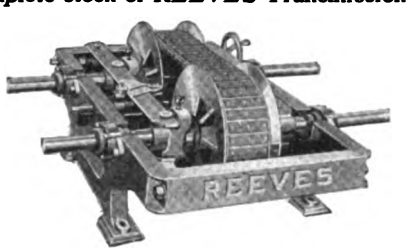
for

Accurate Speed Variation!

GET in touch with the REEVES representative nearest you and let him show you the advantages which accurate speed variation will bring to the machines in your plant.

*Reeves-Bond Sales Company Chicago
*Reeves Pulley Company Detroit
Reeves Pulley Company Toledo
*Manning Maxwell & Moore New York & Boston
*Charles Bond Company Philadelphia
W. E. Shipley Mach. Co. Philadelphia
*Carey Mach. & Supply Co. Baltimore
*J. A. Webb Belting Co. Buffalo
*Strong, Carlisle & Hammond Cleveland
*Link Belt Meese & Gottfried San Francisco
*Link Belt Meese & Gottfried Los Angeles
Link Belt Meese & Gottfried Portland, Ore.
Link Belt Meese & Gottfried Seattle
*E. M. & W. Engineering Co. St. Louis
Neill-LaVielle Supply Co. Louisville, Ky.
F. Raniville Company Grand Rapids
Palmer-Bee Company Detroit
Charles B. Scott Company Scranton, Pa.
Ty-Sa-Man Machine Co. Knoxville, Tenn.
Charlotte Supply Company Charlotte, N. C.
Mine & Smelters Supply Co. El Paso
Skinner Machinery Company Dunedin, Fla.
T. L. Rose & Son Pittsburgh
Dodge Mfg. Corporation Cincinnati
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Vonnegut Machinery Company Indianapolis
M. L. Foss Denver
Martin & Campbell Company Detroit
*Cecil R. Lambert Company Detroit
*Cross Brothers Company Rochester, N. Y.
Alamo Iron Works San Antonio
J. E. Dilworth Company Memphis
*Chain Belt Company Minneapolis
Boston Gear Works Co. Chicago
Boston Gear Works Co. New York

—indicates the representatives who carry a complete stock of REEVES Transmissions



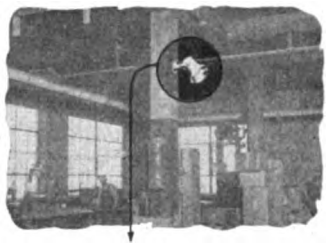
Ordinary speed changing devices give just *steps* in speed, but steps are not *exact* enough for best results. Often, the speed you need is *between* the steps, and the REEVES Transmission is the only way of getting the "in-between" speeds accurately. You get literally *millions of speeds* with the REEVES—*any* speed between fastest and slowest, even to the smallest fraction of a revolution. Accurate and dependable, always.

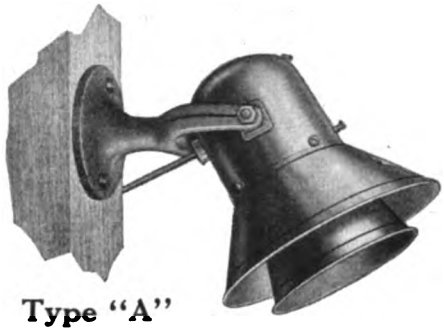
REEVES PULLEY COMPANY
Established 1887
Columbus, Indiana

REEVES
Variable Speed Transmission

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Gets *IMMEDIATE* ATTENTION





Type "A" Federal Electric Siren

$37.50 Complete

The shrill piercing note of the Federal Electric Siren penetrates every corner, through any amount of other noise, and gets your men to work on time. It is the most modern efficient signal for every factory purpose.

Can be operated from your office or automatically from your clock. The Federal is always ready for service. Oiling at long intervals is the only attention it requires. The universal motor operates on all voltages from 6 to 250, or from storage battery.

Mail the coupon TODAY. 30 days' trial. Money back guarantee. Be sure to give voltage desired.

FEDERAL ELECTRIC COMPANY
8700 So. State St., Chicago, Ill.
Send Type "A" FEDERAL SIREN, $37.50 complete, for.....volts, and if not pleased with it I will return it prepaid for credit.

Company Name .....
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I.I. 1

A Heavy Duty Truck Wheel

THE Metzgar Co., Inc., of Grand Rapids, Mich., have recently developed a truck wheel for heavy duty trucking, made in a large range of sizes to apply to different types of factory trucks and trailers. This wheel is made up of equal wedge-shape segments of hardwood, treated, and rigidly bound together by a patented process.

One of the novel and practical features claimed for this wheel is the interchangeability of bearings. It may be purchased either with end-wood bearings or with Hyatt roller bearings, in case extremely easy rolling



qualities are desired. The wheel shown here is Hyatt equipped. If for any reason the bearing fails it can be removed and a new one installed by the simple use of a screw driver in a minute's time.

Another advanced feature claimed by the manufacturer: simple and efficient means that may be employed for lubrication. As a result of the alemite Zerk, dustproof flush fitting one shot with the compressor gun is said to do the job. An ordinary oil can may also be used with this fitting.

This wheel is made by the Metzgar Co., Inc., of Grand Rapids, Mich., who also make regular duty wheels.

THE United States imports large quantities of both copper ore and unrefined copper for our smelters to make into finished material, notwithstanding that we are the largest producers of copper in the world.

Foreign demand for copper is an important factor in its price. This is also true of lead and zinc. All three metals have recently been rather slow of movement, because European political and economic affairs are uncertain and in a constant state of change.—*La Salle Extension University.*

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Tramrail Stocks in the Following Cities:

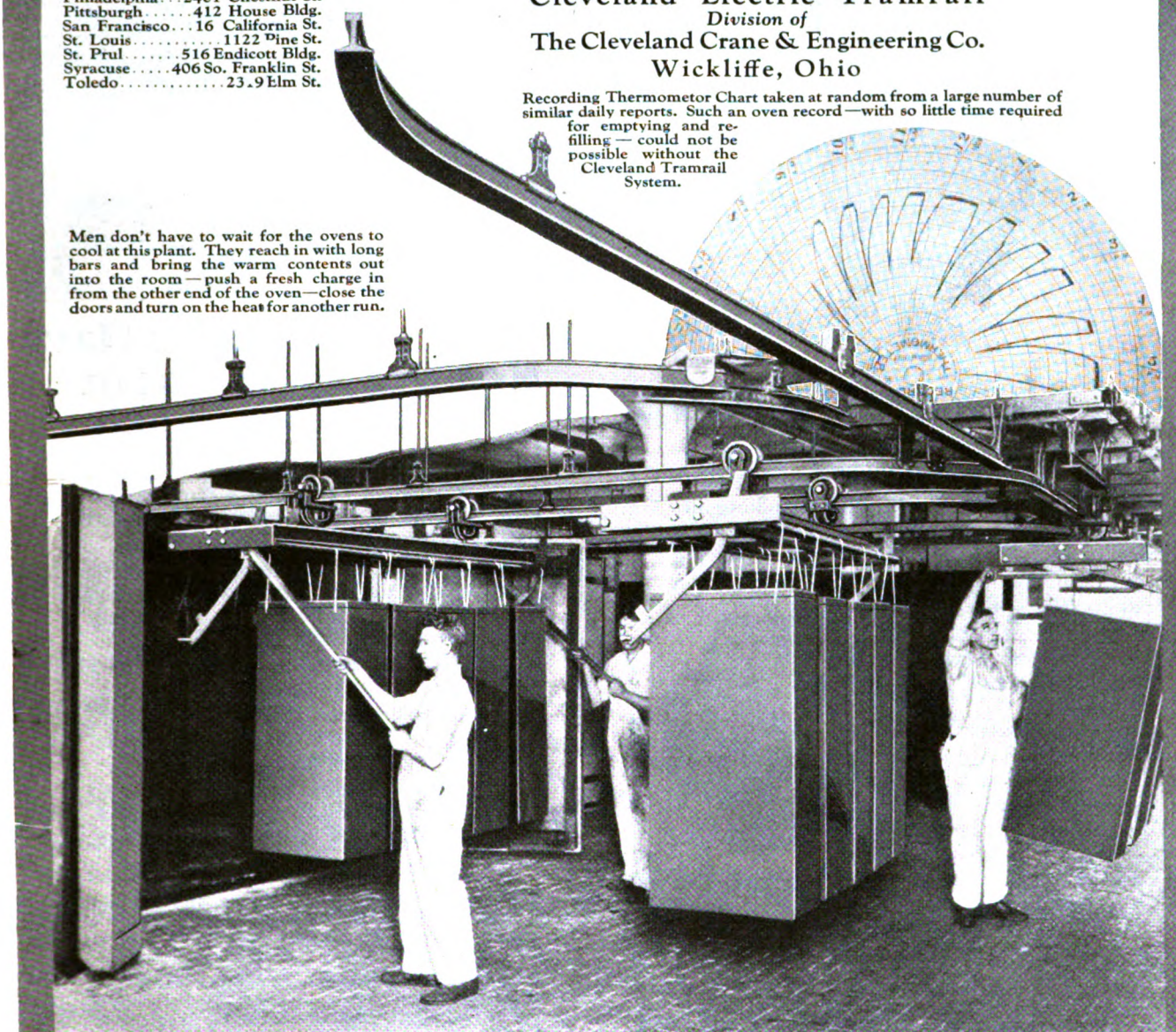
Albany.....93 State St.
Boston.....44 Bromfield St.
Buffalo.....1507 Hertel Ave.
Cincinnati
.....701 Union Central Bldg.
Chicago.740-44 W. Van Buren St.
Denver.....1226 E. 17th Ave.
Detroit.....149 E. Larned St.
Los Angeles.....43 E. Third St.
Louisville....513 Columbia Bldg.
Milwaukee.B'dway & Michigan St.
New York.....30 Church St.
Philadelphia...2401 Chestnut St.
Pittsburgh.....412 House Bldg.
San Francisco...16 California St.
St. Louis.....1122 Pine St.
St. Prul.....516 Endicott Bldg.
Syracuse.....406 So. Franklin St.
Toledo.....23-9 Elm St.

NO time lost—no heat wasted! Dried pieces are pulled out, more stock shoved in, and the heat turned on again. This Cleveland Tramrail System makes it possible to recharge each of these ovens ten times every day; to empty and reload at two hundred degrees—in less than five minutes. Let our nearest representative show you how Cleveland Tramrail can make similar savings for you.

Cleveland Electric Tramrail
Division of
The Cleveland Crane & Engineering Co.
Wickliffe, Ohio

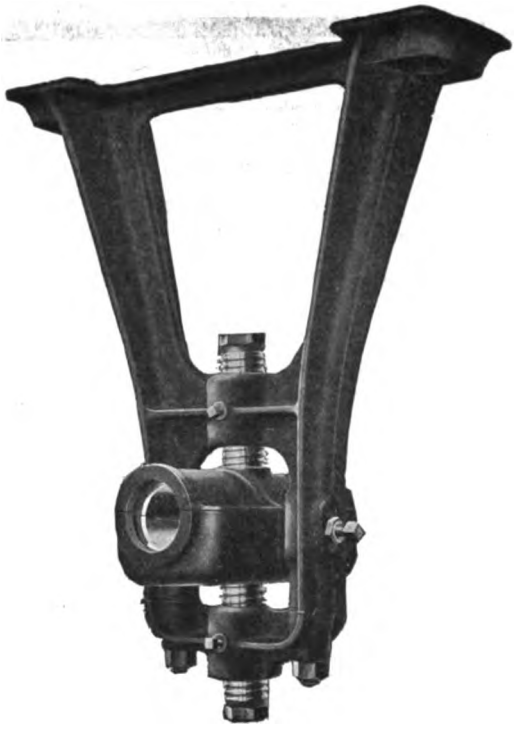
Recording Thermometor Chart taken at random from a large number of similar daily reports. Such an oven record—with so little time required for emptying and refilling—could not be possible without the Cleveland Tramrail System.

Men don't have to wait for the ovens to cool at this plant. They reach in with long bars and bring the warm contents out into the room—push a fresh charge in from the other end of the oven—close the doors and turn on the heat for another run.



CLEVELAND
HAND OR ELECTRIC
TRAMRAIL SYSTEMS

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Founded on the Bed Rock of Quality

TAKING into consideration the long life of a cast iron hanger and pulley, the first cost is negligible. Then why not specify the article with an inbuilt reputation for quality—the T. B. Wood's Sons Company Line of Power Transmission Appliances?



For 69 years T. B. Wood's Sons Company has been manufacturing a quality product that is durable and dependable—a line of power transmission appliances that has established a "high mileage" reputation. In all of those sixty-nine years we have never sacrificed permanent good will for temporary profit—and we never will.

On that next order call in the Wood's Dealer

T. B. WOOD'S SONS COMPANY
Chambersburg, Penn.
New England Branch, Cambridge, Mass.

Southern Office
Greenville, S. C.

Flexible Couplings, Motor Pulleys, Speed Reducers, Cast Iron Pulleys and Hangers, U. G. Automatic Belt Contactor for Short Center Drives.



Clay and Brick Dust Have Not Stopped Them

A COMPLETE installation of Valley Ball Bearing Motors in one of the plants of the Superior Pressed Brick Company, Saint Louis, operates brick machines, compressors, elevators, molds, rollers, hoists, mixers, and other machinery.

In the two years which these motors have been in service, the Company has not lost a minute's production or incurred any maintenance cost for these motors.

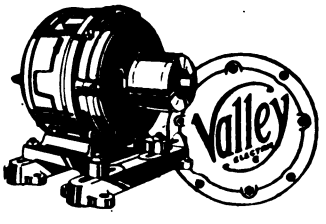
Although these motors are regular stock motors not provided with any special covered housing, the clay and brick dust which fill the air at this plant have not interfered with their performance.

The management does not even bother to blow them out periodically. The only attention which they get is lubrication service.

This is just another demonstration of the fact that the delivery of continuous power with unusual operating economy under adverse conditions is all in the day's work for Valley Ball Bearing Motors.

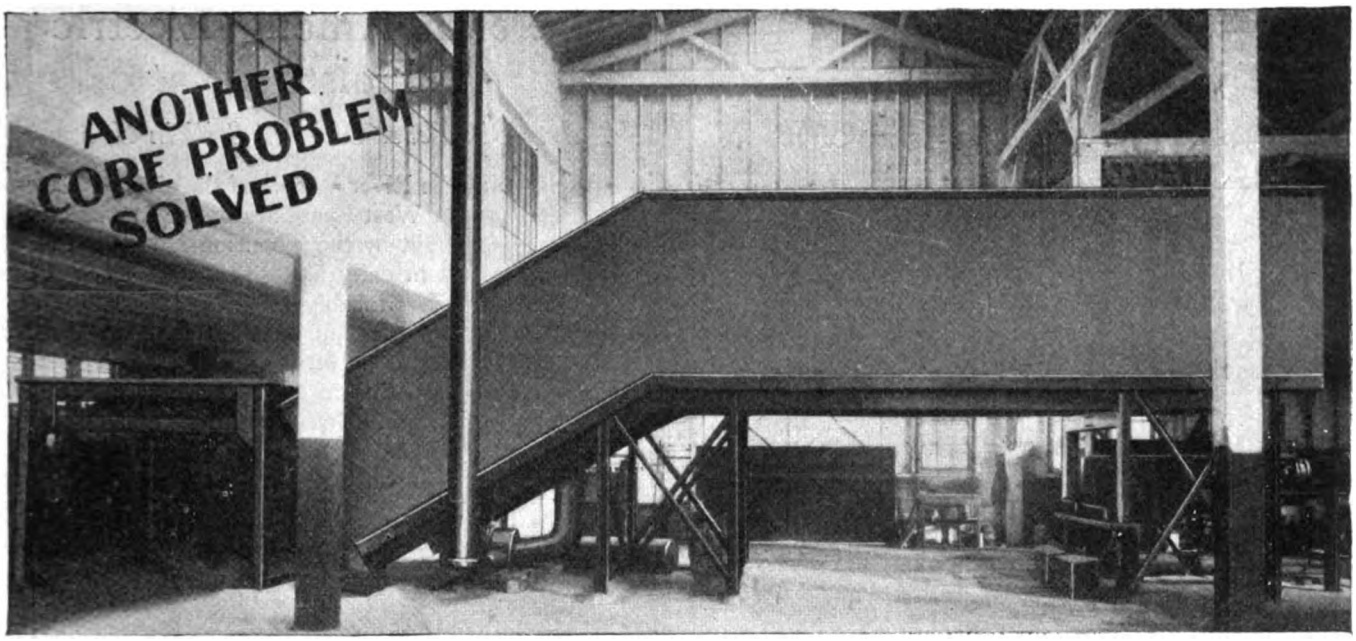
Before you buy or recommend another installation of motors, it will pay you to get all the facts about Valley Ball Bearing Motors. Write for descriptive booklet.

Motor Division
VALLEY ELECTRIC CO., ST. LOUIS, U. S. A.
Branches in Principal Cities



Valley Electric

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PERFECT CORES
at the rate of 400 per hour

for the
EUREKA VACUUM CLEANER CO.

The Eureka Vacuum Cleaner Co. has just installed in the Detroit Plant a new permanent moulding process.

The new process demanded PERFECT CORES.

The new production schedule demanded VOLUME OUTPUT.

An extensive study of core oven performance resulted in the adoption of a Young Brothers Oven. Today one of our continuous conveyor type ovens is turning out the required volume of perfectly formed, durable cores at costs well under the operating budget.

It took a YOUNG BROTHERS OVEN to handle the job

YOUNG BROS. COMPANY
6508 Mack Avenue, Detroit, Michigan

District Sales Offices:

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988 Ellicott Square, Buffalo
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248 Central Bldg., Seattle, Wash.

YOUNG BROS. CO. OVENS — OUR BOLTLESS JOINT — DETROIT

Core and mould baking.
Low temperature heat treating.
Drying.
Japanning and enameling.
Electrical appliance baking.
Adapted to all meth ds of heating.

INDUSTRIAL OVENS

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Keep Up with Today
and Tomorrow will take Care of Itself



HORSES gave way to horsepower when their job became too much for them. In the same way, King Tut's artisans were supplanted, after centuries, by modern drilling machinery; and the drills—even the drills used on the horse car—have long since been relegated to the limbo of useless equipment.

Today's drilling demands are a thousand fold more exacting, and infinitely immense. The tools must do tasks that a few years ago were considered impossible. Only the best can hope to meet these demands. Only the best can keep drilling costs pared down to a par with other improving operations.

But, to serve today's needs, and to meet your own standards, here is CLE-FORGE, backed by world's records in drilling cast iron, machinery steel and armor plate.

CLE-FORGE High Speed Drills are regularly carried in stock by Cleveland dealers everywhere.

The CLEVELAND TWIST DRILL COMPANY CLEVELAND



CLE-FORGE

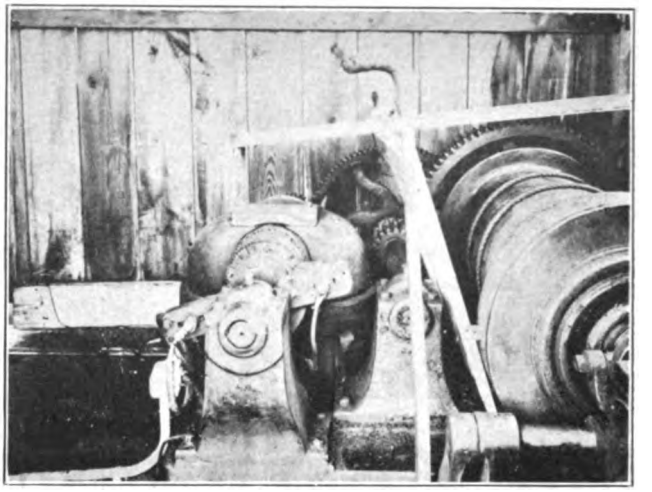
TRADE MARK REG. U. S. PAT. OFF.

A Veteran Among Electric Hoists

Thirty-Six Years Old and Still in Use

ON the dock of the River Works of the General Electric Company at West Lynn, Mass., the first electric hoisting equipment built by the Thomson-Houston Electric Company is still in daily use. This equipment was built in 1889 and was probably the first application of the electric motor to hoisting purposes.

In the fall of 1889 this outfit was on exhibition at the Maritime Exposition in Boston as a notable contribution to the practical application of electric power, and was the subject of much favorable comment. It was in constant service for three years, principally on wharves and docks



in various localities, then it was returned to the factory in exchange for a hoist of greater lifting capacity.

When the River Works was started in 1892, this hoist was installed at the dock and was in daily use for unloading coal, sand, etc., from vessels up to 1917, when it was superseded by a gantry crane. Since then it has been used daily for hoisting the screens which catch seaweed and other material which would otherwise enter and clog the intake for circulating water pumped through the condensers in the power house.

The motor has needed very little attention in the way of repairs, although it has always been housed in a small wooden shed in an exposed location. The armature has been rewound once, the commutator replaced once and one field coil rewound.

BECAUSE of the wide range of business interests directly or indirectly dependent on construction, the course of the industry has been followed with close attention. The possibility of a general over-expansion of activity, followed by an abrupt decline and a collapse of real estate values, has been a source of some anxiety, particularly during the past year. In view of the essentially regional character of building and real estate values, it appears hardly probable that the more dire predictions will be realized.—*The Guaranty Survey.*

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PYOTT POWER WHEELS

GEARS · PULLEYS · SPROCKETS



PYOTT RED FACE PULLEYS

Pyott Pulleys are recognized as standards of perfection. The elements of balance, accuracy, uniformity, true running—which our thirty years of experience have found essential to satisfactory long life power transmission—are as much a requirement of our manufacture as the proper kind of iron.

Plain cast iron pulleys 3″ to 144″ dia.—width to 60″. Tight and loose ball bearing pulleys—greaseless. All painted with "red face" for identification as Pyott.

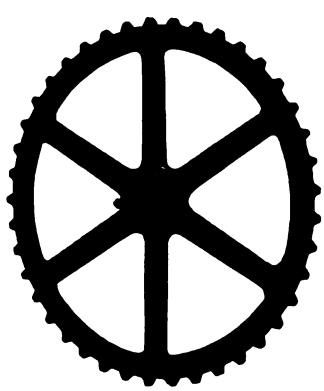
PYOTT GEARS



Pyott Gears for any and all purposes are absolutely accurate and true for both light and heavy duty. Cast, either in Pyott process semi-steel or superior grey iron, they are perfect in shape and material. Our great stock of patterns enables us to fill any order in shortest possible time at no pattern cost to customers.

Spur Gears—Bevel Gears (pairs)—Mitre Gears (pairs). All standard sizes—all standard pitches—all standard face widths—any number of teeth.

SPROCKETS



Tough, semi-steel, carefully cast in accurate and scientifically correct molds insures to Pyott Sprockets a lifetime of good service under even heavy duty. Pyott Sprockets are absolutely accurate, year in and year out. Each sprocket actually tested with its chain before passing inspection.

Sprockets for all standard chains—for every purpose.

FLYWHEELS

From quantity production of staple flywheels for gas engines, pumps, etc., to specially built huge power plant flywheels up to twelve feet in diameter, the Pyott Flywheel is supreme. Realizing the great responsibility of making this vital part of the machine safe and of long life, Pyott Foundry—and every man in it—puts behind every Pyott Flywheel, the full weight of the Pyott reputation for perfection. Again, our vast stock of patterns is at your service to save you expense.



SHEAVES

Accurate, even, true, made as nearly perfect as a quarter century of devotion to one class of work can produce, Pyott Sheaves for every purpose can be depended upon absolutely.

Pyott Power Wheels have made the reputation for "making good" by being made good. If you want better power, specify *Pyott*.

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Protection of your accounts—printing a permanent and unalterable record of the *exact total of working time elapsed,* as well as the beginning and ending of each job—that's the work of Calculagraph.

An "investment" that *saves* money, *earns* money—and Calculagraph goes on saving for you year after year.

Calculagraph is sturdy, durable and foolproof! In design, construction and quality it is *more than equal* to constant daily performance. Though its calculations are made with the utmost sensitive precision, the machine serves for a long hard term.

Send at once for free booklet, "Elapsed Time Records"

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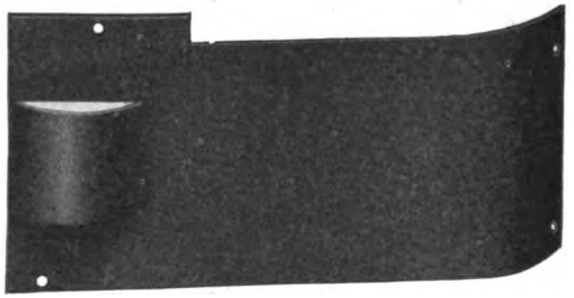
CALCULAGRAPH
The Elapsed Time Recorder

REPLACE CASTINGS
WITH
SHEET METAL PARTS

You will find that in doing so you will be able to assemble quickly, avoid machining, eliminate breakage and defects; sheet metal parts will give you a smoother job and save much in freight bills.

We manufacture anything made in sheet metal up to and including ¼ gauge in

STEEL, IRON, BRASS, COPPER, MONEL METAL, etc.
STAMPING, FORMING, DRAWING, BLANKING, PUNCHING.

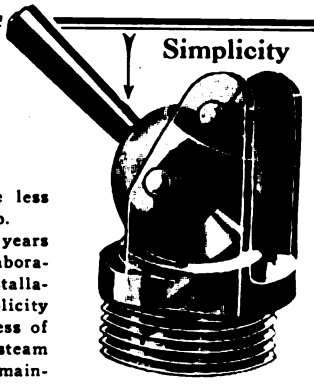


Our Engineering Department will assist you to make your change from castings to sheet metal parts. Send us your pencil sketches or blue prints.

THE BREESE BROS. CO., CINCINNATI, OHIO

See Data A. S. M. E. Condensed Catalog of Mechanical Equipment, also Hendricks, Chemical, Sweets Engineering and Thomas Catalogs.

It's the Valve—
that makes a steam trap



The simpler the valve, the less chance for trouble in the trap.

Here is a valve that after years of rigid tests, both in our laboratory and in actual plant installations, has proved by its simplicity of operation and the ruggedness of construction that it will end steam trap trouble and save big maintenance money.

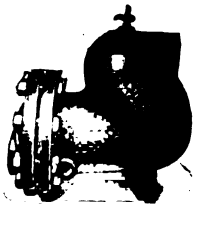
In the Paracoil Steam Trap there is only one moving part—the solid recessed sphere which rotates over the valve seat. Even after long wear this simple construction assures a tight contact.

You can save big money and end steam trap troubles by installing tested Paracoil Steam Traps, which are guaranteed against repairs for two years. Designed for capacity up to 75,000 lbs. per hour and steam pressures from 30 to 200 lbs.

Write for catalog A-12.

DAVIS ENGINEERING CORP.
90 West Street, New York City
Factory: Elizabeth, N. J.

Paracoil
STEAM TRAP



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If you are now handling material with electric trucks you have adopted by all odds the most economical means of transporting your product. But there is yet another important saving you can make, a saving that hinges upon your choice of a storage battery for those trucks.

One sure way to cut the cost of material handling—

Equip your electric industrial trucks with a battery that will give you more speed, power and life, and less expense for repairs, charging and maintenance

THE number of miles your electric vehicles make, the speed with which they cover routes, the days they spend out of service, the amount of charging they require, and the frequency with which you have to renew batteries—these are things that determine how much you pay to handle goods.

These are things, too, that should determine what storage battery goes in the battery box of your electric trucks. For the efficiency of your handling service, and the amount of money it costs you, is directly influenced by the performance of your storage batteries.

That is why manufacturers are more and more analyzing their delivery costs and buying storage batteries on a performance basis. And that is why more and more of these men are standardizing upon Exide-Ironclad Batteries for material handling. Exide-Ironclads have proved to be the make of battery that over a period of years will deliver the most goods, in the quickest time, at the lowest cost.

Why Exide-Ironclads "deliver the goods"

Exide-Ironclad Batteries have many points of superiority—unique features of construction and performance that can best be explained by our personal representatives.

But to sum up briefly, the general advantages of the Exide-Ironclad are these five:

1. *Power*—No matter how steep the grade or how heavy the load, a truck powered by an Exide-Ironclad always moves right along. When there is more work to be done than usual, this battery has the peculiar ability to call on its tremendous reserve power and deliver more power than usual.

2. *Speed*—"Pep," the driver calls it, and pep this battery has—not just in the early morning when freshly charged, but all through the day and right down to the charging plug at night. The reason for the Exide-Ironclad's great stamina is that its voltage remains high throughout its discharge.

3. *Ruggedness*—An Exide-Ironclad is built to stand hard knocks. Rarely if ever does it lose any time out of service. Many companies report that during the entire life of this battery they have no repairs to make.

4. *Long life*—Actual service records show that the Exide-Ironclad Battery gives years of day-in and day-out service.

5. *Low cost*—The low cost of an Exide-Ironclad does not mean price alone—though that is reasonable. It means that the amount of money you pay for this battery, taking into account all factors such as repairs, maintenance, life, etc., is lower than you may expect.

Near you is an Exide branch where are battery specialists, men well qualified to talk over your handling problems with you and make suggestions how you can improve your service. One of these men will gladly call, and without obligation give you the benefit of our long experience in this field.

Or, if you prefer to have complete information about Exide-Ironclad Batteries to study at your leisure, drop us a line and ask for our booklet, "15 Points of Exide-Ironclad."

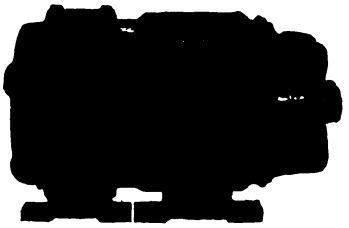
Exide
IRONCLAD
BATTERIES

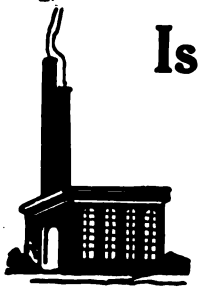
THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

Exide Batteries of Canada, Limited, 153 Dufferin Street, Toronto

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A Battery Charger is as important as your Boiler Room. Both keep the wheels moving.

Is Your Charging Plant Reliable?

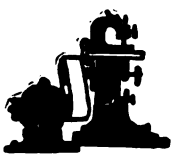
Every hour your hauling equipment is idle costs you money. Batteries must go on charge and off charge like clock work to have your charging equipment operate efficiently.



A reserve of energy is sound management.
A reserve of Charging facilities means sure operation.

Does it operate to meet your requirements?

Peak seasons must be anticipated. Properly planned charging equipment embodies a margin of capacity for safety—facilities to meet extra needs without delay.



Remote Power is Expensive.
Remote Charging is likewise.

Is it convenient in its location?

How much needless time and mileage do you waste in bringing your equipment to a far away charging plant—when it should be departmentized along with your other units of production?



The face that watches the clock produces nothing.
Help that nurses the charger is an unnecessary drag on the payroll.

Does Your Charging Unit Save Current or Waste It?

Unless your method is automatic in operation, unless it is breakdown proof, unless it is flexible in capacity, unless it is convenient to where your equipment is operated—

you can gain new ideas, cost saving suggestions, by writing us for our latest Bulletins on Battery Charging. They are yours for the asking.

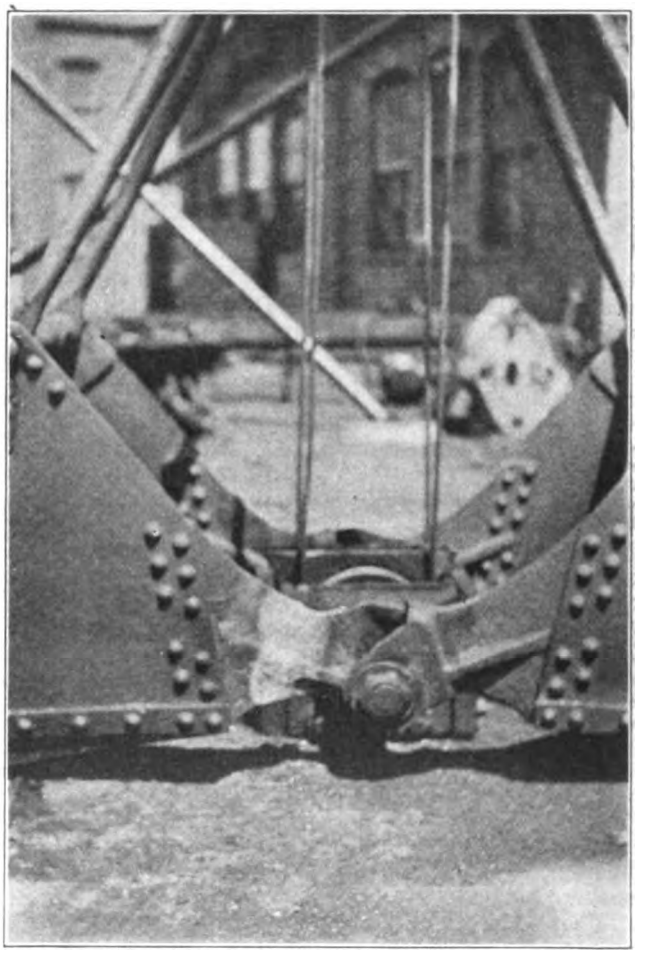
The HERTNER ELECTRIC COMPANY
W. 112 th. Street Cleveland, O. U.S.A.

Saved from the Junk Pile

Repairing a Clam-Shell Bucket on the Job

RIGHT in the middle of an important unloading job at a manufacturing plant, a clam shell bucket was put out of commission with a broken cast steel ear. This tied up the unloading crane and embarrassed the plant considerably, both because it held up the supply of needed material and because demurrage on freight cars was threatened.

It would have taken several days to secure a new part for this bucket and then considerable time would have been required to install it. However, the plant was equipped with oxy-acetylene welding apparatus, which was called upon to repair the piece.



The casting was about ¾-in. thick with a rib through the center. The parts were put in alignment, prepared for welding by cutting out a vee with the oxy-acetylene cutting blowpipe. After carefully cleaning away the slag, the break was then welded. The total time required for this work, including preparation and welding, was about 1½ hours. Within two hours from the time the break occurred, the crane was back at work.

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THE NEW HOME OF THE LAY BROOM



1876—1926

SUPERIOR MERIT of Lay Metal Case Brooms has forced us to increase our manufacturing facilities **SEVEN TIMES IN FIFTY YEARS.**

Progressive manufacturers everywhere recognize the real merit of Lay Brooms and have used them in their plants for years.

The Reasons Why Lay Brooms are used in so many Industrial plants

1. They are designed and built for maximum service—*and they give it.*
2. They are so constructed that the handles cannot come loose—*and they hold their shape till worn to a stub.*
3. They are perfectly balanced on the handle—*and they sweep with ease.*
4. The sweeping tips are wide and flexible—*and they strike the floor at the correct angle.*

For service, satisfaction and economy the Lay Broom has little competition. That is why more than 5,000 progressive manufacturers rely wholly upon Lay for their industrial brooms.

Complete information concerning prices and service upon request.

Sales Offices:
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CLEVELAND 9343 Gorman Ave.
CHICAGO 920 Medinah Bldg.
MILWAUKEE 400 University Bldg.

THE JOSEPH LAY COMPANY, Portland, Indiana

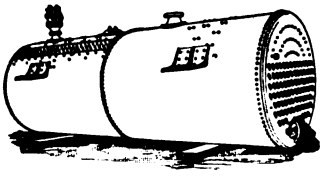
Vertical Water Tube



Steel Cased Setting Increases Efficiency

WICKES Steam Boilers

Ask for Bulletins describing in detail—sent free.



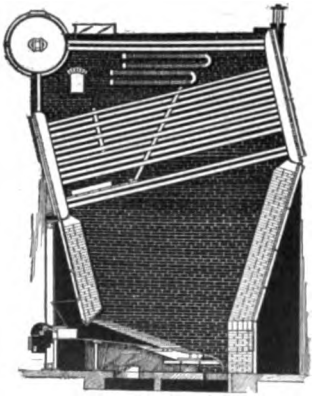
Horizontal Return Tubular

THE WICKES BOILER CO.

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Horizontal Cross Drum Water Tube



The One Joint Header Boiler.

MEN WANTED

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AN opportunity for men who have sold to industrial plants or for others with a knowledge of plant practices who are looking for the chance to become salesmen. Positions open in industrial centers and good territories will be assigned. Earnings are unlimited and good future for men who make good.

The work consists of selling subscriptions for one of the best known publications in the industrial field. A magazine published for 35 years with an enviable reputation for its service to industrial executives. Men who can give only a part of their time will also be considered. Write giving an outline of your experience. Address box 535, Care INDUSTRIAL MANAGEMENT, 120 West 32nd Street, New York.

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This Chicago Automatic Conveyor in Your Plant



Price $490.00

An adjustable wheelframe, ball bearing, three-phase motor including conductor cord plugs and receptacle or 3 H.P. gasoline engine with clutch.

Will Cost You Less than $1.00 per week

If you get labor for less than that, then you don't need this Chicago Automatic 24′ Conveyor. But we know of no place in the world where work can be performed for as low a cost as this.

The Chicago Automatic will last at least ten years. This is proven by performance records. Based on the price, therefore, the conveyor will cost $49.00 per year or less than $1.00 per week.

Let us prove this to you.

Made in belt and bucket type.

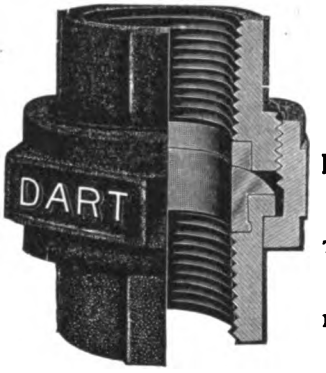
Chicago Automatic Conveyor Co.
982 Old Colony Bldg., Chicago, Ill.

Storing coal direct from car with a Chicago Automatic Conveyor



The Unions that Assure Steam Power Economy

There is no reason why you should have any waste steam in your plant, which means higher costs and lower efficiency. Dart Unions eliminate all losses due to leaky unions. They are absolutely steam tight. They are guaranteed because of the bronze to bronze seat rings machined to a true ball joint and properly ground together with oil and corundum. Adapted for both high and low pressure. Brigg's Standard pipe thread. They are easy to fit and require no packing.



A sample sent on request

E. M. DART MFG. CO.
Providence, R. I.

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THE FAIRBANKS CO.
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DART UNION CO., Ltd.
Toronto, Can.

THOMPSON'S HACK SAW BLADES

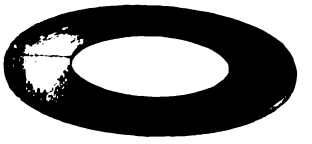


"MILFORD" Brand—All hard tungsten steel for cutting solids such as tool steel, rails, etc.



THE WAVY SET BLADE

"MIL FLEX" Brand—The Wavy set blade Soft-back tungsten steel practically unbreakable, for cutting pipe, BX, Sheets, Conduit, etc.



THOMPSON'S Flexible Back Band Saws for cutting Metals.

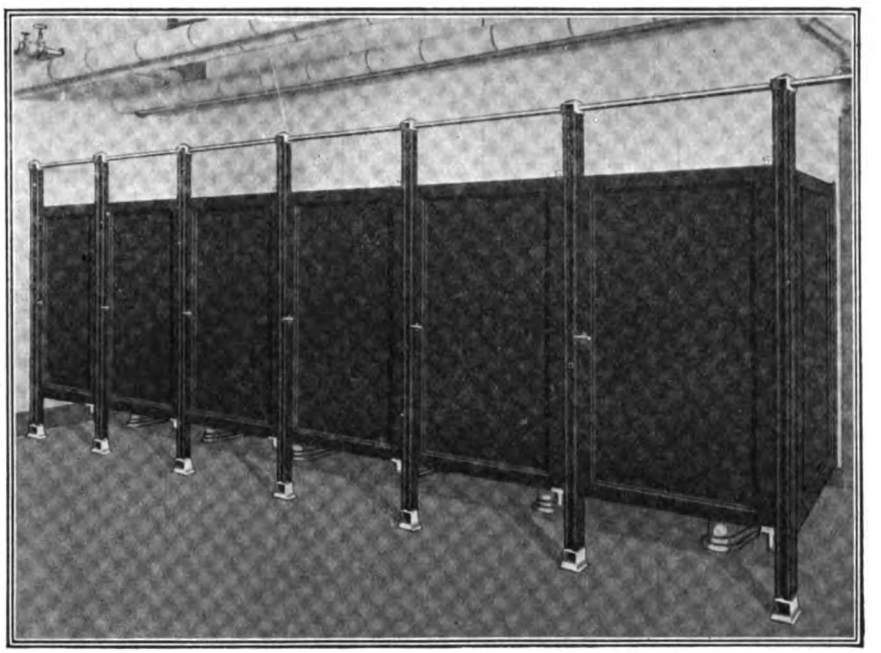
Sample band or hack saw blade sent on request.

— Manufactured by —

The Henry G. Thompson & Son Company
ESTABLISHED 1876
New Haven, Conn., U.S.A.

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A Standard Type of Industrial Toilet

Metal Is a Stubborn Fighter

YOU know how severe are service conditions in the average shop toilet. Indifferent, slam-bang treatment may put wood partitions in a down-at-the-heels, unsanitary, unsightly condition. But *metal* will stand up and fight—hard knocks and abuse make little impression on it.

Most people, when they say metal, think of Sanymetal, which exemplifies all that is strong, staunch, and clean in the way of a metal partition.

Sanymetal Products are: Partitions for toilets, showers, dressing rooms, urinals. Partitions for offices and factories. Metal doors, screens and wainscot. Sanymetal Gravity Roller Hinges for toilet doors. Write for latest Bulletins.

The Sanymetal Products Co., 1710 Urbana Rd., Cleveland, O.

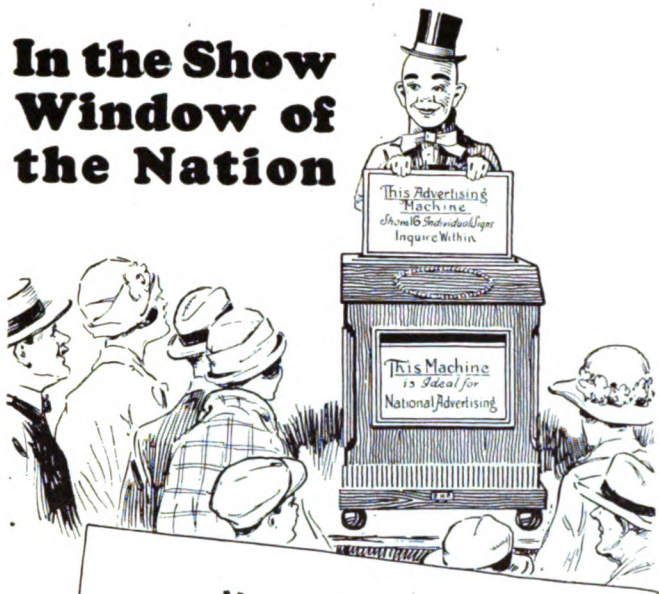
TRADE MARK U.S. REG.

Sanymetal

Toilet and Office Partitions

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In the Show Window of the Nation



NORMANDIE IMPORT CO.
Human Electric Show Figures
and Novelties
1194 BROADWAY
Hotel Breslin
NEW YORK

Wisconsin Electric Co.,
Racine, Wis.
Gentlemen:

We are very grateful to have made your acquaintance. We tried a number of motors without satisfaction. It was not until we got in touch with your representative, who showed us all the courtesy one could expect, by furnishing us sample motors to try out, that we found you could make for us a universal motor, which just fills the bill.

It is about two years since we have started using these motors, and as you know, by your record, we have used an immense quantity of them, and we must say that we have never had occasion to make a complaint to you about a single motor. Under the circumstances, we feel it our duty to let you know of this, as we feel that we are obligated to you to a great extent in furthering our business.

Very truly yours,
NORMANDIE IMPORT CO.

J Wolf

YOU have undoubtedly seen this clever little advertising figure in some dealer's window. But perhaps you did not know that behind those life-like movements hummed a sturdy little Dumore motor.

No installation is so unusual, no requirement so exacting, but what a Dumore will do the work better, and more dependably.

Maybe our Engineering Department can be of service to you in working out your small motor problems. Just write or wire—our experience is yours for the asking.

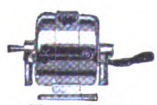
Wisconsin Electric Company
70 Sixteenth Street - Racine, Wis.

DUMORE
Fractional H.P. Motors


Type D


No. 3GM—Stripped

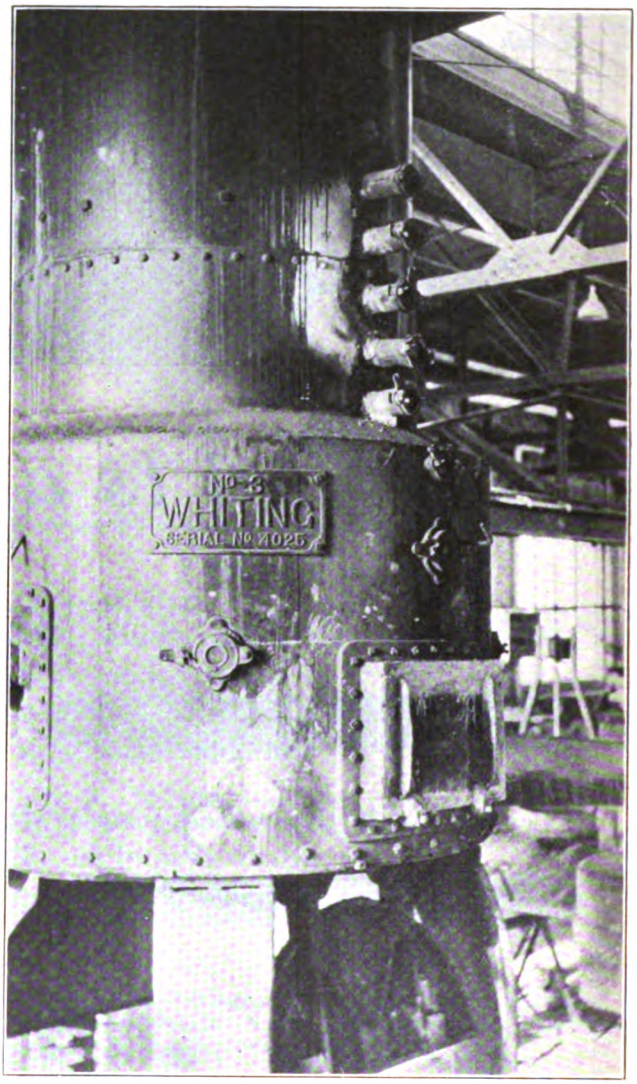

Type A—Stripped


Type SAX

They Watch the Iron Melt in This Cupola

By Donald A. Hampson

AFTER fuel and metals are put into a foundry cupola, the process of melting goes on practically unwatched. The metal charge is made up according to analysis or the kind of castings to be poured and the introduction of large volumes of air makes it possible for the coke to melt eight to ten times its weight in metal. Combustion and melting take place—presumably—according to certain theories but it is impossible to prove these because they take place entirely out of sight.



Whether or not the foundry is getting the most out of its charge, the best iron that the cupola can produce, and if the materials are charged (or placed) inside to best advantage is something that can only be judged—very indirectly—from the castings that are made. The zone of maximum combustion is assumed to be a certain distance above the wind belt and the bed is regulated vertically to put the melting in this zone, without actually knowing that an arbitrary height is the best one for the particular cupola.

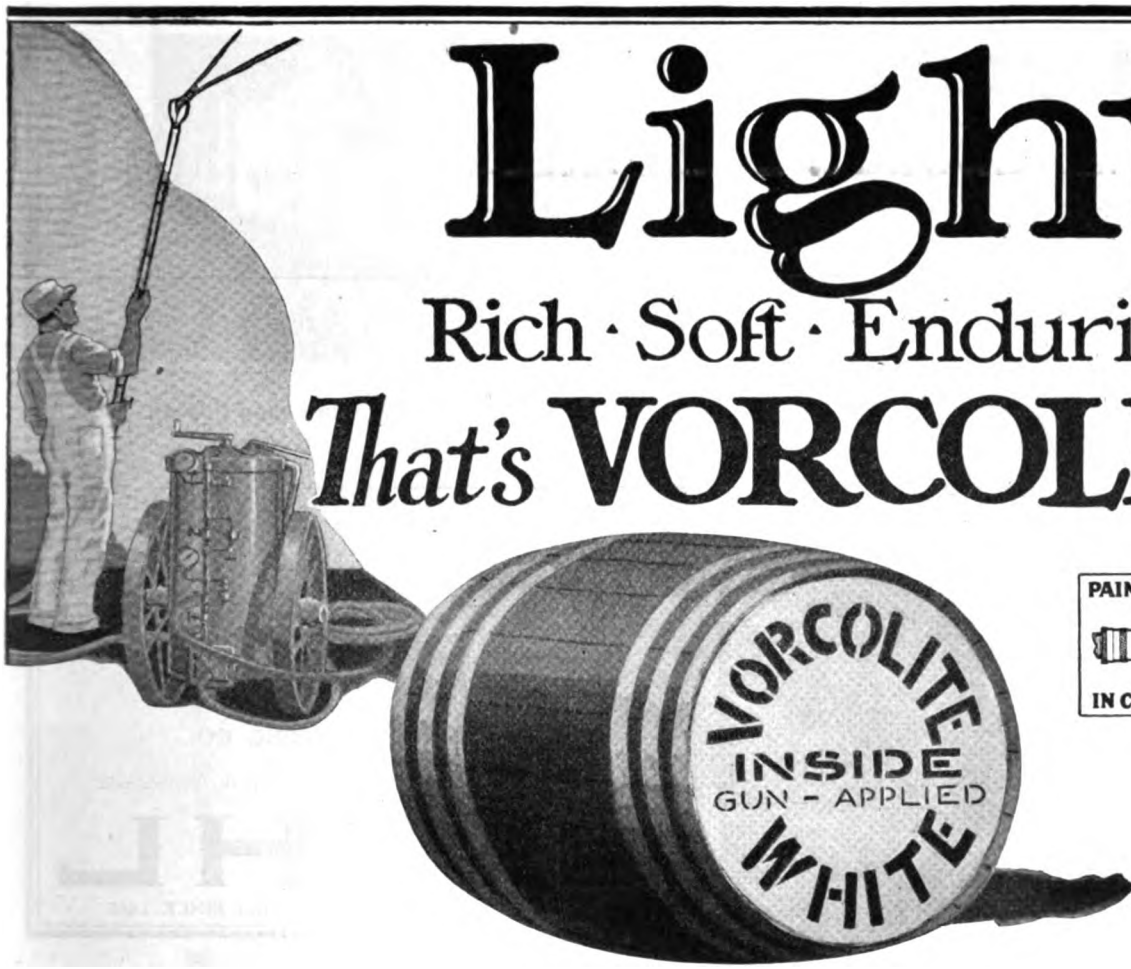
One foundry took the trouble to find out how their cupola practice compared with theoretical ideas and to

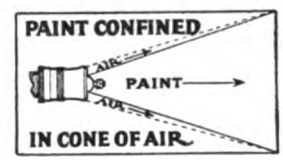
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Light

Rich · Soft · Enduring

That's VORCOLITE





WHEN you paint with Vorcolite, you paint for clean, enduring whiteness that multiplies your working light, makes for alert, contented workers and greater production.

Vorcolite is a Flat White of the finest ingredients and proven merit. Free alike from gloss and from chalkiness, its dense, crystalline surface diffuses the light and avoids dazzling reflection and sharp confusing shadows.

The richly pigmented paint body of Vorcolite covers effectually in one application with the Vortex Painter equipment. It holds its color and texture long after inferior paints have yellowed or disintegrated. Vorcolite and the Vortex Painter are co-ordinated in the

VORTEX PAINTING METHOD

used only in the maintenance painting of large surfaces.

Vortex Painting Follows Through. Our concern for your complete satisfaction does not end until the paint is actually on the wall. We furnish without cost the Vortex Painter, a trouble-proof, high speed paint gun. Your own unskilled labor, with this equipment can do a better, quicker and more convenient paint job than a whole squad of hand painters.

Painting Costs Reduced. With a paint of the finest quality, Vortex Painting cuts costs below what many concerns pay for inferior paint on the wall. Application is often less than 10 per cent of the total cost, when you use the Vortex Painter, loaned for use with Vortex Paints.

Dirty Walls Mean Waste. Thousands of hours are rendered non-productive in a dark shop. Workmen become dissatisfied and quit. You owe it to yourself and your concern to enjoy the efficiency, economy, satisfaction and high output that result from Vorcolited walls. Write today to

THE VORTEX MANUFACTURING COMPANY
1979 West 77th Street, Cleveland, Ohio

Use this coupon to learn more about the Vortex proposition

The VORTEX MANUFACTURING CO.
1979 West 77th Street, Cleveland

We are interested in Vortex Painting for work of approximately .....square feet.

Interior or exterior..... Color.....

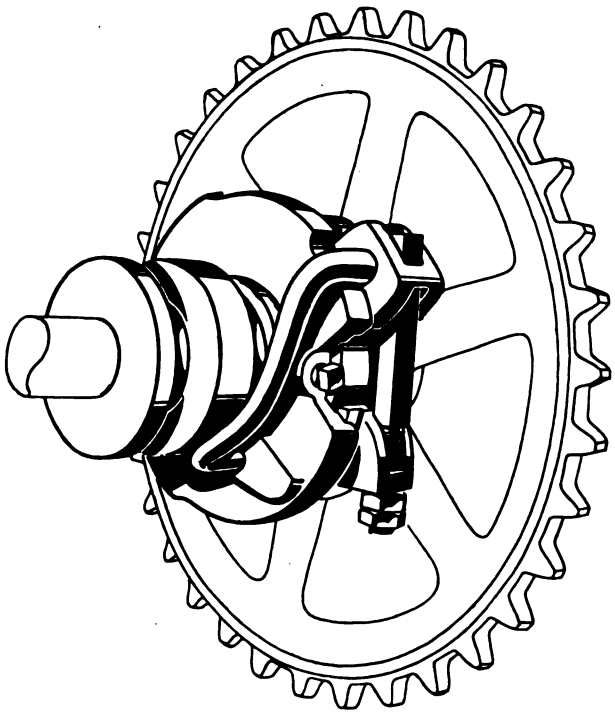
Name.....

Address.....

Attention of.....

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Hard Boiled!



Any clutch that keeps company with a sprocket wheel is a "tough bird." It spends its precious hours and days, around the shipyards, on the dredge-boats, in the mines, along the roads and in the lumber camps. It communicates intimately and frequently with such base things as, sand, gravel, coal, logs, wreckage, junk, concrete, ashes, rock, dirt, pipe lines, etc. It "bums around" with the "gas house gang," the arrogant Scandinavian, the important negro and the disgruntled Slav who operate and neglect such mechanical brutes as Steam Shovels, Wagon Loaders, Trench Diggers, Conveyors, Hoists, Dredges, Oil Well Machinery, Rolling mills, Mixers and rock crushers.

Yes—the CONWAY CLUTCH is a BRUTE for work and a glutton for punishment. But in its makeup is every scintilla of refinement and care that an ingenious engineering corps, and a company of highly skilled and painstaking manufacturing personnel can bestow upon it.

Its full floating friction band, one point adjustment, easy engagement, quick release; its enormous power transmission capability and its free and complete idling, come from the Engineering department. Its efficient functioning and long life under the most exasperating conditions, result chiefly from accurate workmanship.

It's simple, and it's good. We believe you are looking for it. We invite you to become acquainted. Send us your letter head, and we will mail you Bulletin No. 35, and a letter asking some questions about your starting and stopping.

THE CONWAY CLUTCH CO.

1960 Riverside **Cincinnati, Ohio**



Diehl Exhaust Fan in Large Boston General Office Building

A large industrial concern installed 12 Diehl Exhaust Fans, of from 18 to 42 inches, fan sizes, in their general office building. The office workers are assured a never failing supply of clean, fresh air. Safeguard the health of your workers, by keeping the rooms and buildings well ventilated. Diehl Exhaust Fans are easy to install, economical and quiet in operation and efficient in results produced.

Send for descriptive bulletins—now.

DIEHL MANUFACTURING CO.
ELIZABETH, N. J.
Atlanta Boston Chicago Detroit New York Philadelphia

DIEHL

BUILDERS OF FANS AND MOTORS SINCE 1888

In what condition is your copy of

Emerson's

"Twelve Principles of Efficiency?"

Worn out from constant use? Borrowed by somebody, and never returned? Or have you just put off the privilege of owning a copy at all?

In either case use this coupon. You should by all means have a copy handy for reference. The oftener you dip into it, the stronger will be your grip on the fundamentals of Good Management, which lie at the basis of all business success, all economical production, all lowering of costs, all boosting of profits, all satisfactory human relations.

It is the great Management Classic which has helped thousands of men to improve their knack of directing men, machines and methods to the most enduring economical advantage. It will be sent to you for your FREE EXAMINATION.

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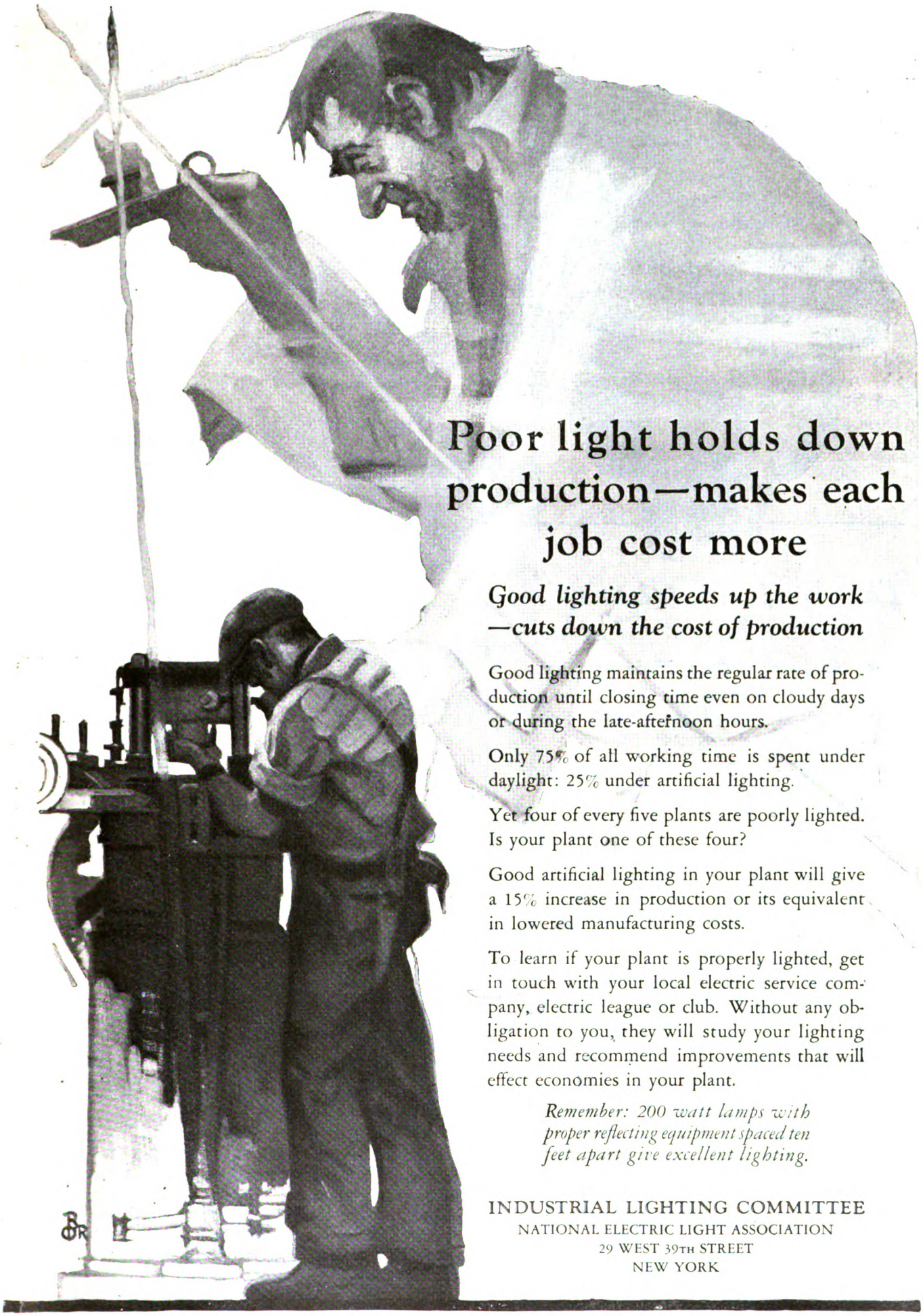
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Poor light holds down production—makes each job cost more

Good lighting speeds up the work —cuts down the cost of production

Good lighting maintains the regular rate of production until closing time even on cloudy days or during the late-afternoon hours.

Only 75% of all working time is spent under daylight: 25% under artificial lighting.

Yet four of every five plants are poorly lighted. Is your plant one of these four?

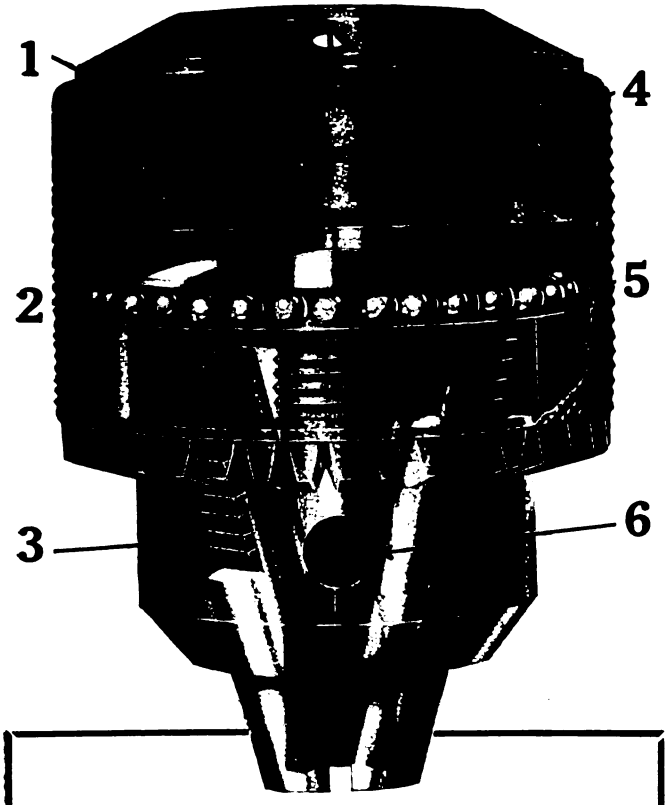
Good artificial lighting in your plant will give a 15% increase in production or its equivalent in lowered manufacturing costs.

To learn if your plant is properly lighted, get in touch with your local electric service company, electric league or club. Without any obligation to you, they will study your lighting needs and recommend improvements that will effect economies in your plant.

Remember: 200 watt lamps with proper reflecting equipment spaced ten feet apart give excellent lighting.

INDUSTRIAL LIGHTING COMMITTEE
NATIONAL ELECTRIC LIGHT ASSOCIATION
29 WEST 39TH STREET
NEW YORK

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The Built in Quality of Jacobs Super Chucks

1 Ground Arbor Hole—Greater Accuracy

2 Ball Bearing—Eliminates Friction

3 Coarse Pitch 90° thread—Rapid Action, Greater Strength

4 Design of Body — Decreases Weight

5 Threaded Plug—Readily Removable

6 Body Deeply Case hardened—Reduces wear

And then in addition, all Jacobs Chucks are carefully made and rigidly inspected. Jacobs Chucks and Arbors are moderately priced, considering their quality. Securely packed in neat boxes. Ask your dealer for the New Jacobs Super Chuck.

THE JACOBS MANUFACTURING CO.
Hartford, Conn.

The World's Largest Producers of "Drill Chucks"

do that they adopted the novel plan of providing means to see right inside the cupola where the iron was supposed to be melting. As may be noted from the illustration, they put six tubes in a line at one side of the cupola and welded them fast to the shell—the outer end of these is closed with a cap having mica windows and the interior extends inward to the refractory lining. Of course the metal of the tube could not extend through the firebrick lining and last very long, so they use refractory shells to round out the openings that have been cut through the firebrick and these are luted with clay when the inside of the cupola is patched.

This gives a clear passageway for vision into the mass which is being melted. The inner ends of the refractory tubes are set so they project about an inch inside the cupola lining which has the effect of keeping the tubes free of obstructions. In practice, these passages keep themselves clear until the last end of the heat when there is little or no weight on the mass from above and the air blast then blows cinders and larger pieces of coke about promiscuously.

These peeps into the cupola remove all doubt as to what is going on. They include a vertical height of nearly three feet where the most important work of all goes on. What works well in one cupola may be wholly wrong in another and this plan enables the foundry to settle positively such things as:

Whether the height of their bed charge is correct;
If the subsequent charges of metal and fuel are too thick or thin;
When the slag begins to form;
Quality and action of the slag;
If the scrap, pig, and steel of each charge are placed in best order for melting;
Condition of metals when melting;
In what part of the cupola melting seems slowest;
Where and when some stoppage or "bridging" occurs;
The relative flames from different cokes;
The way in which some metals melt, in contrast to others, and the practical value of this in producing castings.

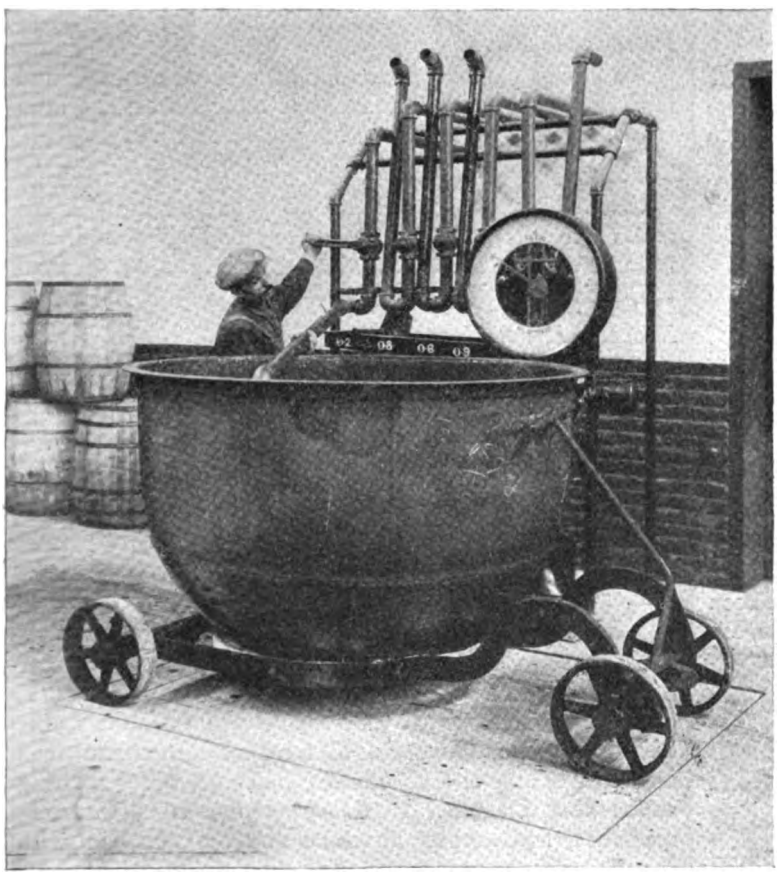
Through these openings, it has been learned that steel melts in a different way from iron, dripping off from the edge very early in its appearance in the combustion zone while the iron carries well down without losing its shape, then suddenly collapses. This has resulted in some changes in their mode of charging, which heretofore had been "standard."

THE principal feature of commodity price movements this year has been the exceptional stability of the general level. The wholesale price index of the Bureau of Labor Statistics has covered a range of only six points, as against twelve last year and nine in 1923. There has been no consistent trend. The high mark of 161 per cent. of the 1913 average was reached in February, and the low of 155 three months later. The index advanced again to 160 in July and remained at that point for three months, then declined to 158 in October and November.—*The Guaranty Survey.*

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TOLEDO SCALES

NO SPRINGS HONEST WEIGHT



THOUSANDS of manufacturers are measuring their materials on Toledo Scales today for the same reasons that they are manufacturing their products with modern production machinery.

For in the weighing and counting of materials and commodities, Toledo Scales automatically eliminate those risky manual and mental operations which, with less modern equipment, are an unavoidable part of every weighing operation.

Toledo Scales produce accurate weight totals *automatically*. The operator merely puts on the load and reads the weight or count in plain figures on a great dial from five to seven feet in circumference.

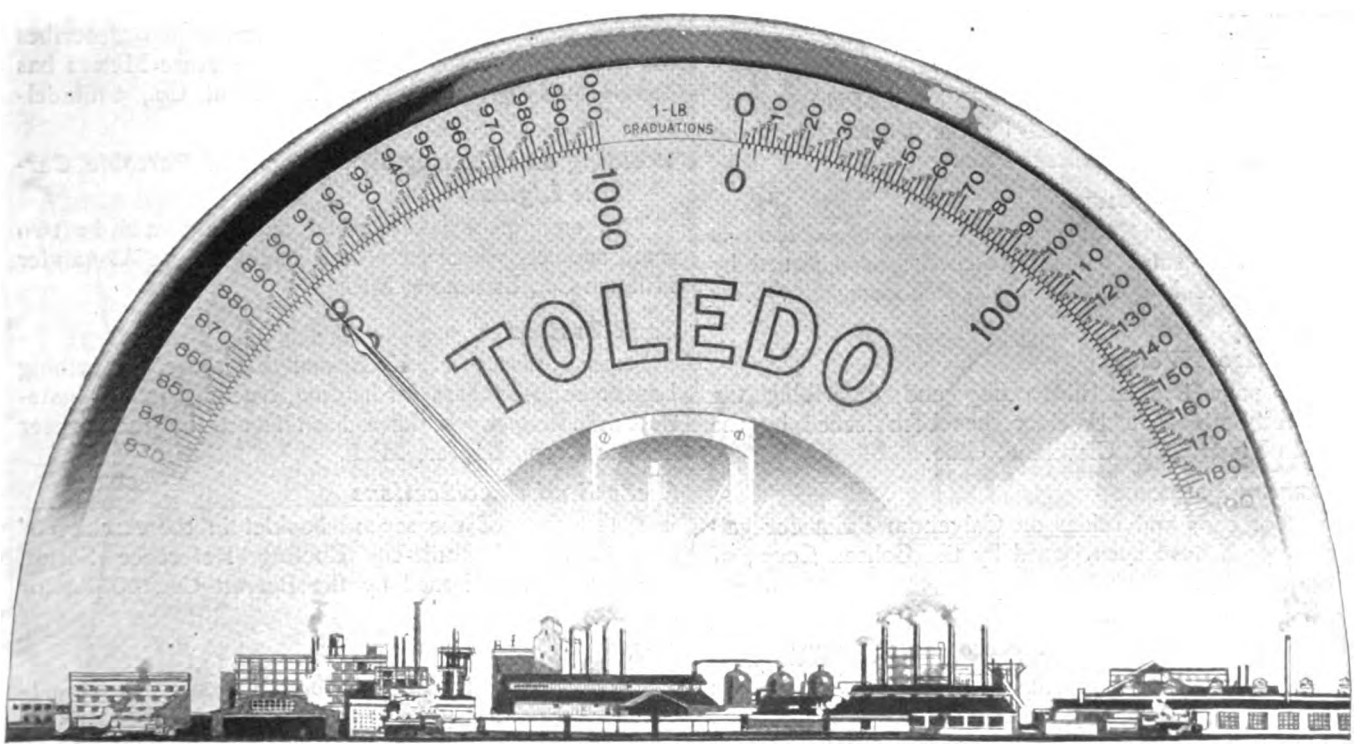
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Manufacturers' Bulletins and Catalogs

Helpful new literature for the man who selects and directs industrial equipment

Hand Lift Truck

The new Cowan Blue Streak type "L" Light Duty Hand Lift Truck is described in the second issue of the house organ which is being issued by the Cowan Truck Co., Holyoke, Mass.

"The Story of Link-Belt"

is the title of Book No. 545, which tells about the development of the conveying machinery business which started with the invention of the Ewart Detachable Link-Belt fifty years ago. In commemoration of its fiftieth anniversary this book has been issued by the Link-Belt Co., of Chicago, Ill.

Switchboards and Capacitors

Booklet No. 87000-E, containing 120 pages of illustrations and description of the installation, operation and maintenance of switchboards, has been issued by the General Electric Co., Schenectady, N. Y. Another booklet issued is GEA-77, which contains 24 pages of illustrations and description of Capacitors for Power-Factor Correction.

Level and Pressure Instruments

An illustrated folder describing Republic Electrical Level and Pressure Indicators and Recorders, has been issued by the Republic Flow Meters Co., of Chicago, Ill.

Gas and Vapor Scrubbers

Tracyfier Gas and Vapor Scrubbers are illustrated and described in a folder which has been issued by the Andrews-Bradshaw Co., 530 Fourth Ave., Pittsburgh, Pa. A reprint has been issued by this company of a paper read before the National Electric Light Association by Roger W. Andrews, the title of which is "The Physical Side of Concentration in Boilers."

Ball and Roller Bearings

Two 19-page booklets, which describe and illustrate "Hoffmann" Precision Roller Bearings and "Norma" Precision Ball Bearings of the open and closed types, respectively, have been issued by the Norma-Hoffmann Bearings Corp., of Stamford, Conn.

Vapor Heating System

The Gorton Single Pipe Vapor Heating System is described in a small booklet which has been issued by the Gorton & Lidgerwood Co., 96 Liberty St., New York, N. Y.

"Stable-Arc" Welder

A 23-page booklet illustrating and describing the Lincoln "Stable-Arc" Welder, has been issued by the Lincoln Electric Co., Cleveland, Ohio.

Galvanum Paint

A color card and folder on Galvanum Paint for galvanized iron have been issued by the Goheen Corp., of Newark, N. J.

Wick Feed Oil Cups

Two circulars describing the "Shurflo" Wick Feed Oil Cups and the Airspring Compressed Air Grease Cups have been issued by the Hunter Pressed Steel Co., of Lansdale, Pa.

Hinges

Catalog No. 42, containing 25 pages of illustrations and description of Special Purpose Hinges, has been issued by the Richards-Wilcox Mfg. Co., Aurora, Ill.

Renewable Fuses

An 8-page pamphlet describing the ferrule contact and knife-blade contact "Union" Renewable Fuses, has been issued by the Chicago Fuse Mfg. Co., of Chicago, Ill.

Tractors

Catalog No. 26, containing 32 pages of illustrations and description of Mead-Morrison "55" Tractors, has been issued by the Mead-Morrison Mfg. Co., of Boston, Mass.

Electric Rivet Heaters

and Shop Appliances are described and illustrated in a 16-page booklet, which has been issued by the American Hoist & Derrick Co., St. Paul, Minn.

Belted Synchronous Motors

Bulletin No. 812, which describes and illustrates Belted Synchronous Motors has been issued by the Electric Machinery Mfg. Co., Minneapolis, Minn.

Automatic Feed, Billing, Accounting and Writing Machines

Several profusely illustrated booklets have been issued by the Elliott-Fisher Co., 342 Madison Ave., New York, on the machines which they manufacture; namely, the double barrel automatic feed machine, automatic feed machine, billing and accounting machine, order writing and billing machine, Ideal and Universal accounting machines, bookkeeping machine and the machine with the flat-writing surface.

Electric CO_2 Meters

A 16-page booklet, which illustrates and describes the Electric CO_2 and Flue Gas Temperature Meters has been issued by the Brown Instrument Co., Philadelphia, Pa.

Welding and Cutting Apparatus and Portable Carbide Lights

This equipment is described and illustrated in two small booklets which have been issued by the Alexander Milburn Co., Baltimore, Md.

Semi-Trailers

Several pieces of illustrated literature, describing Lapeer Semi-Trailers for hauling, trucking and all materials handling work, have been issued by the Lapeer Trailer Corp., Lapeer, Mich.

Steep Roof Specifications

is the subject of the second booklet in the Architects' and Engineers' Built-Up Roofing Reference Series, which are being issued by the Barrett Co., 40 Rector St., New York.

Belt Fasteners

An illustrated folder describing Crescent Belt Fasteners has been issued by the Crescent Belt Fastener Co., 247 Park Ave., New York.

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THE U. S. Line of electrically driven machine tools has the distinction of being the oldest and broadest in the world.

It comprises Portable Electric Drills; Screw Drivers and Nut Setters; Surface Grinders 6", 8", 10", 12"; Combination Grinders and Polishers; Ball Bearing Grinders, 12", 14", 16", 18"; Buffing, Polishing and Tire Roughing Machines, Heavy Duty Ball Bearing Grinders.

Write for Catalog No. 22.



The Grinder That *Saves* Its Cost in One Year

Made by the Makers of the World-known U. S. Portable Electric DRILLS



"They Make Light Work of Heavy Jobs"

HOW? Simple enough. By a patented arrangement, the speed of the grinding wheel as it wears down is automatically increased so that the peripheral speed of the wheel is kept constant, regardless of decreased diameter. The saving in wheel cost alone is sufficient reason for installing this machine. Investigate!

THE UNITED STATES ELECTRICAL TOOL COMPANY
CINCINNATI, OHIO, U. S. A.
Oldest Builder of Portable Electric Drills in the World

FOREIGN AGENTS: Fenwick-Freres & Co., Paris, France; Thomas-Robinson & Son, Rochdale, England; Andrews & George Co., Tokyo, Japan; C. M. Goodall & Co., Ltd., Sydney, N. S. W., Australia; Westinghouse Elec. International Co., Buenos Aires, Argentine; D. Drury & Co., Ltd., Johannesburg, Duman and Cape Town, Africa.

U. S. Drills are Serviced through the Service Stations of the Westinghouse Electric Manufacturing Company at—

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Mercury

[This is No. 1 of a series]

Let's "think straight" about Factory Trucking—

If your power unit *pulls trains*—instead of *carrying a single load*—it does more work and earns more money for you—doesn't it?

No argument here!

The simple principle briefly stated above is the foundation of the Mercury business. After eleven years experience we are still building "tractors and trailers"—*to the exclusion of all other types of trucking equipment.* And—the kernel in the nut is, that our business is increasing nicely every year.

There must be something to it!

Note — To Interested Executives

The back-bone of the Mercury sales organization is composed of men who have been with us from the start. They know "tractors and trailers" and the way to use them.

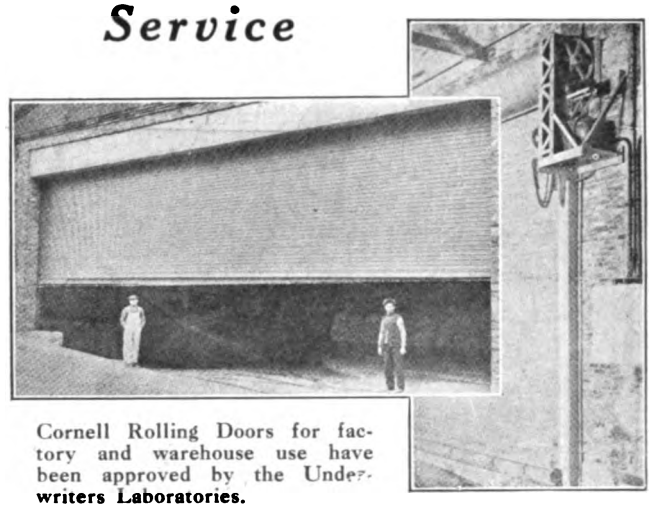
If a Mercury Sales-Engineer says—"*it can be done*"—he will back up his recommendation with an actual demonstration in your plant.

Just ask us to send a bulletin
— no salesman will call.

Mercury Manufacturing Company
4112 So. Halsted St. Chicago, U. S. A.

Tractors and Trailers

A Record of 58 Years' Service



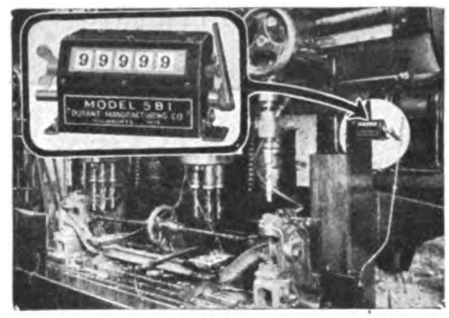
Cornell Rolling Doors for factory and warehouse use have been approved by the Underwriters Laboratories.

But not only are they safe, they are also the most economical. They last for years. Some Cornell Doors have been in use 58 years and still good for more years of service.

Let us give you the facts about rolling doors and why they are the best in the long run.

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Established 1846
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CORNELL ROLLING DOORS



Producimeter applied to Multiple Spindle Drill Press

Cut Down Waste!

Waste cuts sharply into profits. A dependable means of reducing waste—in time, men, and machines—is an accurate count of the output of each machine, each operator, daily and monthly.

Productimeters at each production unit tell you at a glance what is being done.

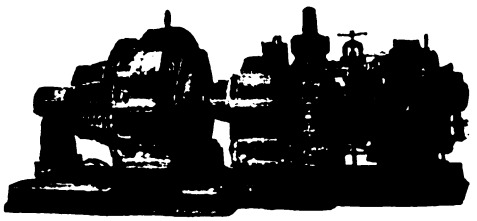
Send for the Productimeter Catalog and facts on how to use them for better production records.



DURANT Manufacturing Company
608 Buffum St., Milwaukee, Wis.

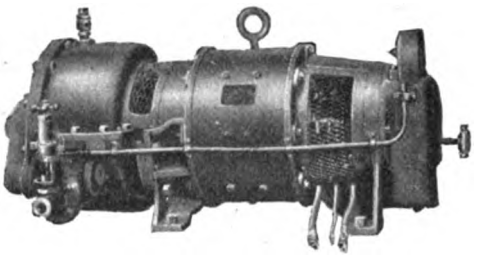
The Productimeter
The Speedometer of Industry

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Geared Turbine-Generator Unit

One of a line of reliable and efficient non-condensing, geared units, in capacities ranging from 25 to 750 kw. direct current and 30 to 1,000 kw. alternating current. Suitable for main or auxiliary purposes—and particularly when clean exhaust steam is required for heating or manufacturing purposes. The steam does not come into contact with oil.



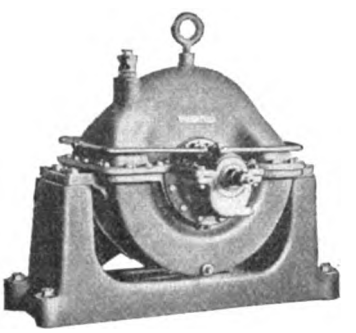
Small D-C Turbine-Generator Unit

5 to 15 kw., direct-connected. Ideal for lighting small industrial plants and for general outdoor construction work. Also for excitation purposes and locomotive crane magnets.



1½ kw. Turbine-Generator Unit

A high-grade small, non-condensing unit for oil well rigs, steam shovels, general outdoor construction work, marine service, and the like. Unusually simple and rugged in design.



Mechanical Drive Turbines

A notable line possessing among others the following important features: (1) Center line supports which keep the shaft in alignment under all temperature conditions. (2) Water-sealed glands.

Small Turbines with a Big Pedigree

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You'd consider carefully the reputation and experience of the maker, if you were buying the largest turbine in the world. Do that likewise when it comes to small turbines and turbine-generator units.

Whatever your need, you will find it met in the diversified line of Westinghouse small turbines. Right now Westinghouse is building the world's largest turbine-generator unit; it will not surpass the ones shown above, however, in care of manufacture or in the proven engineering experience which it represents.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
EAST PITTSBURGH, PA.
Sales Offices in All Principal Cities of the United States and Foreign Countries

Westinghouse

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Readers' Guide to Profitable Equipment

Practical Helps for Mill and Factory Managers

The Booklet, "Getting the Drop on Competition," contains some valuable information on saving time and increasing production. See page 6. McCaskey Register Co.

How to Save on Loading Costs is shown on page 33, by the Link Belt Co.

A Booklet Describing the New Ruboid Wheel that gives more resiliency to industrial trucks is offered by the Bassick Company. See page 71.

A Book Entitled "Methods of Cutting Metal," giving useful information of handling heavy, tough metal cutting jobs, can be obtained from Simonds Saw and Steel Co. See page 82.

Details of the Ettco Keyless Drill Chuck can be seen on Inside Front Cover, Eastern Tube and Tool Company, Inc.

A 30-Day Trial on a Factory Signal Siren can be obtained from the Sterling Fire Alarm Company, Inc. See page 70.

Bulletin No. 30 Describes the New Type Dump Body for Ford Trucks as well as the complete line of industrial railway equipment. See page 54. Easton Car & Construction Co.

Information on Lighting Fixtures, adjustable for any operation, is given in the catalog offered by the American Fixture Company. See page 87.

Free Bulletins on Air Filtration System is offered on page 77. Reed Air Filter Company.

Interchangeability of Parts Is a New Idea in Motor Manufacturing by the Master Electric Co. See page 75.

An Application of Cleveland Tramrail System to Heating Furnaces is shown on page 89 by the Cleveland Crane & Engineering Company.

Coatings that Cut Down Upkeep on Rod, Floors and Walls. Choice of samples offered by L. Sonneborn Sons, Inc. See page 63.

A National Organization for Accurate Speed Variation. See list of representatives. Page 87. Reeves Pulley Co.

An Economical Method of Handling Scrap is shown on page 116 by the McMyler Interstate Co.

A 30-Day Test Is Offered on an Industrial Fire Fighter. See page 54. The Oil Conservation Engineering Co.

A Solution to Industrial Lighting Problems solved by the Reelite. See page 79. Appleton Electric Co.

"Hitting the High Spots" is the title of a book which shows ways to cut grinding costs. For a copy see pages 57-100. Wisconsin Electric Co.

A Lift Truck Platform that Results in 50% Speedier Handling is described on page 86. Barrett-Cravens Company.

C-100 is a Descriptive Booklet Offered by the Edwin L. Wiegand Company and describes heating strips for every industrial purpose. See page 119.

End Grain Wood Wheels for Trucks used in industrial building is described on page 50 by the Metzger Company, Inc.

Catalog on the Various Types of Chain Hoists is offered by the Wright Manufacturing Company. See page 87.

Five Very Interesting Bulletins on Boiler Room Economies are offered by The Wickes Boiler Co. See page 97.

The New Plant of the Joseph Lay Company Makers of Brooms for Industrial Use is described on page 97.

Description of the Hallowell Platform is given on page 117. Standard Pressed Steel Company.

Catalog 43 Issued by the Medart Company affords a simple method of concentrating transmission machinery purchases. See page 38.

Literature on the Industrial Gasoline Locomotive can be obtained from The Fate-Root-Heath Company. See page 113.

The Advantages of Timken Tapered Roller Bearings on Belt Conveyor is shown on page 5.

The Industrial Truck Built Like a Motor Truck. See description of this on page 43. The Yale & Towne Mfg. Co.

A Catalog Describing Cocheco Belting, a high quality transmission belting is offered by the I. B. Williams & Sons, on page 37.

The Productimetor Catalog Describes Counting Machines which aid in speeding up production. For a copy see page 108. Durant Manufacturing Co.

A Condensed Handy Catalog and Price List showing the complete line of Chucks and Arbors is now ready for mailing by The Jacobs Mfg. Co. See page 104.

The "Merrick Catalog" shows how bulk materials can be weighed while conveyor handled. The Merrick Scale Co., page 2.

Catalog and Price Lists on Steam Unions that prevent loss of steam, can be obtained from the E. M. Dart Mfg. Company. See page 98.

A 62-Page Catalog Describing the Various Types of Scales, that indicate weights, while material is on the move, is offered by The American Kron Scale Co. See page 111.

Small Turbines and Turbine-Generator Sets are illustrated on page 109. Westinghouse Electric & Mfg. Co.

An Installation of Baker Electric Trucks and Tractors is described on page 70 by the Baker-Raulang Company formerly Baker R. & L. Co.

Grinding Machines for Internal, External, Surface, Thread and Extra-deep-hole Grinding. J. E. Gilbert Grinder Company. Page 56.

The Aid Given to Manufacturers in the Use of Fractional H. P. Motors is described on pages 57-100. Wisconsin Electric Co.

The Latest System in Watchclocks. Literature describing this system is offered by Detex Watchclock Corp. See page 70.

A New Development in Factory Seating. See page 85. Do/More Chair Co.

Descriptive Bulletins on Industrial Paints can be had by writing to the Nitrose Company. See page 85.

Pyott Red Face Pulleys, Gears, Sprockets, Flywheels, and Sheaves are illustrated and described on page 93. Pyott Foundry Co.

An Analysis of Belt Requirements and Uses is made in an interesting booklet, offered by the Chas. A. Schieren Company. See page 64.

"15 Points of Exide-Ironclad" is the title of a booklet on Storage Battery information. See page 95. The Electric Storage Battery Co., Philadelphia.

A Book Showing How the T-Rail Has Cut Handling Costs. Offered by the Armington Engineering Co. See page 44.

Consultation Service on Forced Draft, Ventilation, Air Conditioning and Heating. See page 65. American Blower Co.

Illustrated Catalog Describing Compact, Sturdy, Steam Engine for many industrial purposes is offered by the Troy Engine & Machine Co. See page 45.

Coal Handling Economy, possible whether handling five or five hundred tons, is shown on page 49 by Gifford-Wood Company.

Sanitation plus Good Appearance is the theme of Sanymetal Products Company advertisement, page 99. Bulletins offered.

A 30-Day Trial Offer on the Federal Electric Siren is offered on page 88 by the Federal Electric Company.

A Paint Specially Made for Industrial Use. See pages 60-61. American Asphalt Paint Co.

The Solution to Your Paint Problem. See pages 60-61. American Asphalt Paint Co.

A Paint Made Expressly for Galvanized Iron is described on Inside Back Cover by Goheen Corp.

A Booklet Entitled, "Saving Slippage and Space," contains facts on the use of short center drive. For a copy see page 74. F. L. Smidth & Co.

A Folder, "Choosing the Locomotive for the Industrial Plant," can be obtained from Davenport Locomotive Works. See page 68.

High Speed Drills for high speed production. See page 92. The Cleveland Twist Drill Co.

A Detail Description of the New Air Circuit Breaker for Alternating Current. See page 8. The Cutter Company.

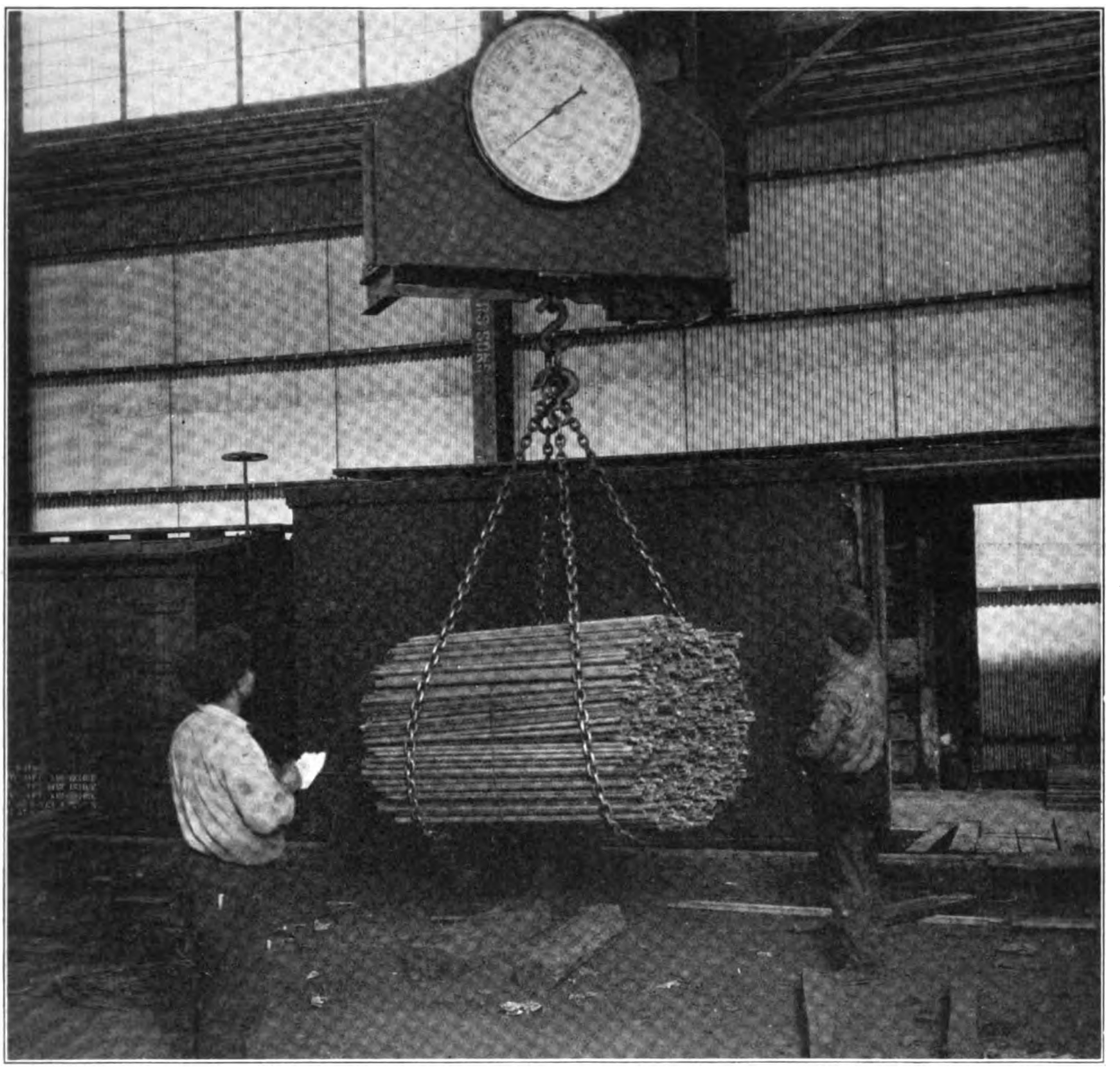
Eliminating Dust, Filings, Lint, etc., from Workrooms as a means towards industrial efficiency is described on page 84 by Invincible Vacuum Cleaner Manufacturing Company.

An Interesting Illustrated Folder describing a well made pressed steel shaft hanger and other transmission pulleys,

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KRON SCALES

Weigh it While You Move



The Calumet Steel Company, Chicago Heights, Illinois, have eliminated all weighing troubles, errors, etc., since installing this KRON SCALE.

"We couldn't get along without Kron Scales," says L. H. Hook, Works Manager. With these scales attached to the crane they can pick up, weigh and load steel into freight cars, all in one operation.

Kron Scales will weigh anything instantly, accurately and automatically. Remarkably simple in construction—no weights to juggle—no beams—no springs. Simply load and look.

Write for a copy of our 62 page catalog describing all the various types.

KRON SCALES

The American Kron Scale Co.

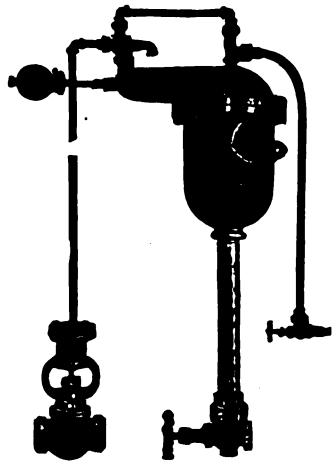
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VIGILANT
Feed
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REGULATOR



No Floats
No Tubes
No Diaphragms
to get out
of order

The action of the Vigilant is entirely automatic and the operation is very simple because it works by gravity. It eliminates the dependence on the human factor, which has been the cause of most boiler explosions.

Let one of our engineers show you how simple it is to insure your boiler room against explosions and how easy it is to keep the water level in your boilers at the point required at all times.

Write for information.

The Chaplin-Fulton Mfg. Co.
28 Penn Ave., Pittsburgh, Pa.



And Now the Type "R"
the Strong, Powerful ROEPER Hoist with the fewest Parts

Light in weight, but substantial and highly efficient is this ROEPER Type "R" Hoist. It has very few parts. Spur Gear and Worm Driven, with the difficulty of adjustment between worm and gear eliminated.

It has a totally enclosed Dust Proof Frame and all parts automatically lubricated.

Capacities 500 to 4000 lbs., inclusive. Write for complete description.

ROEPER CRANE & HOIST WORKS, Inc.
1728 N. 10th St., Reading, Pa.
TRAVELING CRANES ELECTRIC HOISTS TROLLEYS

hangers, etc., can be obtained from the American Pulley Company. See page 114.

Catalog No. 26 Is a Clear Exposition of Present Day Speed Reduction Practices. See page 40. W. A. Jones Foundry & Machine Co.

Catalog No. 860 Illustrates and Describes Applications of Fans and Blowers for every kind of work. See page 52 Buffalo Forge Company.

"Elapsed Time Records," is a booklet containing interesting data on time keeping problems. Free on request. The Calculagraph Co. Page 94.

Catalog on Boiler Feed Water Regulators. .See page 112. Chaplin-Fulton Co.

Sheet Metal Stamping. The service offered by The Breese Bros. Co. See page 94.

Illustrated Folder and Prices on steel platforms, boxes, etc., is described on page 116. The Powell Pressed Steel Co.

A Steam Trap on 30 Days' Free Trial. .Also booklet R-260, which describes the new Number 9 Sarco Steam Trap. See page 75. Sarco Company, Inc.

Catalog Describing the Paracoil Steam Trap with the new patented valve, is shown on page 94. Davis Engineering Company.

Service Bulletins on Charging and Upkeep of Electric Trucks and Tractors are now being distributed by The Hertner Electric Company. Page 96.

Descriptive Booklet Describing Valley Ball Bearing Motors can be obtained from the Valley Electric Company. Page 90.

A Quality Line of Quality Transmission Appliances is shown on page 90. T. B. Wood's Sons Company.

Booklets Describing Temperature Control is offered by Taylor Instrument Companies. See page 115.

Fire-Proof Oily Waste Cans are illustrated and described on page 66. The Witt Cornice Company.

Another Example of the S. K. F. Certified Campaign Against Friction is given on page 4. S. K. F. Industries, Inc.

Catalog No. 22 Describes the United States Electric Tool Company line of Adjustable Speed Grinders. See page 107.

A Belt Lacer, extremely tough, durable, and pliant is shown on pages 80-81, by the Clipper Belt Lacer Company.

The Application of Ball Bearing Boxes to Fans and Blowers is described on page 83. The Fafnir Ball Bearing Co.

Write for a Copy of the Free Book, "Saving from 40% to 60% of Handling Costs." Cowan Truck Co. See page 53.

Bulletins Describing the Construction, Method of Operation and Service of their Heating Pumps are offered by the Nash Engineering Co. See page 10.

Bulletin 35 Describes a Clutch which is adaptable and standardized for many various machines. See page 102, Conway Clutch Company.

An Improved Oven for Cores is featured by Young Brothers Company on page 91.

The Advantages of the Stuebing Truck is very interestingly described on page 73. Stuebing Truck Co.

Bulletins on Various Pneumatic Conveying and Dust Collecting Systems are offered by The Dust Recovering and Conveying Co. See page 26.

The Value of Good Lighting in Industry is shown on page 103 by the Industrial Lighting Committee of the National Electric Light Association.

The Seven Reasons Why Parker Vises Excell. See page 42.

Information on Alloid Steel Boxes and Lift Truck Platforms. See page 3. Truscon Steel Co.

Neilson Survey No. 31 shows some interesting facts on savings effected with low pressure oil burners installed on annealing furnaces. See page 76. Hauck Manufacturing Company.

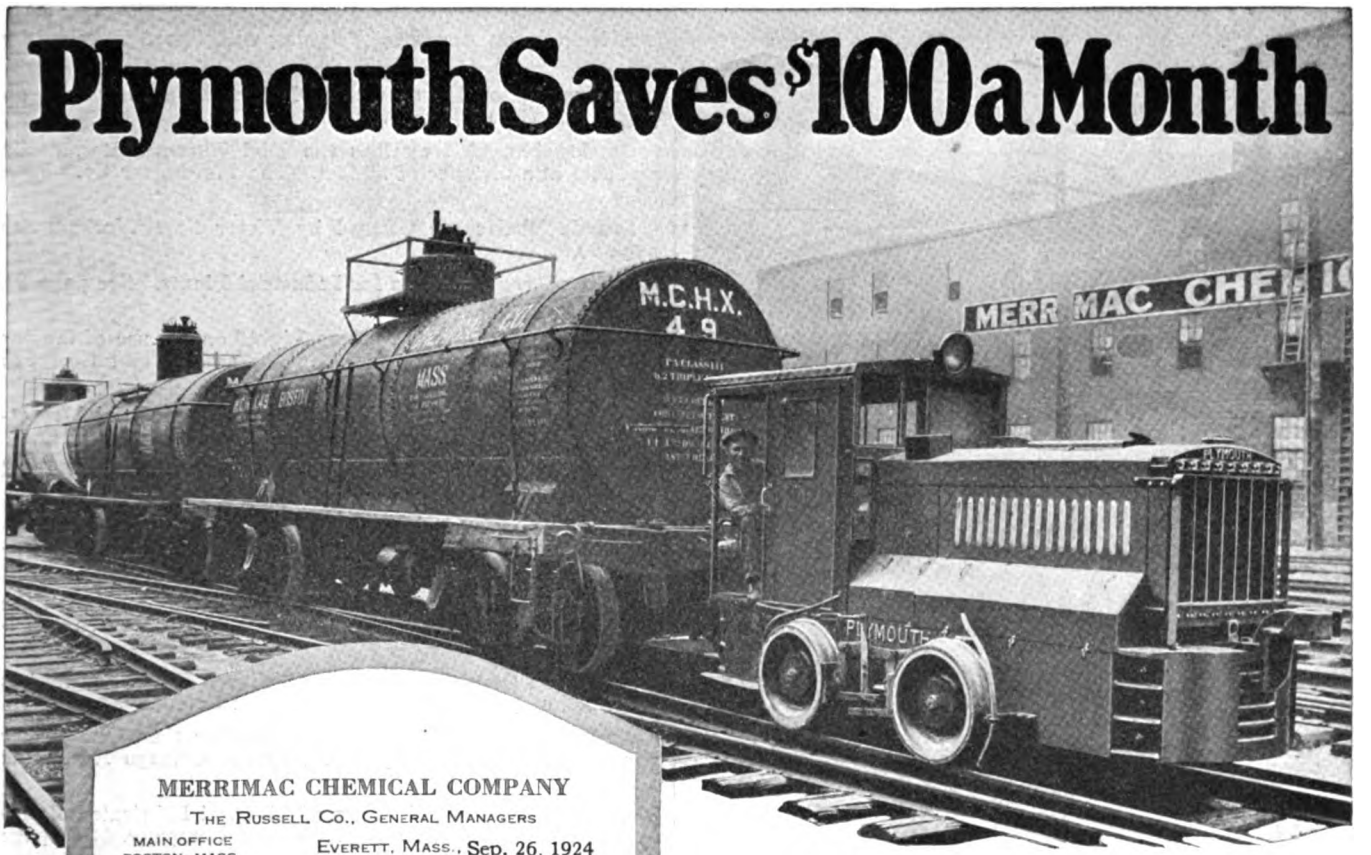
A 120-Page Catalog on the choice of adjustable Pipe Hangers. Grinnell Company. Page 32.

The Use of Angular Tab Guides is described in a booklet entitled, "Eliminate Wastes." For a copy see page 55. Globe-Wernicke Co.

Catalog Number 50 Illustrates and Describes the Complete Line of Everedy Electric Hoists, Reading Multiple Gear

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THE RUSSELL CO., GENERAL MANAGERS

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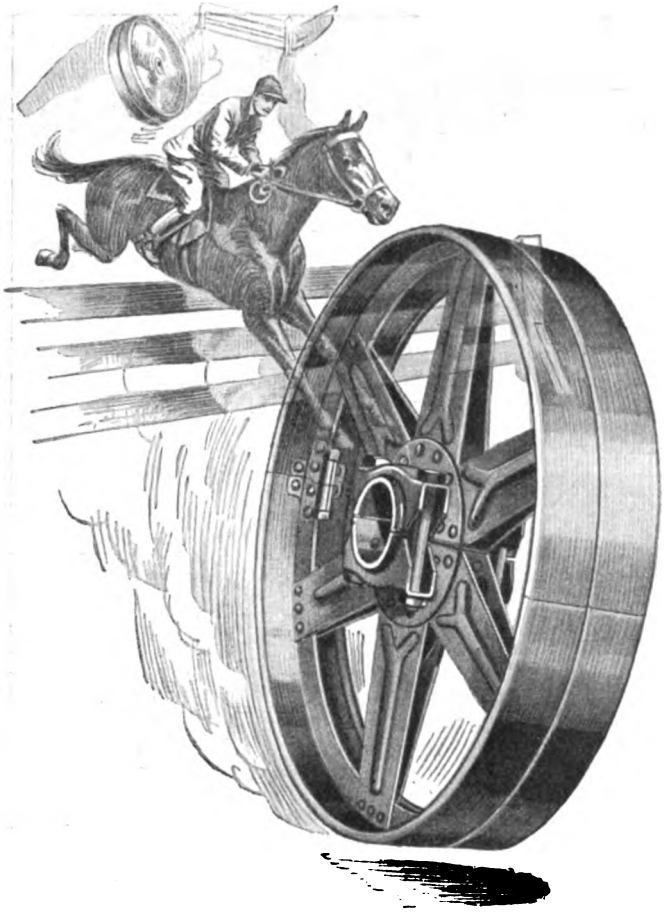
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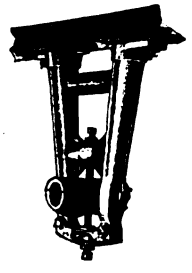
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Chain Blocks, Cranes and Trolleys. Write to Reading Chain & Block Corp. See page 54.

A Bulletin on Accurate Weighing with Speed is issued by the Fairbanks Co. See page 78.

An Installation Photograph of Rolling Doors is shown on page 108. Cornell Iron Works.

Catalog No. 10 Describes the Dial Thermometer, easily readable at a distance of 20 feet. The Motometer Co. Page 72.

Sample Blades are Offered by Victor Saw Works. See page 90.

Sliding Door Problems for Industrial Plants. See page 25. Richards-Wilcox Mfg. Co.

An Illustrated Booklet, "More Light" on the use of factory paint is offered by the U. S. Gutta Percha Paint Co. See page 9.

Information on Electric Hoists for All Industrial Departments. Roeper Crane & Hoist Works, Inc. See page 112.

A Catalog Giving Some Valuable Suggestions is offered by Durand Steel Locker Co. See page 36.

A Free Trial Offer on Five Gallons of Skybryte and a Skybryte Brush. For coupon see page 62. The Skybryte Company.

A Description of the N-E Type Crane—the crane with the two low girders is described on page 85 by Northern Engineering Works.

An Apron Conveyor that Puts Delivery Dates Forward is described on page 120 by the Chain Belt Company.

An Automatic Conveyor that Costs Less than One Dollar per Week, is shown on page 98, by the Chicago Automatic Conveyor Co.

Complete Details and Prices of All-Steel Fabricated Buildings can be obtained from Blaw-Knox Company. See page 39.

An Economical Method of Painting Plant Interiors and Exteriors is shown on page 101. The Vortex Manufacturing Co.

Descriptive Bulletins on Exhaust Fans. See page 102. Diehl Manufacturing Co.

Bulletin No. 83 Describes a Novel Application of Electric Lift Trucks. For a copy see page 30. The Elwell-Parker Electric Co.

A Bulletin on Special Purpose Trucks for Industrial Use. Handles Skids 15 feet long, 6,000 lbs. capacity is shown on page 56. The Lakewood Engineering Co.

Descriptive Circulars Illustrating Steel Fabricated Building for every industrial requirement can be obtained from the Matin Steel Products Co. See page 116.

The New Features of the Electric Traveling Crane is described in literature offered by The Shepard Electric Crane & Hoist Co. See Back Cover.

Roller Bearings Applied to Hand Lift Trucks. See page 7. Hyatt Roller Bearing Co.

The Quick Installation Feature of the Split Lineshaft Roller Bearing is illustrated on page 31. Hyatt Roller Bearing Co.

One of the Various Industrial Uses of Dow Conveyors is shown on page 1 by the Logan Co.

An Electric Motor for the Hard Jobs. See page 69. Howell Electric Motors Co.

Descriptive Literature Showing the Steel Hangers with exclusive features. See page 117. Standard Pressed Steel Co.

Catalog on Equipment for Checking Time and Production. See page 56. Henry Kastens.

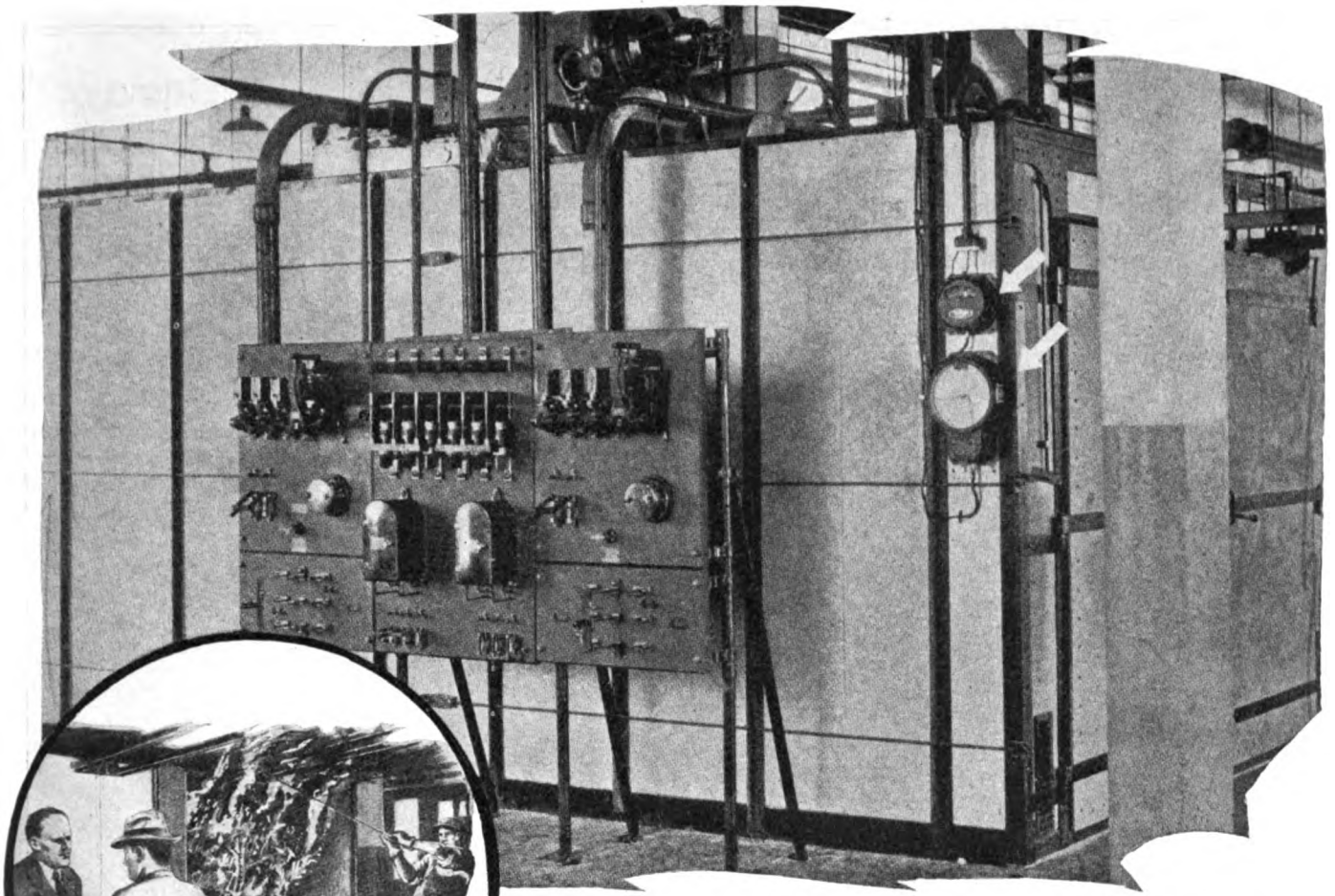
Sample Band on Hack Saw Blades sent on request. See page 98. The Henry G. Thompson & Son Company.

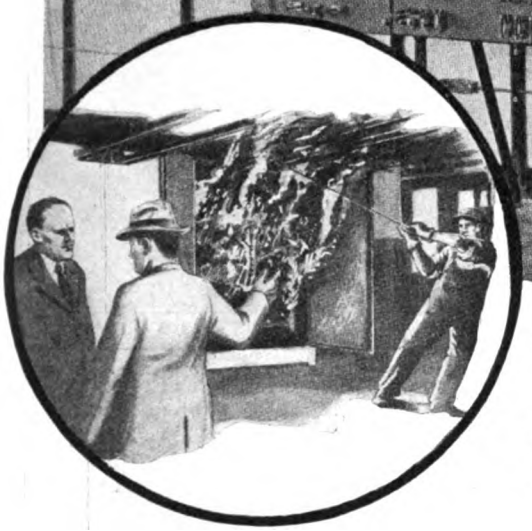
Booklet Entitled, "The Measurement of Material" is offered by the Toledo Scale Co. Page 105.

Catalog and Specifications on Electric and Hand Power Types of Cranes can be obtained from the Whiting Corp. See page 97.

Illustrations Describing the Economical Handling of Materials from one machine or group of machines to another is shown on page 67. The Jeffrey Manufacturing Co.

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BELOW are a few products whose makers have written us telling in detail how Tycos Temperature Control has prevented spoilage and in many instances telling how much money was saved.

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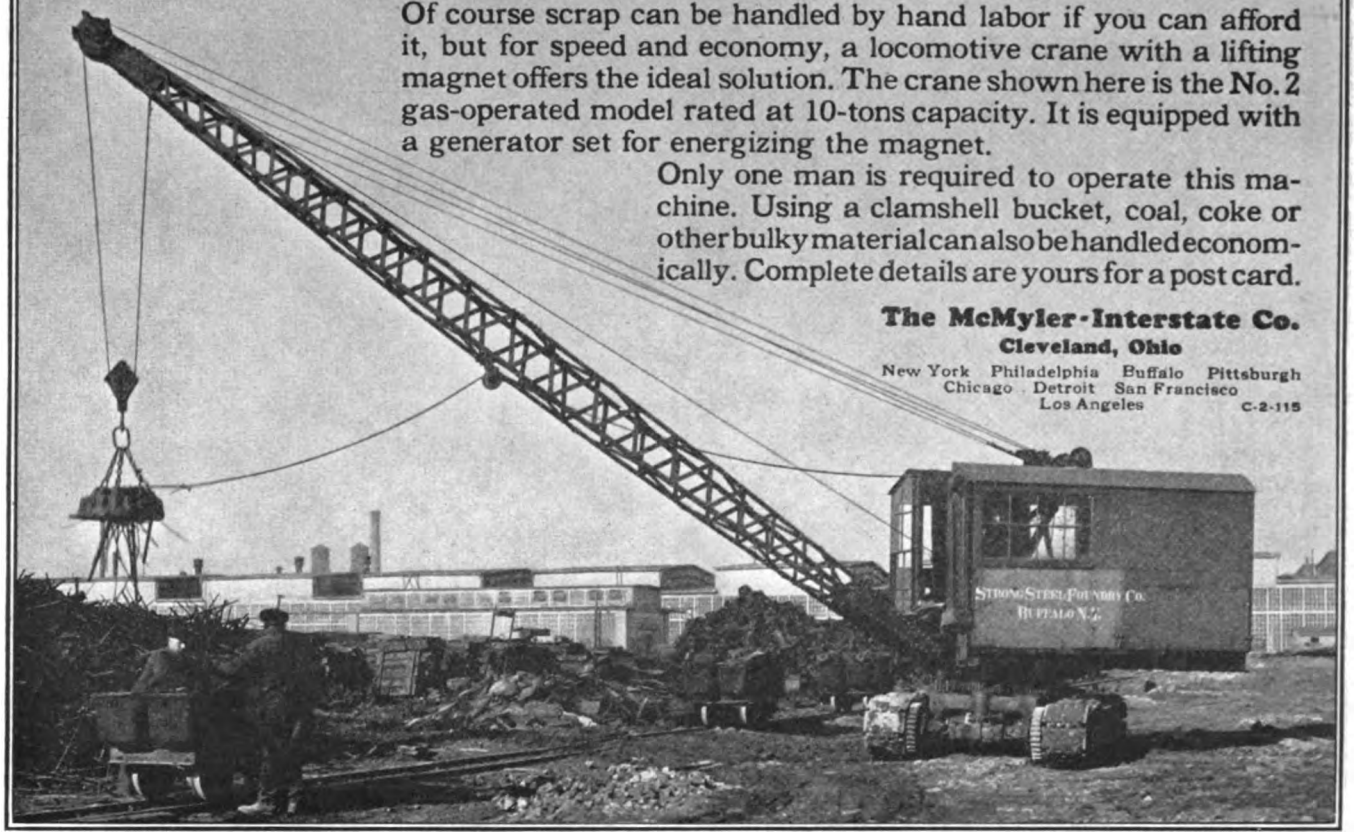
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There's Really Only One Way to Handle Scrap

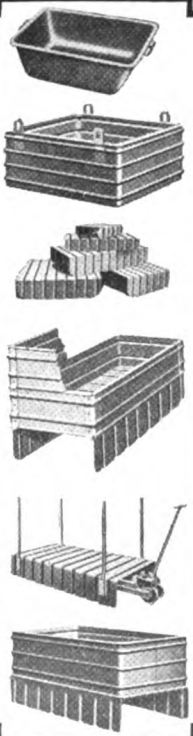
Of course scrap can be handled by hand labor if you can afford it, but for speed and economy, a locomotive crane with a lifting magnet offers the ideal solution. The crane shown here is the No. 2 gas-operated model rated at 10-tons capacity. It is equipped with a generator set for energizing the magnet.

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Modern Handling Methods for 1926

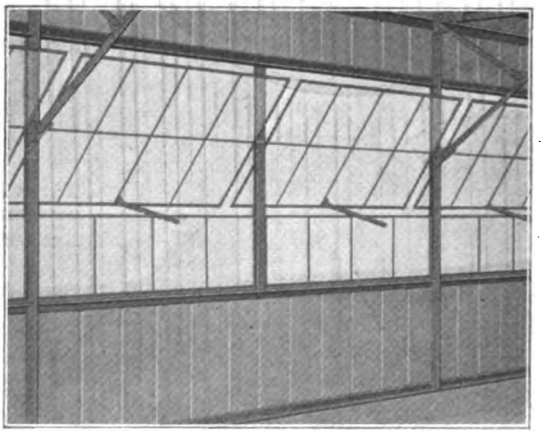
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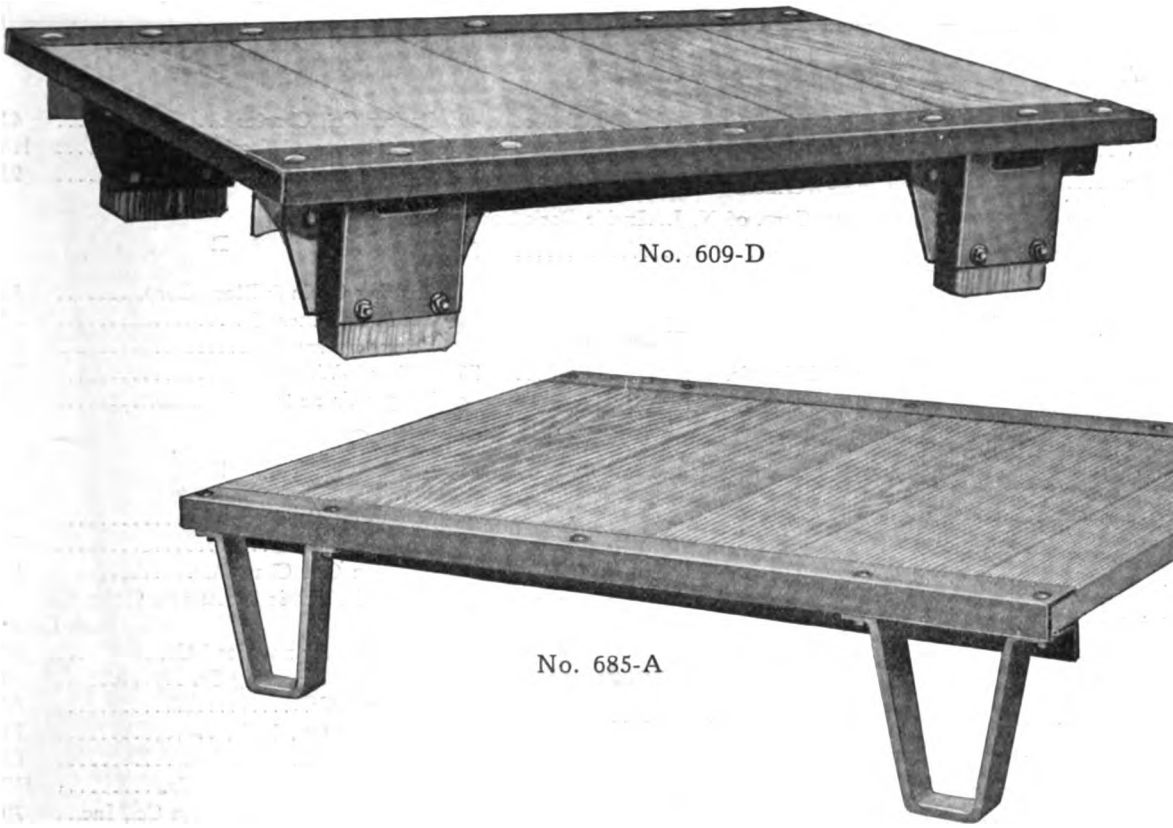
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You will find the particulars on Rex Q. D. Elevators and Conveyors in the side column. If you need the equipment, don't let time fly.

REX Q. D. CONVEYORS

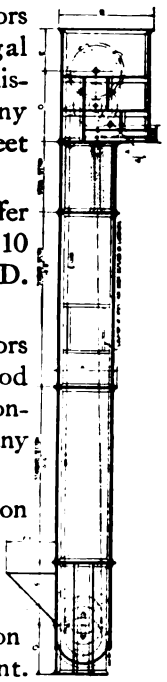
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CHAIN BELT COMPANY
709 Park Street
Milwaukee, Wisconsin

Please send me full information on

☐ Rex Q. D. Conveyors
☐ Rex Q. D. Elevators

Name.....

Street.....

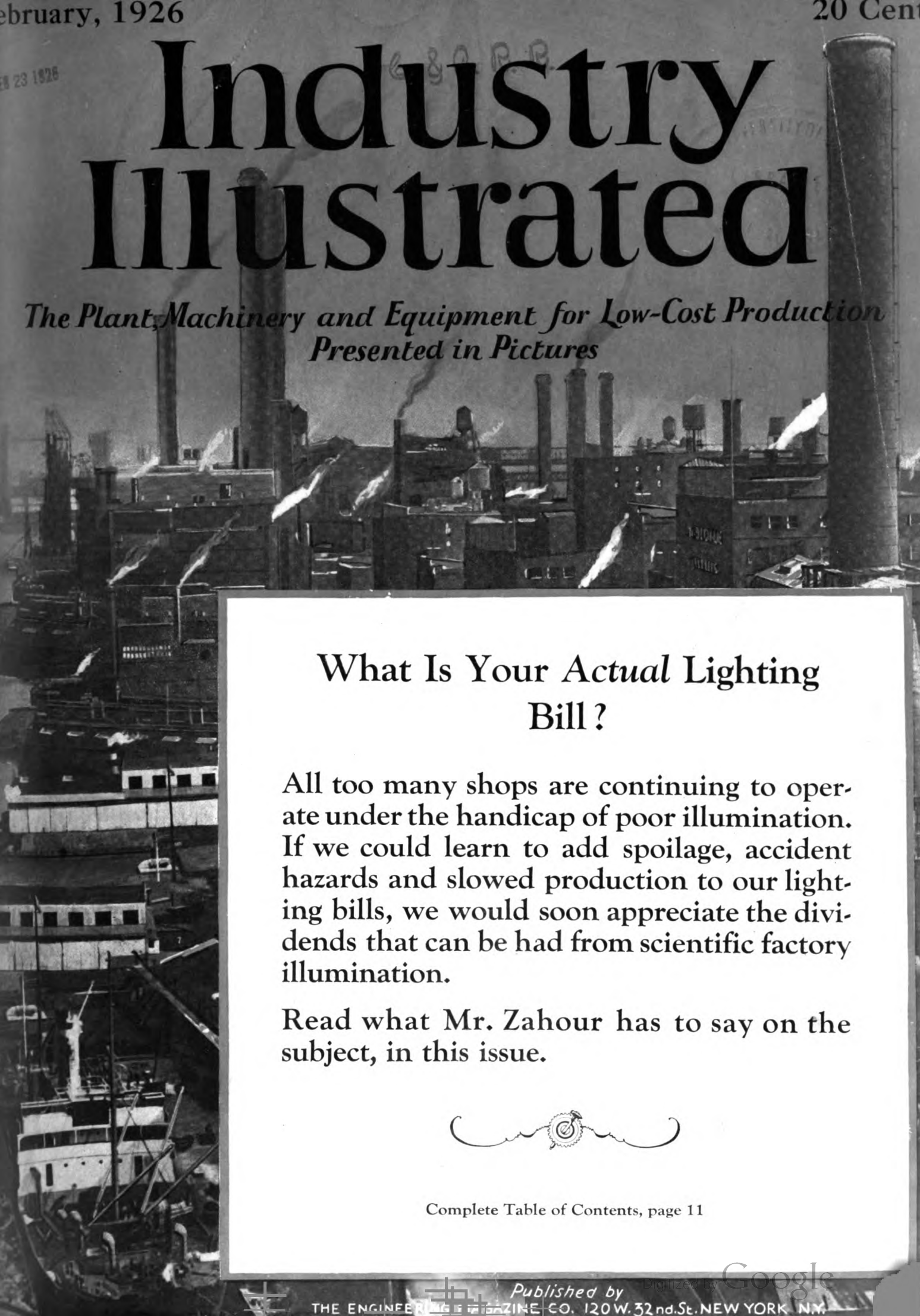
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Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures



What Is Your *Actual* Lighting Bill?

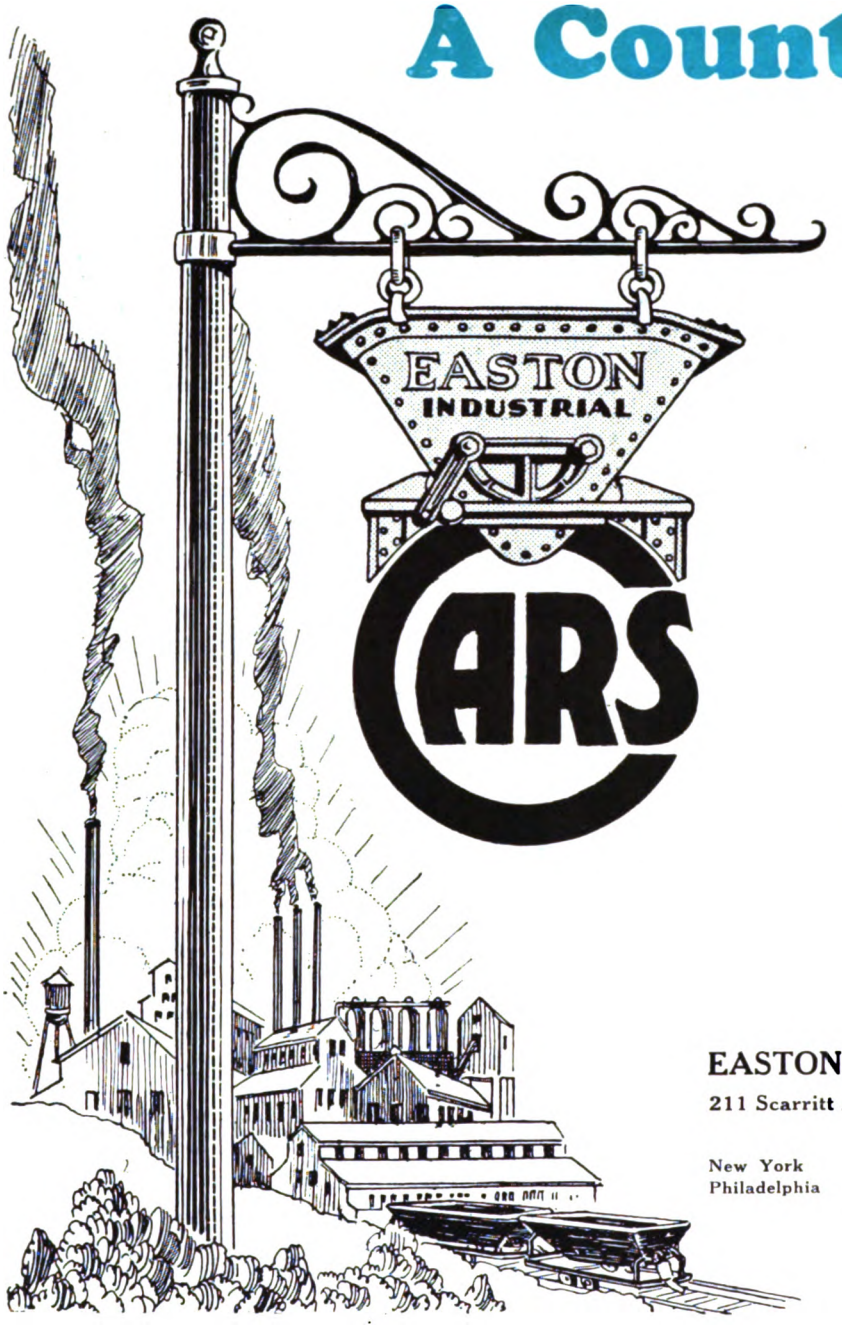
All too many shops are continuing to operate under the handicap of poor illumination. If we could learn to add spoilage, accident hazards and slowed production to our lighting bills, we would soon appreciate the dividends that can be had from scientific factory illumination.

Read what Mr. Zahour has to say on the subject, in this issue.

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Baltimore American - another user



Left: Logan Plate Drop lowers stereotypes from foundry to pressroom. Right: Papers, fresh from the press, arriving in Delivery Dept. on Logan Slat Conveyor and packages of papers on way to motor trucks on street through Logan Spiral Chute

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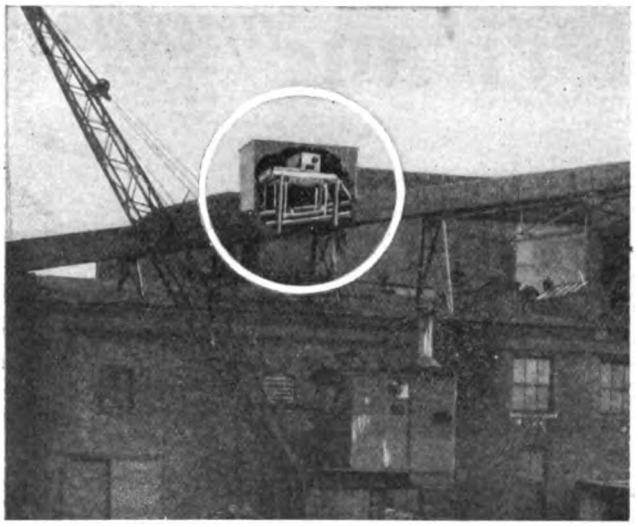
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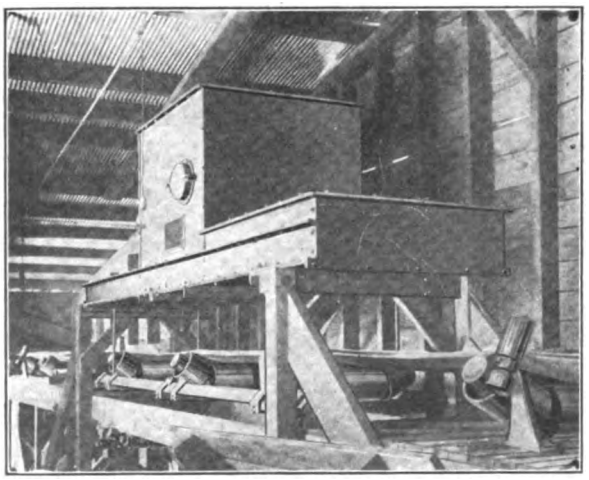
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Industry Illustrated

Published Monthly by

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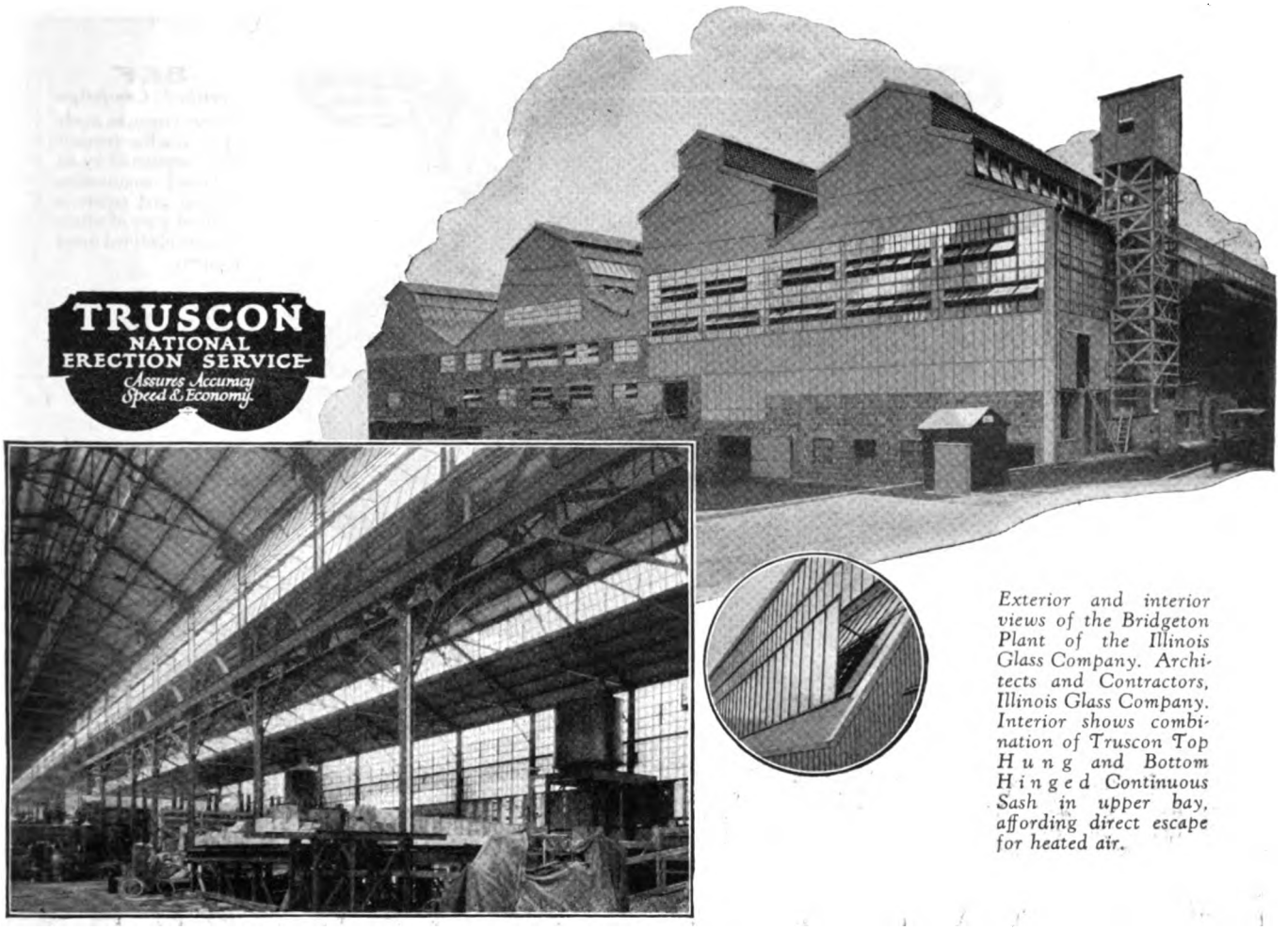
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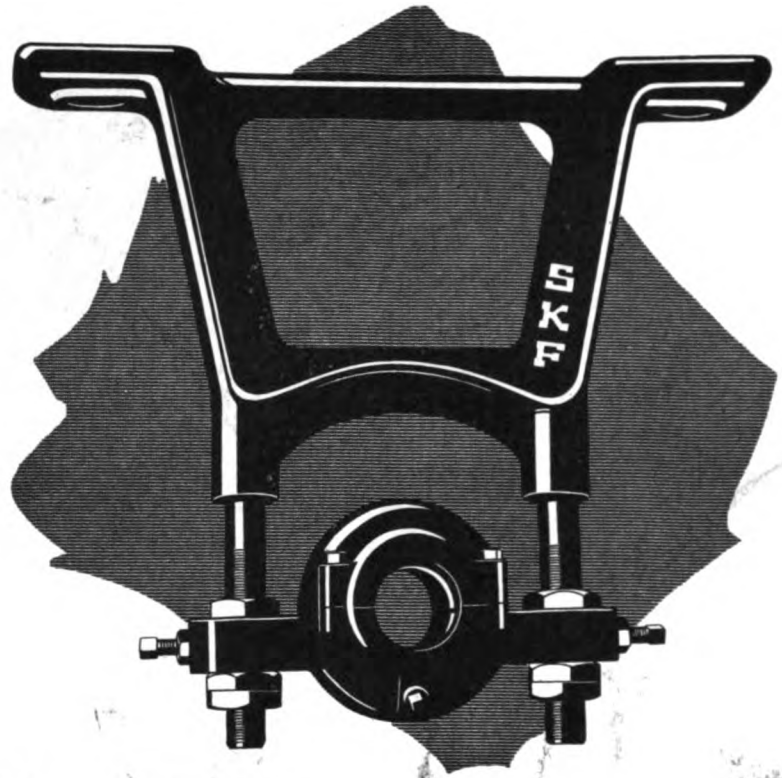
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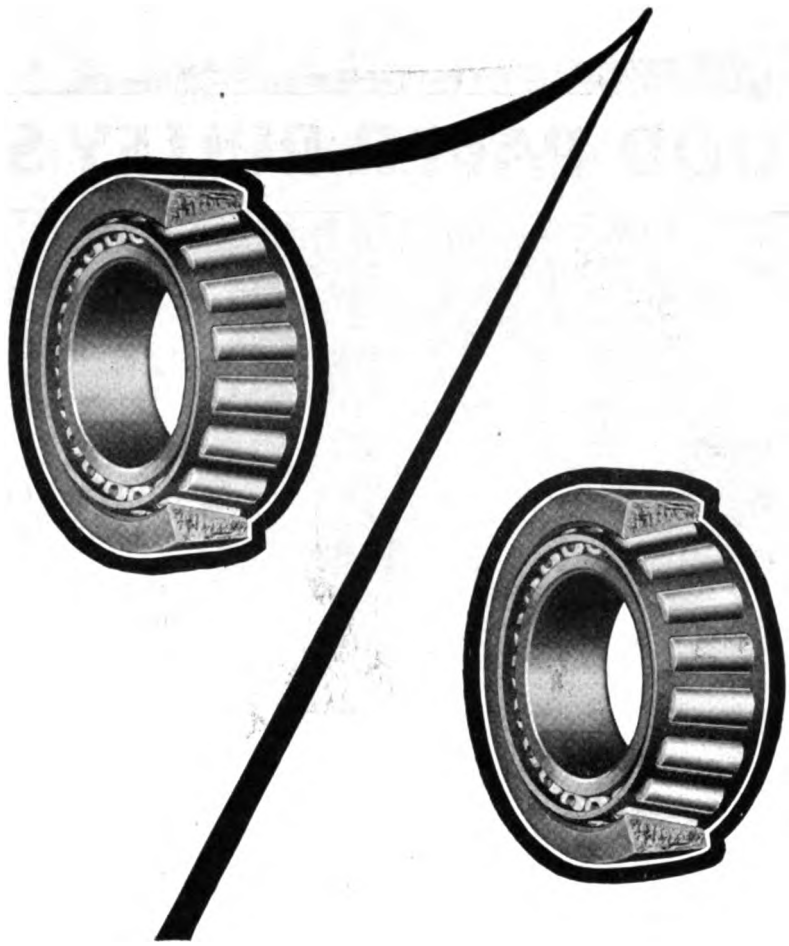
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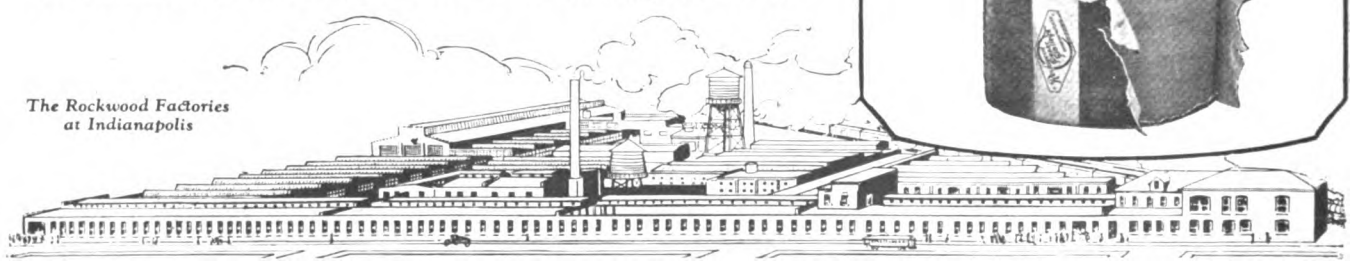
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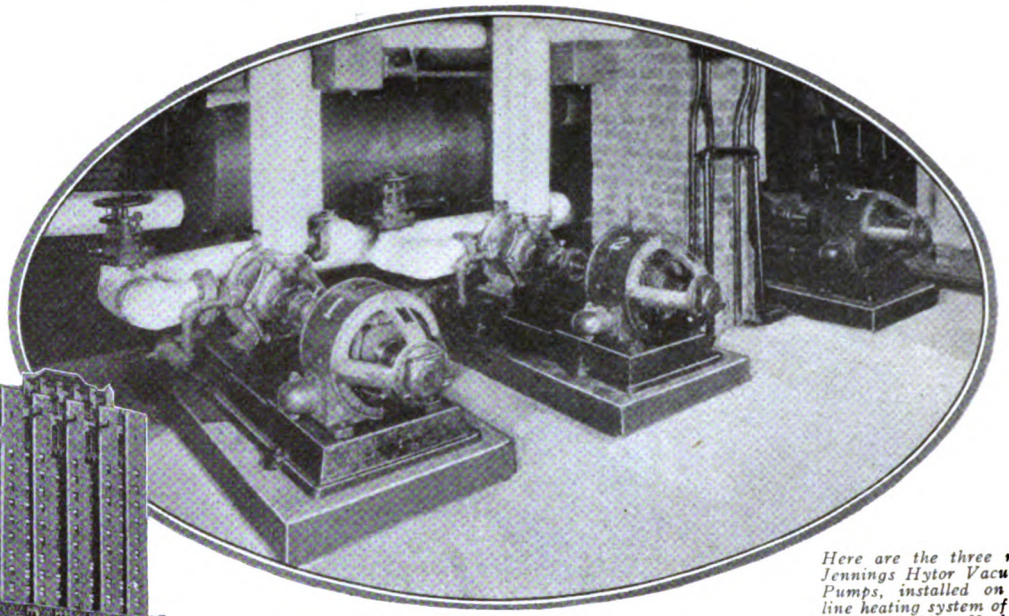
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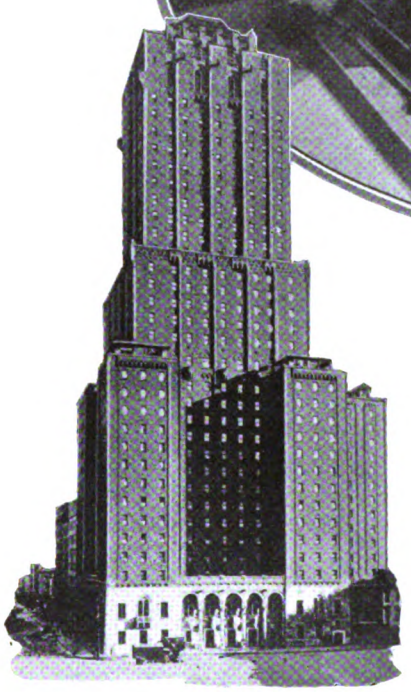
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Shelton Hotel, Lexington Ave. and 49th St., New York, N. Y. Mr. Arthur Loomis Harmon, Architect; Jaros and Baum, Consulting Engineers; Gillis & Geohegan, Heating Contractors; Shelton Holding Corpn., Owners.

Hytors serve the Shelton, also

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FEBRUARY 1926

Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures

JOHN H. VAN DEVENTER, *EDITOR*

W. THOMSON LEES
Associate Editor

ADOLF SCHILDKRAUT
Art Director

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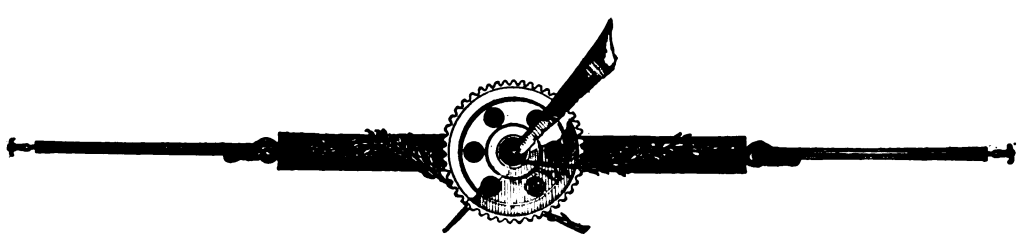
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Is Your Shop Lighting a Help or a Handicap?

By Robert L. Zahour
Illumination Bureau, Westinghouse Lamp Company



Fig. 1. A condition which existed in an otherwise modern shop —and which is all too prevalent in small plants. Note the bare lamps (A-A) hanging low, and the dark and accident-inviting areas (B-B-B).

THERE are three absolute requisites that man must have to exist—food, clothing and shelter. Yet one cannot merely exist, but must live, and therefore light is necessary. The need for artificial light was first realized by primitive cave dwellers who discovered that fire fortified them against darkness and terrors of the night outside. This fact led to the development of torches made from pine knots found in refuse of decaying logs. These small knots, dried, split and fastened in a bundle, burned with a brilliant smoky light and served to drive away wild beasts as well as to show the pathway to the cave.

Later it was found that fat dripping into the fire, from a piece of roasting meat, burned vigorously, giving out a great deal of heat and light. Collecting some drippings in a shell and setting them on fire, the first oil lamp was founded. The addition of a wick made of shredded bark improved and controlled the light from this lamp. Likewise the candles and oil lamps sprang up from such simple beginnings and were the only form of artificial light for many centuries.

However, the rapid development of science and civilization demanded a vast improvement in lighting, and better and more efficient illuminants were sought. It was found that a metal rod heated to a high temperature gave off light as well as heat and from this discovery the carbon filament incandescent lamp was developed—a transitional point from the open flame type of lamp. Further developments and improvements in filament materials have increased efficiency and quantity and bettered the quality of the light.

Due to these improvements, the light emitted from these lamps is similar to the floods caused by the gouged mountain freshets in the spring, and unless properly dammed, considerable danger is likely to result. Likewise if the modern incandescent lamp is not properly controlled in direction, quantity and quality, human eyesight and life are imperilled. Just as the river's high waters are controlled by dams, so the light from lamps is harnessed by means of suitable reflectors and diffusing media. Yet too often we find examples of bare unshielded lamps hung on drop cords, in the present day shops, which are gradually weakening and destroying the eyesight of the workers as well as preventing them from seeing danger that may be present.

The superintendent of a progressive machine shop is a human engineer, and aside from his efforts to obtain a maximum output from his employees, he is also interested in their welfare and safety. He studies the dangers that exist in working about the machines, and provides guards where moving gears are dangerously exposed; he uses white or light colored paint on the walls

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and in the corners to promote a cheerful and sanitary atmosphere; he provides ample ventilation and maintains a well equipped hospital in case of emergencies. In this way, he has done everything that will safeguard his men, with perhaps one exception, the lighting. He may have overlooked the importance of proper and adequate lighting as the greatest aid in the promotion of safety, prevention of accidents, conservation of eyesight and satisfaction among the employees.

A machinist working before a glaring unshielded light realizes that a bare lamp in the field of view is detrimental to clear and comfortable vision. Glare that fogs the plate or film of a camera when taking a photographic picture must fog the plate of the human camera,—the eye retina,—when taking an optical picture. Similarly, a bright sunny day is necessary to take good snapshot pictures; a cloudy sky decreases the amount of light and makes it necessary to take a time exposure. So with the human camera—if an operator must stop to take a time picture before picking up a tool or reading his scale, he loses a few seconds of time before each of his various movements throughout the day, whereas under proper illumination he is able to take snapshot eye pictures of various small objects before him, increasing his working speed and output without additional effort. Accuracy, quality and speed and also safety depend upon the condition of the machine, preciseness of tools, skill of the machinist *and his ability to discriminate objects clearly and rapidly.* A flaw in any of these requirements means a decrease in quality and production as well as increased accidents.

Cause	*Effect*	*Remedy*
Bare Lamps.	Glare, eye strain, wasted light, harsh shadows.	The modern efficient type of reflector such as RLM Standard dome.
Miscellaneous local lights dangling on drop cords.	Glare, eye strain, danger of accident, particularly about belting and moving machinery, short circuits, breakage.	General overhead system.
General System—Units too far apart or too low.	"Spotty" lighting, areas between lamps receive very little light; shadows are very black.	Proper relation between mounting height of units and spacing distance.
Clear lamps where polished surfaces are present on material or machinery.	Reflected glare, eye strain.	Bowl-Enameled MAZDA C lamps, or equipment to diffuse downward light from filament.
Too little illumination.	Time lost by workman, particularly on detail work; eye strain; accidents; no incentive to keep place cleaned up.	Larger lamps in suitable reflectors spaced closer together if necessary.
Sharp, black shadows.	Accidents; time lost; eye strain.	RLM Standard dome reflectors properly spaced. Bowl-enameled MAZDA C lamps.
Gloomy and cheerless appearance of room.	Unpleasant contrast between light sources and background; dispirited workmen.	Liberal use of white paint accompanied in some cases where location is suitable by use of glass reflectors.
Dusty, dirty, or broken equipment.	Loss of 40% to 60% of the light paid for.	Institute a regular cleaning schedule.

Fig. 2. This chart is typical of how lighting equipment manufacturers and engineers are educating the layman to the importance of good lighting.

The prime requisites of a good lighting system embody: first, light of suitable quality; second, light in the proper direction; and third, light in an adequate amount.

In a thorough analysis of lighting for work places, it has been found that bare lamps cause glare, eye strain, wasted light, and harsh shadows. Local lights scattered about the shop on drop cords make a type of installation from which there is always danger of accidents, particularly where local lights are suspended on drop cords in and about belting and moving machinery. Such an installation was used in a progressive machine shop of a large Eastern factory, a section of which is shown in Fig. 1. Note the radical improvement, shown in Fig. 3.

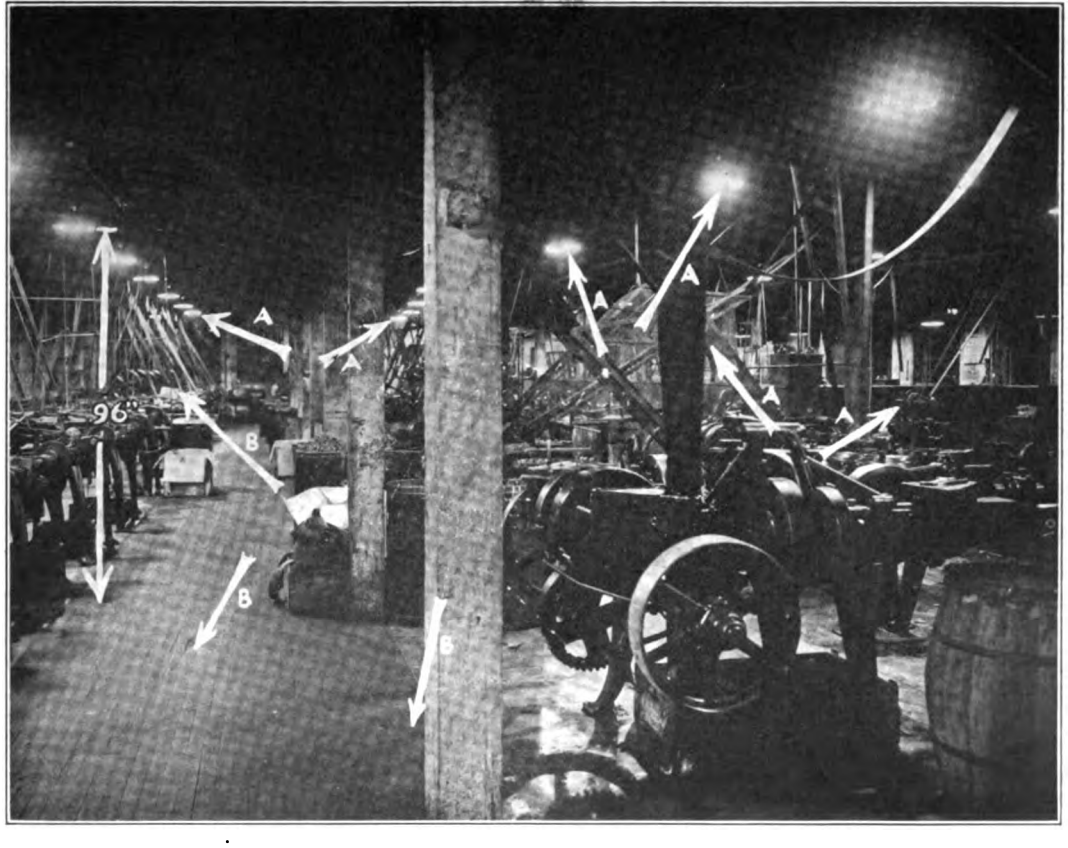


Fig. 3. Here is the same shop section as shown in Fig. 1; with proper lighting equipment installed. Note (A) the correctly spaced and shaded lights, above the line of vision of workers; and (B) the absence of dark areas. Comparing the two, it is plain that the possibilities of accidents in Fig. 2 have been greatly reduced, and a cheerful and orderly atmosphere exists. Besides, the new installation provides light of proper amount, quality and direction to avoid glare and any possible injury to the workmen's eyes.

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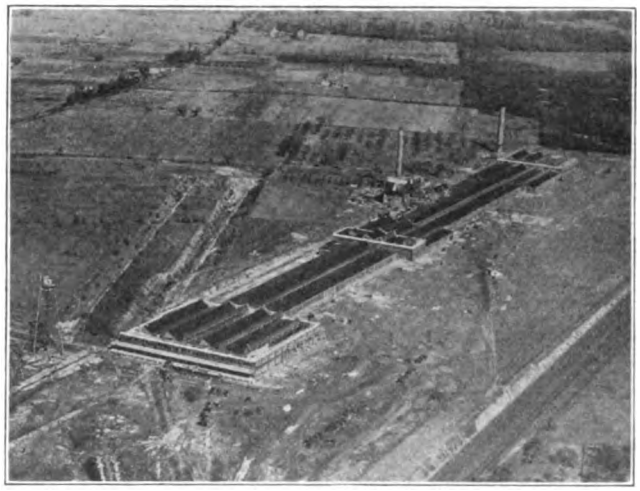


Fig. 1. A bird's-eye view of the thoroughly modern potttery of Thomas Maddock's Sons Company, at Trenton, N. J.

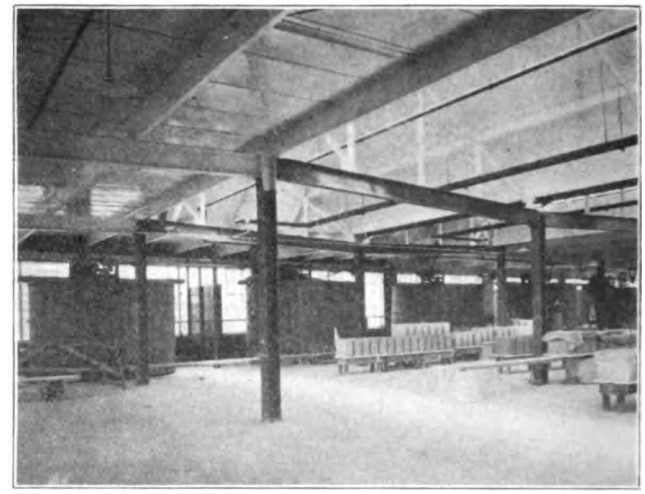


Fig. 2. Agitators, or blunging tanks, each one being eight feet high and twelve feet in diameter. These, located above the casting shop, permit gravity flow for the "slip."

What Modern Machinery is Doing for Sanitary Pottery Production

A Notable Development in Plant Design and Procedure

By LeRoy W. Allison

THE leaders in various branches of clay-working industry are now not only giving attention to complete modernization of plants and equipment, but to standardization of production in its different phases, from raw clay storage to finished ware. Such potteries are typical of the advancement that is to come and which must come, and it is such a plant that the Thomas Maddock's Sons Co., Trenton, N. J., has recently completed and is now operating.

This company specializes in the manufacture of all-clay sanitary ware, frequently termed "sanitary earthenware." Its founder, Thomas Maddock, was the first successful producer of such ware in this country, and the new pottery stands as a monument to his foresight and genius. The business had its inception in 1873 at Trenton, under the name of Millington, Astbury & Maddock; in 1878, Mr. Maddock became the sole owner. Later, his sons became identified with the enterprise and in 1882, the firm of Thomas Maddock & Sons was organized. In 1902, a number of ears after the death of Mr. Maddock, Sr., the present company was incorporated as the Thomas Maddock's Sons Co., and has continued from that time without interruption.

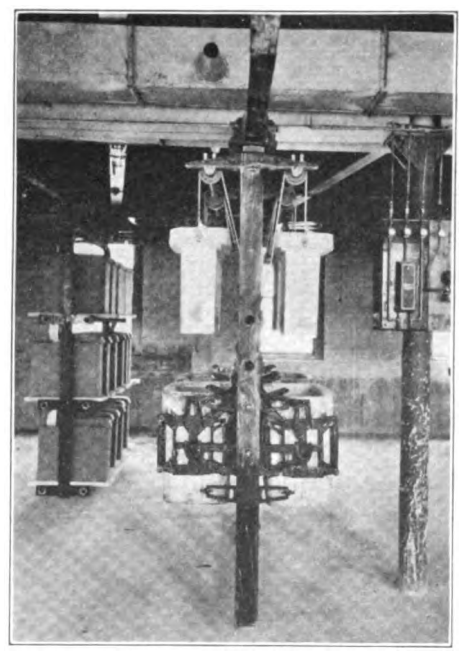


Fig. 3. A typical casting machine at the Trenton plant. These machines are a notable advance over older methods of shaping pottery products.

In 1923, the Maddock business demanded expansion; plant output did not meet sales. Rather than attempt to add to the existing plant, occupying valuable property in the heart of the City of Trenton, and with buildings and environs not susceptible to complete modernization, the company sought another location. It wanted land near this city of potteries with which it had become so firmly identified, acreage which could be secured for a reasonable figure, and a site sufficient to allow for future expansion.

This was found at Hutchinson Mills, Hamilton Township, just east of the city limits of Trenton, on the main line of the Pennsylvania Railroad, where a tract of 125 acres of land was available. Plans were drawn and construction of the new pottery started early in 1924. About a year later, April 1925, the first complete unit was ready for occupancy, and following a number of trial runs, regular commercial production was inaugurated.

Since that time the pottery has developed into a full-fledged producing unit; the prophecy that it would reduce materially the cost of production and show marked efficiency in operation has come true; the initial inception, born as an idea in the minds of the officials of the Maddock organization, has

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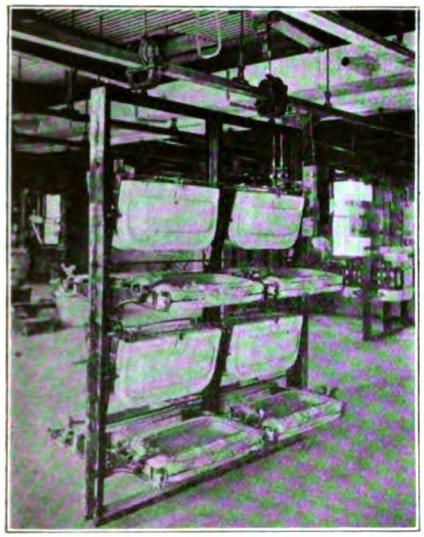


Fig. 4. A rack of tank lid molds, eight to the frame, four on each side.

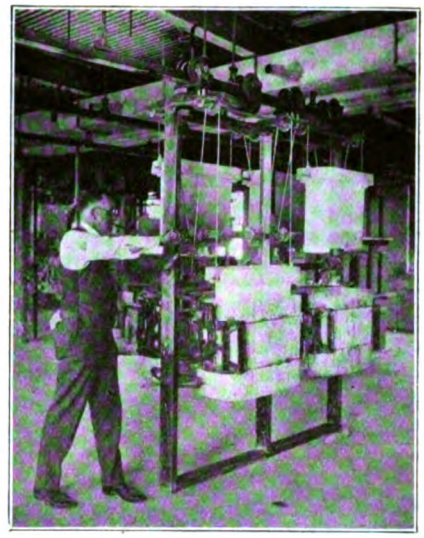


Fig. 5. Cores are removed about 1½ hours after pouring. The operation is simple, requiring only the turning of a crank.

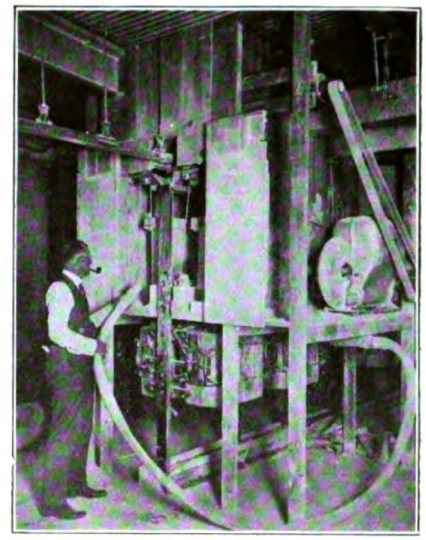


Fig. 6. The molds are then run through a dusting machine and made ready for the next batch.

wrought into being an enterprise of mammoth scope of attainments in the sanitary ware branch of the ceramic industry.

Multi-story buildings as at the former Trenton plant have given way to the modern trend of a continuous structure of one and two-story type, the latter only in a portion of the plant where necessitated by operating conditions. The building is of brick and steel construction, thoroughly fireproof. Several bays are of saw-tooth roof type, with intermediate sections of sloping monitor framing to afford full daylight advantages.

In this latter connection, the exterior walls have been arranged with a maximum amount of steel sash, flooding the interior with daylight, even of sufficient extent to permit operations without artificial illumination on normally cloudy days. This, likewise, means good ventilation and sanitary working quarters. The floors are of concrete, easy and simple to keep clean and free of accumulation of clay materials, and insuring secure and level footing for the workmen, neglecting the advantages in routing the work from department to department.

A further extension will be made at the plant in the near future in the form of a slip house, or structure for mixing the clay body slip. This building will be one-story, 162x200 ft., located at the extreme right of the plant. At the present time, the slip is transported from the old pottery, where it is prepared, to the new plant in tank cars; it is discharged by means of a centrifugal pump, operating at 90 gals. per min., directly to agitators, or blunging tanks, situated on the second floor of the two-story building forming the present terminus of the plant.

In line with its intention for complete modernization, the Maddock company has abandoned beehive type kilns in favor of continuous tunnel kilns for the new pottery. Two such units of muffle type have been installed.

The kilns are arranged in tandem style, with each unit 374 ft. long, and indicated capacity for holding 60 cars

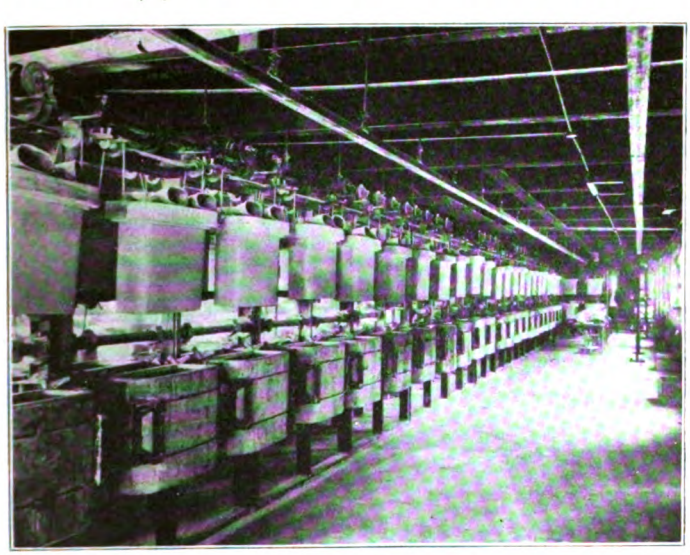


Fig. 7. View of a battery of tank-casting molds, lifted from plaster casts, ready for work in the finishing shops. Note the monorail track, which runs throughout the plant and is invaluable.

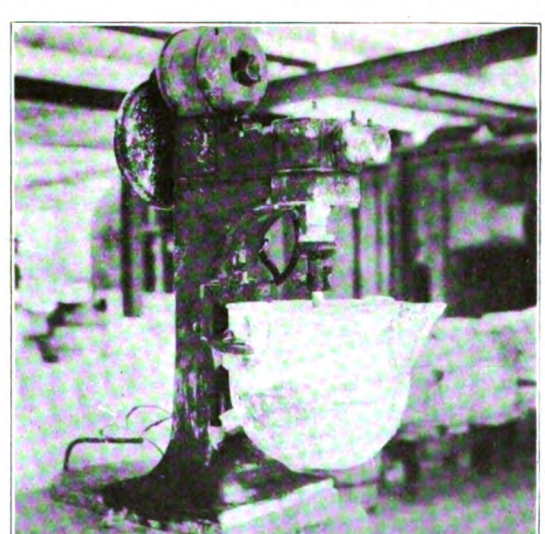


Fig. 8. To eliminate hand mixing of plaster for casting molds, a standard mixing machine has been adapted to this use. Electrically driven, they are superior to the hand method in every way.

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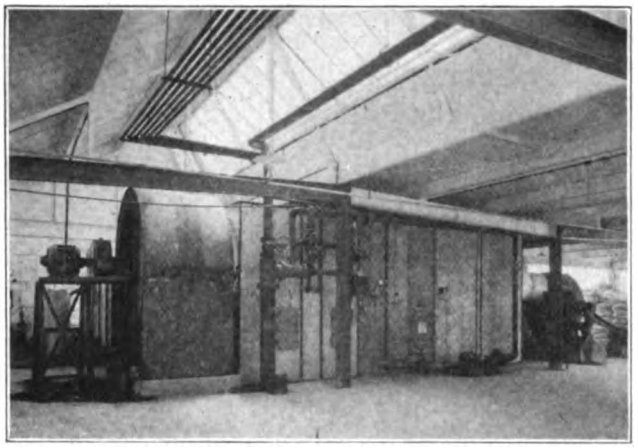


Fig. 9. The air conditioning apparatus. This plant is said to be the first of its kind where scientific and accurate "climate" control is used.

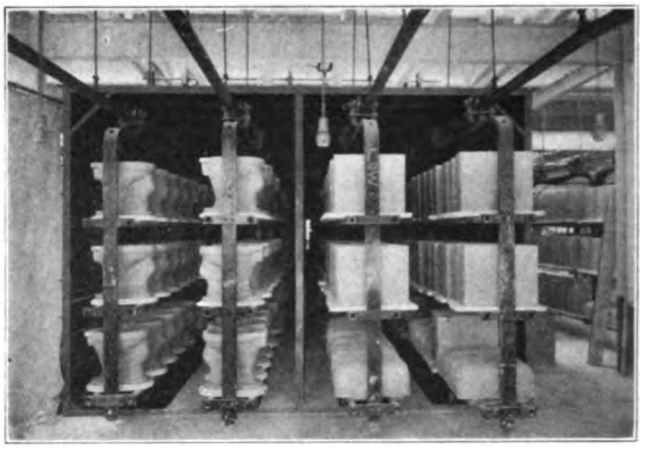


Fig. 10. Following preliminary handling (after the operation in Fig. 7) the ware is placed on monorail racks for transport to the dryers.



Fig. 11. A view of the finishing shop, where the ware goes from the dryer, still by monorail. Here it is sand papered, sponged, inspected, and made ready for the bisque kiln or initial firing. Incidentally, from pouring to first firing operations requires about three days.

loaded with ware at one time. In view of future expansion, the plant has been laid out to accommodate two additional kilns of the same size. It is expected that these will be installed before many months have passed.

In operation, a car of ware is run into the kiln about every 50 min., and another car of ware is pushed out simultaneously at the exit end. Fig. 12 shows two cars loaded with material for the bisque kiln, illustrating the method of stacking the green ware to secure utmost capacity. As will be noticed, a full loaded car will convey 16 closets and 16 tanks.

The kiln is fired by means of producer gas, generated in the plant's power house, from buckwheat coal, and is provided with complete regulating and recording instruments for the positive control of heat at all times.

The extreme end of the plant, following out the routing schedule, is equipped as a packing and shipping department. Every known labor-saving device is installed for the rapid handling and dispatch of outgoing finished material. A total of approximately two miles of railroad siding has been installed, and from the shipping platforms no less than eight freight cars can be loaded at one time.

It will take not only quality but quantity production to develop the line to its full extent; it will take economical and efficient manufacture to stand foremost among competitors; and it will take modernization and standardization in all factors of output to conduct production on a profitable basis.

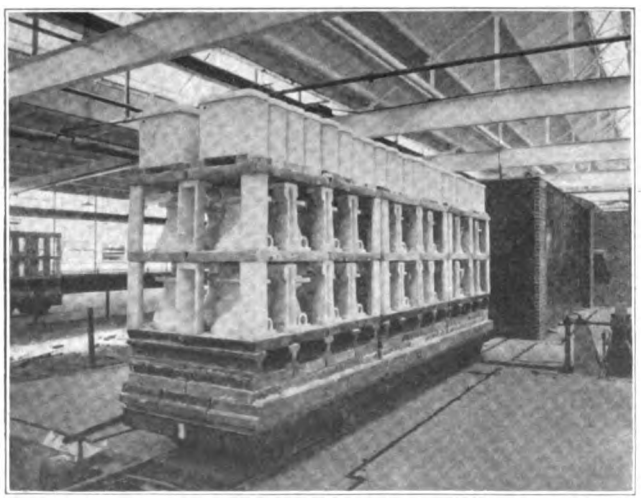


Fig. 12. Two cars loaded for the bisque kiln, showing how the ware is stacked for utmost capacity. The kiln is producer-gas-fired, with complete recording and regulating control. After inspection, the ware is then dipped, and goes to the glost kiln (not shown).

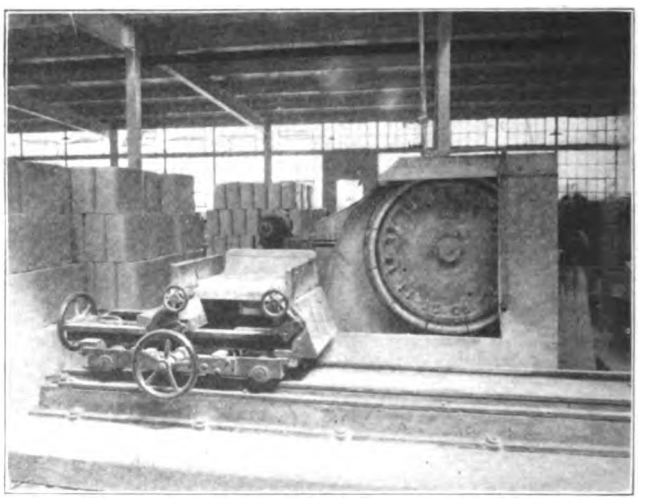


Fig. 13. The grinding machine, which grinds flush surfaces on those parts which in service require to set flush against wall or floor.

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PROFIT POSSIBILITIES CAUGHT BY THE CAMERA



Saving 13% of Your Coal Bill

Keeping Tabs on Stock and Orders

Profits Outside of the Factory Door

How to Lubricate Trucks and Tractors

Is Your Power Transmission System Up-to-Date?

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Profits Outside the Factory Door

Study Your Neighboring Plants, as Possible Markets or Sources of Supply

By John A. Piquet

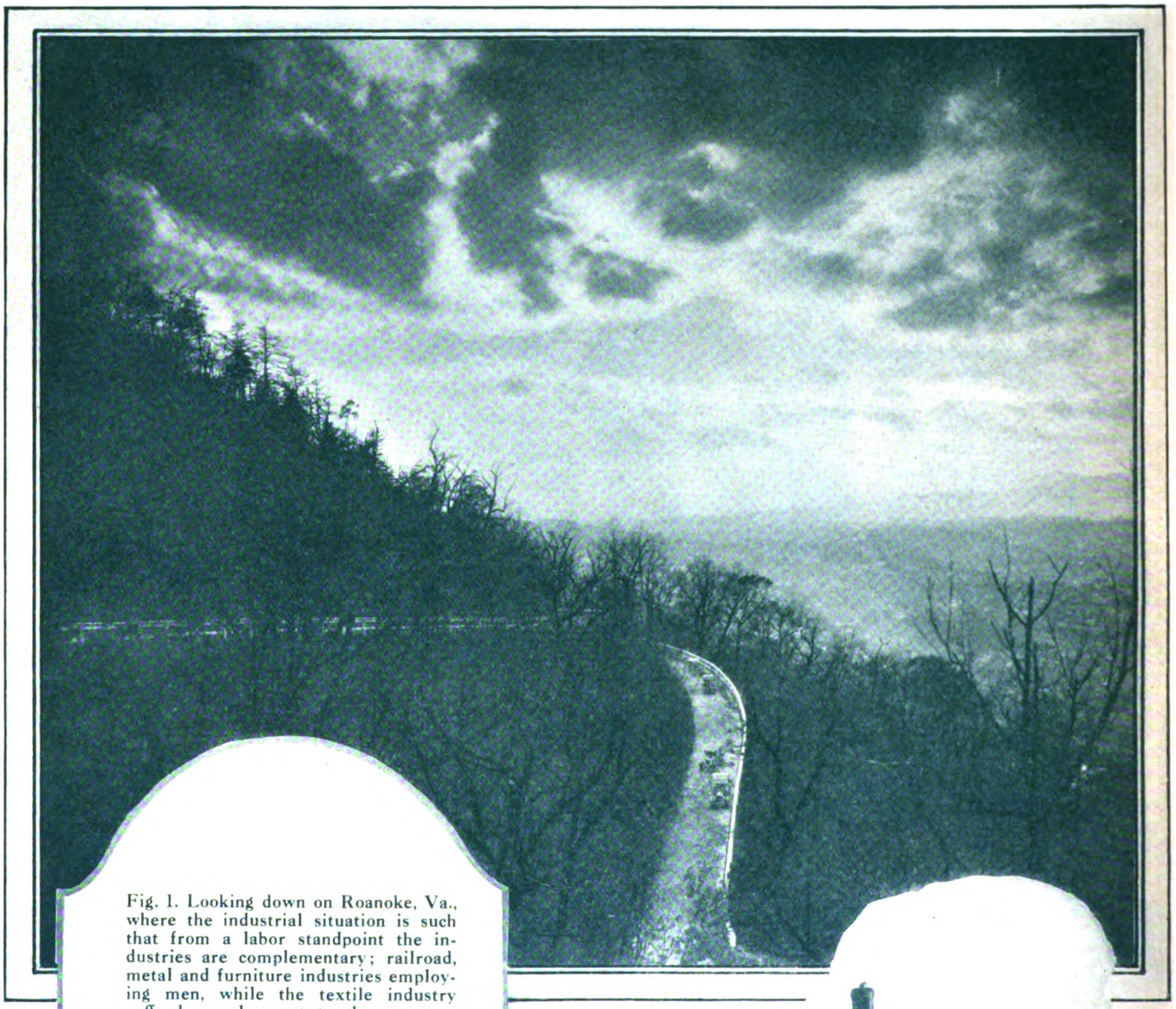


Fig. 1. Looking down on Roanoke, Va., where the industrial situation is such that from a labor standpoint the industries are complementary; railroad, metal and furniture industries employing men, while the textile industry affords employment to the women.

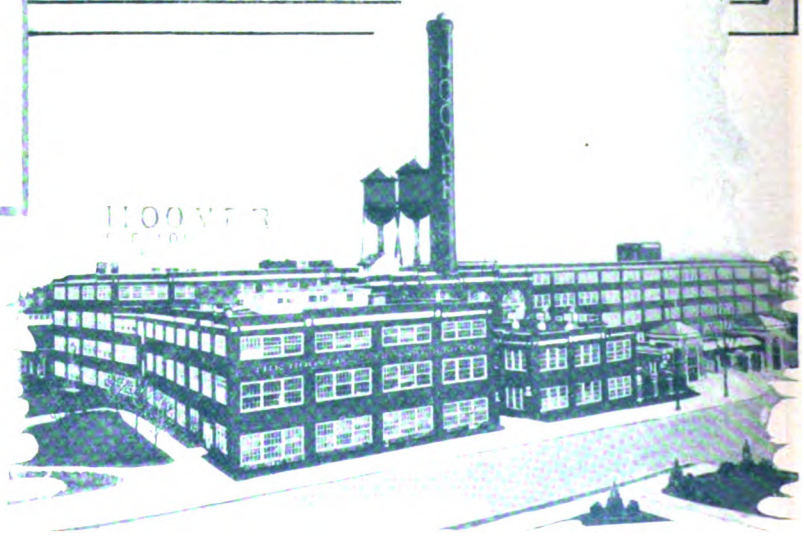


Fig. 2. Canton, Ohio, is not only centrally located as to markets, but the Hoover Suction Sweeper plant gets a large proportion of its materials from surrounding metal manufacturing plants.

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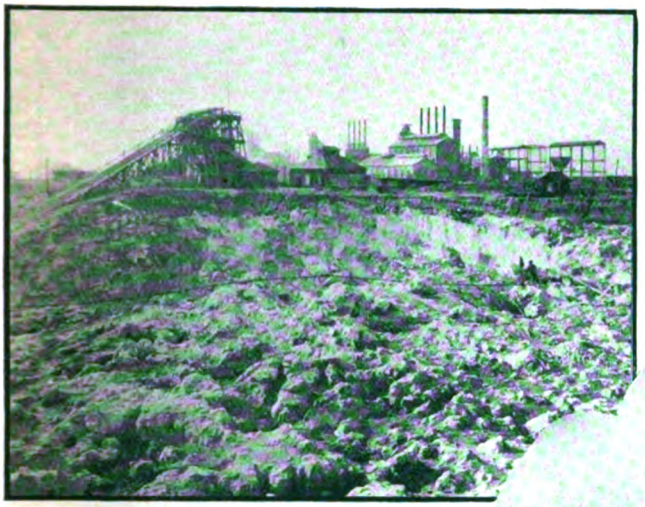


Fig. 3. The Birmingham plant of the Republic Iron & Steel Company is a good example of a plant which benefits by its neighborhood. With coal and iron deposits on either side, this limestone quarry furnishes the third essential to the production of iron and steel.

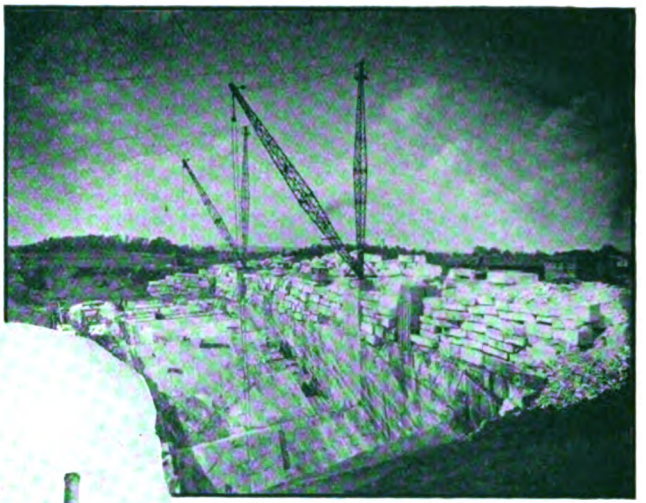


Fig. 4. Above—Here is another case of profitable cooperation, in the Birmingham district. This marble quarry finds a market in the extensive development of the district, and at the same time itself furnishes a market for the nearby steel industry. One helps the other, and both help to develop the district.

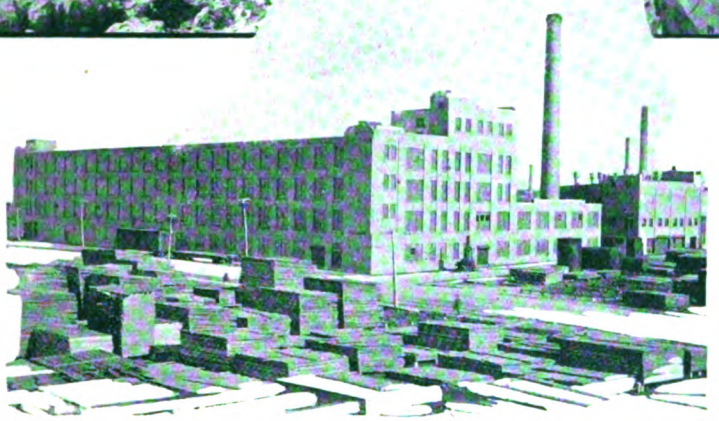


Fig. 5. The modern plant of the Armour Leather Company, at Sheboygan, Wis., is within easy reach of a market among the Mid-West shoe factories, and finds right at hand the packing plants and the source of tanning acids which make for low cost production.



Fig. 6. Wide awake local manufacturers have found the new Baltimore branch of Montgomery Ward & Company furnishes innumerable and profitable opportunities for complementary relations. It furnishes both a nearby market for products and a nearby source of supplies, in each case with reduced freight rates.

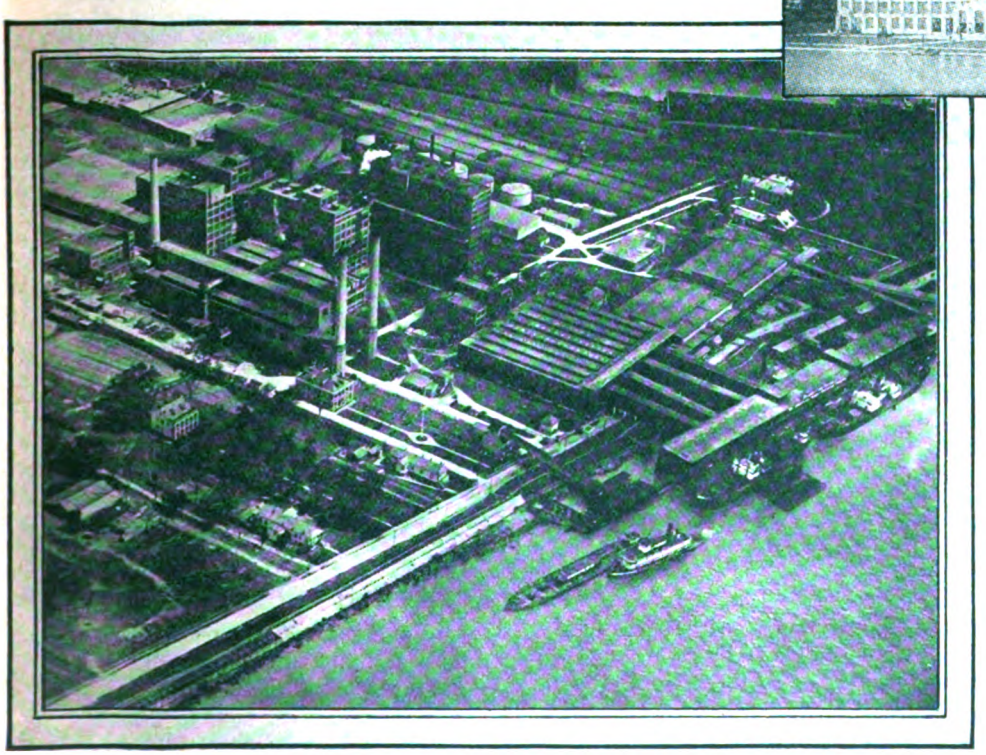


Fig. 7. New York once had a monopoly of sugar refineries. But this, the largest single unit refinery in the world, located at New Orleans, is evidence that the sugar refiner is alive to the economies and profits found in complementary locations. At New Orleans, he is near the domestic sugar producer and at a modern port near the Cuban supply.

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Fig. 8. This Louisville furniture factory (at the right) is but one link in a long chain of complementary industries. Nearby are hardwood lumber, veneer manufacturers, paint makers (with nearby chemical plants and so on), as well as manufacturers of wood working machinery.

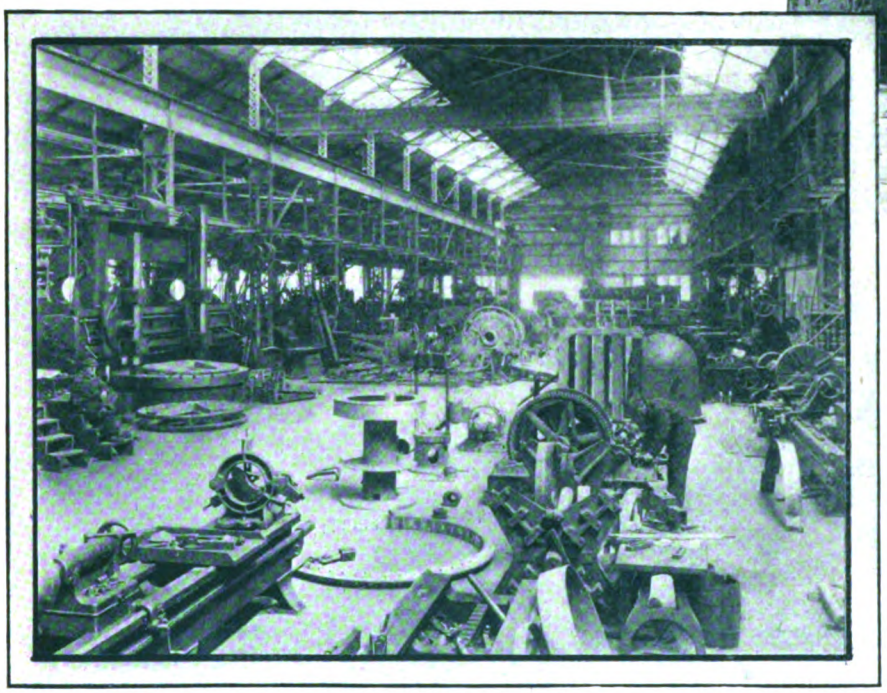




Fig. 9. Five Denver foundries got together under the name of the General Iron Works, and built a large, splendidly equipped factory. While each company retains its identity and line of products, all five benefit immensely through their coöoperative and complementary association—an unusual, but highly profitable one.

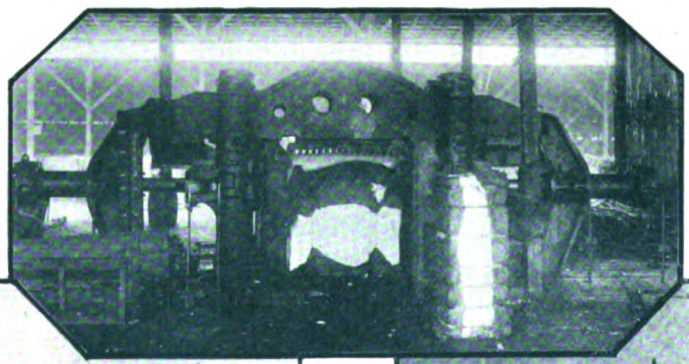


Fig. 10. Driven by Alabama Power Company current, this cotton baling press is symbolic of this section of the new South, with its recent splendid development of raw materials, and its intelligent fostering of industries which fit into a complementary relationship.



Fig. 11. The Pacific Northwest is developing its resources on a large scale. At the same time, individual plants such as this Seattle sash and door mill, are profiting by becoming links in the chain from lumber producers to bungalow makers.

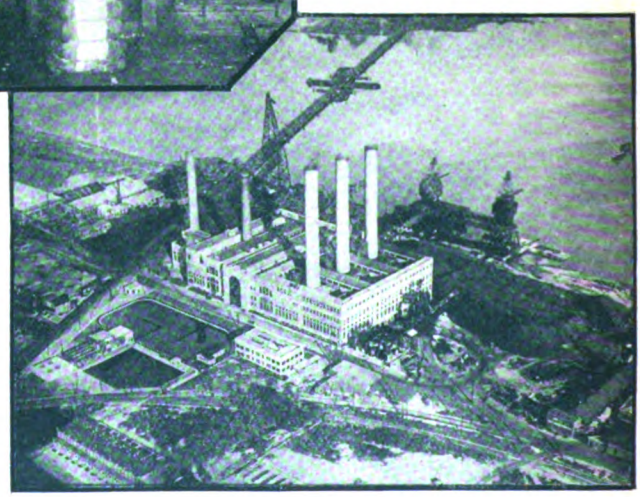
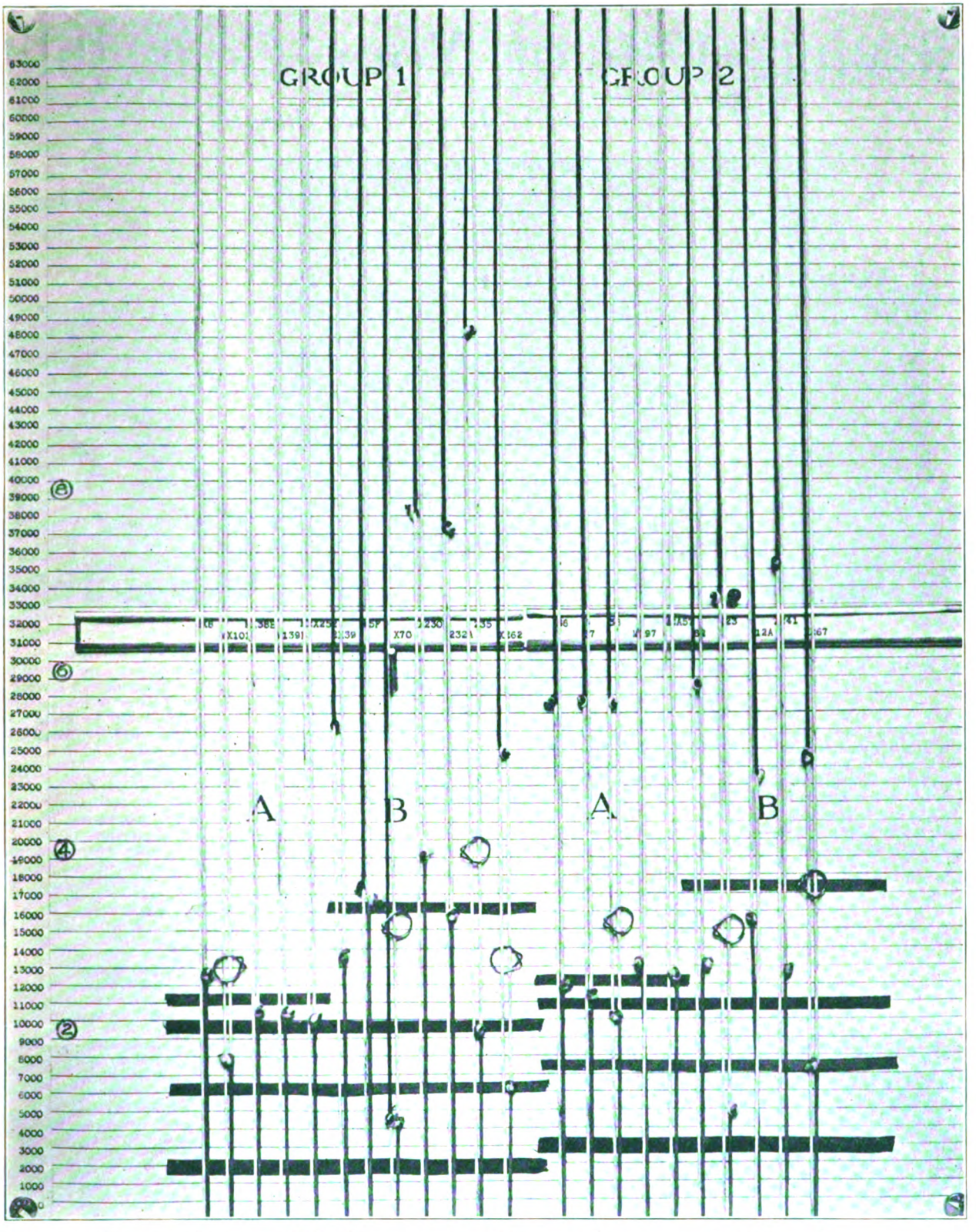


Fig. 12. The mammoth plant of the Consolidated Gas, Electric Light & Power Company, at Baltimore. Public plants are among the most progressive in fostering the complementary relationship, with resultant profit both to themthemselves and to the areas they serve.

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Keeping Tabs on Stock and Orders

Control Boards are by no means new. In order to be of value, they must be simple enough to be clearly understood, and "posted" systematically and promptly.

Then a glance at the Control Board will give the needed information about stock, parts in the process of construction, and completed goods ready for sale or delivery. This saves time and effort in looking through heavy, clumsy volumes of records or complicated filing systems. The Control Board has the added advantage of presenting relative and important facts side by side.

Such a Control Board has been worked out by the Corona Typewriter Company, of Groton, N. Y. White strings represent raw material on hand; blue strings represent "Worked" inventory or stock upon which work has been begun or completed; red strings fix the boundary limits. The knots on the strings are placed according to a scale on the side of the Board, and this scale is worked out in terms of sets or parts. This Control Board has been found a great aid in efficiency, and a decided short cut for the Planning Engineer of the factory.

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Saving 13% of Your Coal Bill

Why Superheaters Merit Serious Attention

By Francis Juraschek

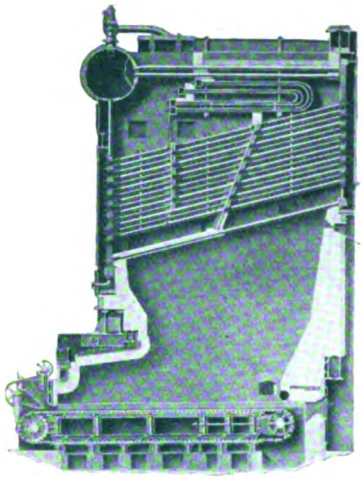


Fig. 1. All over the world the power plants which are outstanding examples of economical operation are fully equipped with superheaters. These devices are simply rows of small diameter tubes, usually nested in one of the boiler passes, through which the steam from the boiler passes and is "extra-heated" by the excess heat in the gases of combustion. Above is shown a convection type superheater installed in a B. & W. boiler.

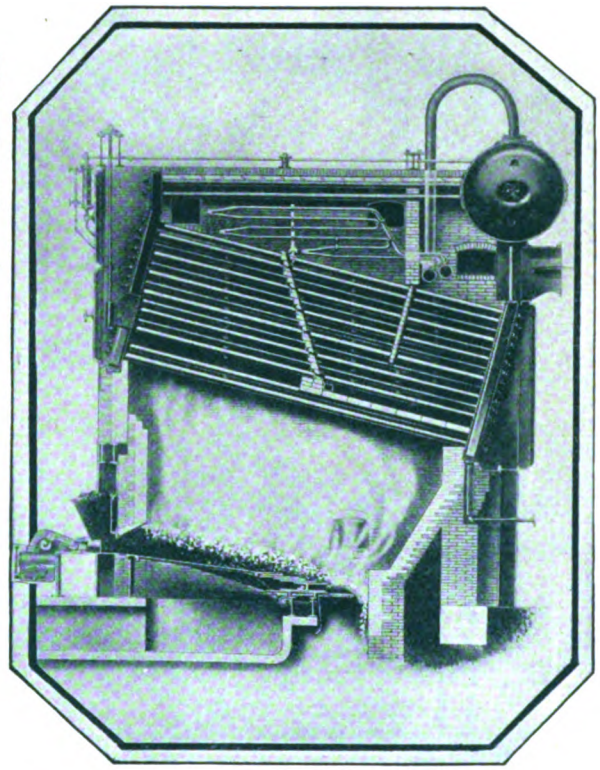


Fig. 2. Steam in contact with the water in a boiler is "wet" or "saturated" steam. Any drop in temperature of this steam as it passes through the pipe lines to the engine, will cause it to start condensing. Saturated steam is not only wasteful of fuel, but causes power losses in the engine. Notice the location of the superheater in this Casey-Hedges boiler.

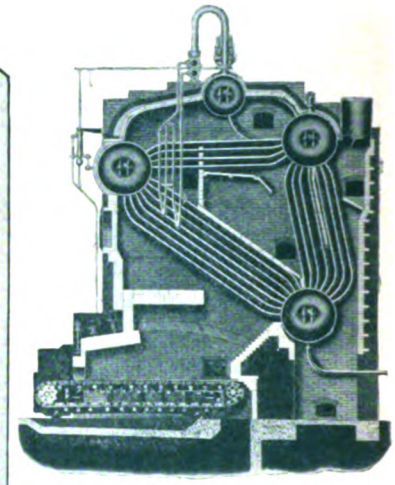


Fig. 3. The more nearly steam approaches the conditions and behavior of a perfect gas, the greater is the amount of work it can be made to do. Steam which condenses to water in the performance of its duty, is far from behaving like a perfect gas. Herein lies the real secret of the great economies of superheated steam. In this Vogt boiler the superheater turns the saturated steam into an efficient gas.

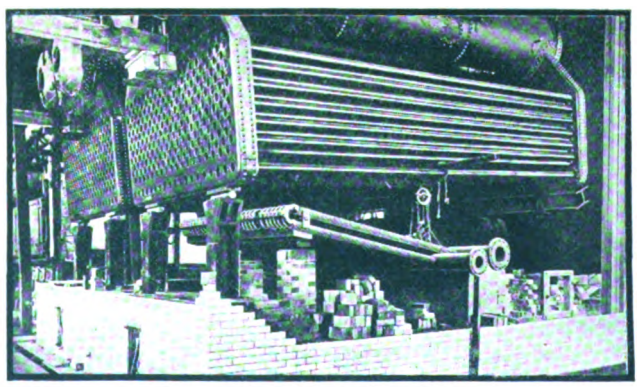


Fig. 4. The capacity of existing steam lines now overloaded and subject to excessive pressure drop and heat losses may be increased by superheating the steam, thus permitting better pressure regulation, heavier loads and lower friction and radiation losses. The illustration shows a convection type superheater installed *below* the boiler tubes.

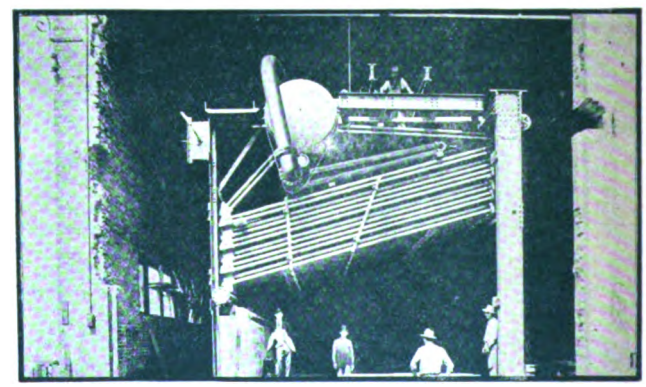


Fig. 5. A superheater is not a complicated piece of mechanism; there are no moving parts, there is no maintenance problem, it can readily be added to any steam plant that is in operating condition. It is simply a series of hot pipes through which steam is passed to make it hotter.

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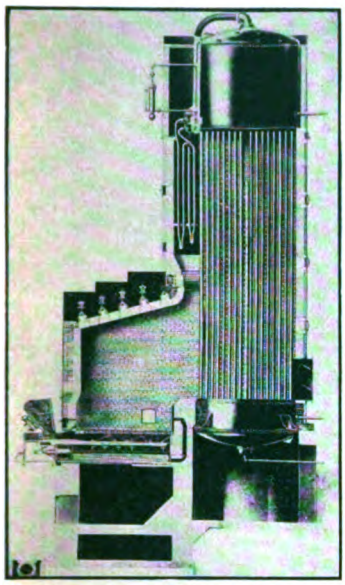
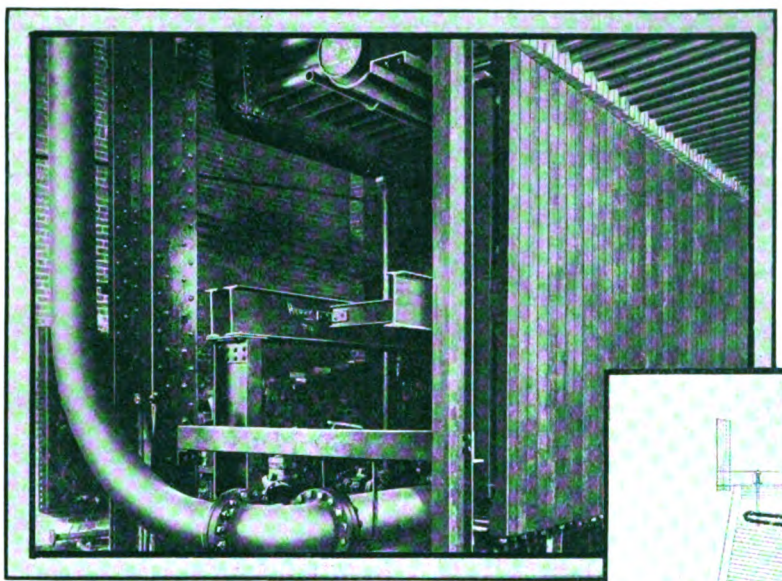


Fig. 6. Superheaters reduce the coal and water consumption of a power plant by utilizing the heat in the gases of combustion that would otherwise be wasted. Six boilers with superheaters will do the work of seven without this equipment. In a Wickes vertical boiler a superheater is provided for by building out the front wall.

Fig. 7. A superheater of the radiation type is shown here. This is usually placed in the rear wall of the combustion chamber, where it absorbs radiant heat from the fire; serving the double purpose of cutting down the maintenance charges on the usual refractory wall, and extra-heating the steam from the boiler.



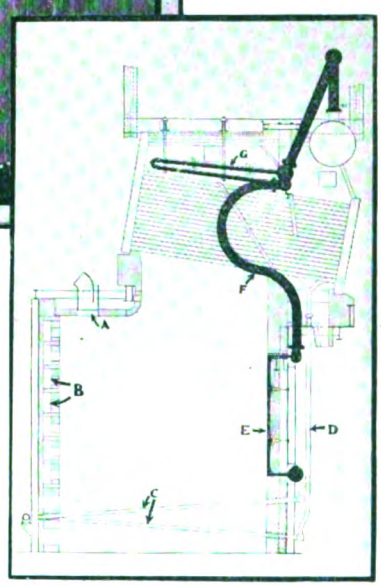


Fig. 8. An ultra-modern idea of heat-conservation. A is a pulverized fuel burner. B is the air-cooled wall. C is the water-screen. D is the circulation return of the water-screen water to the boiler—a feed water heater effect. E is a radiant type superheater. F is the steam header connecting both superheaters. G is the usual convection type superheater.

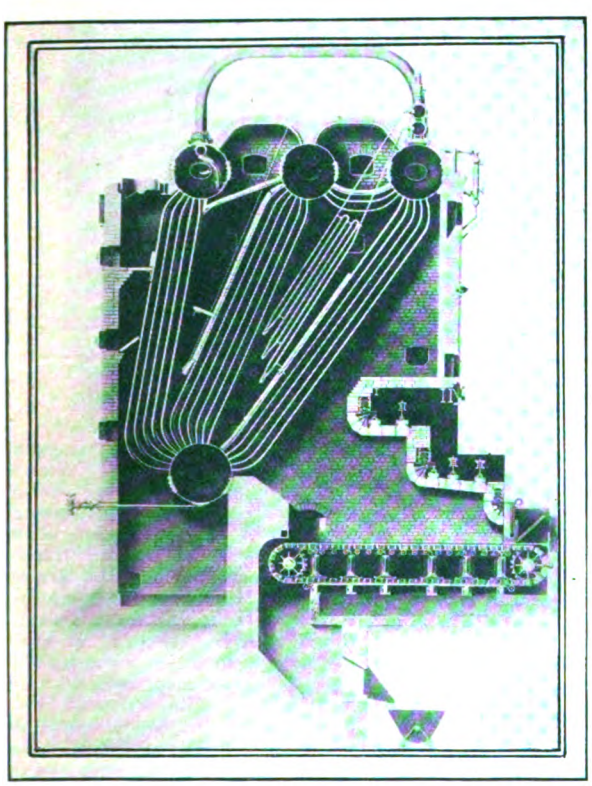


Fig. 10. The actual economy of superheated oversaturated steam may run from 10% to 25% in the average power plant. The biggest saving is in the elimination of initial condensation in the cylinders of the engine, but the elimination of condensation and reduction of radiation losses in the pipes are also valuable assets.

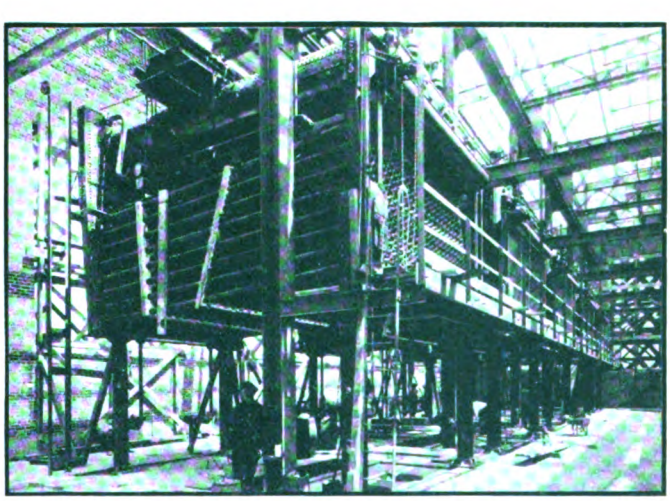


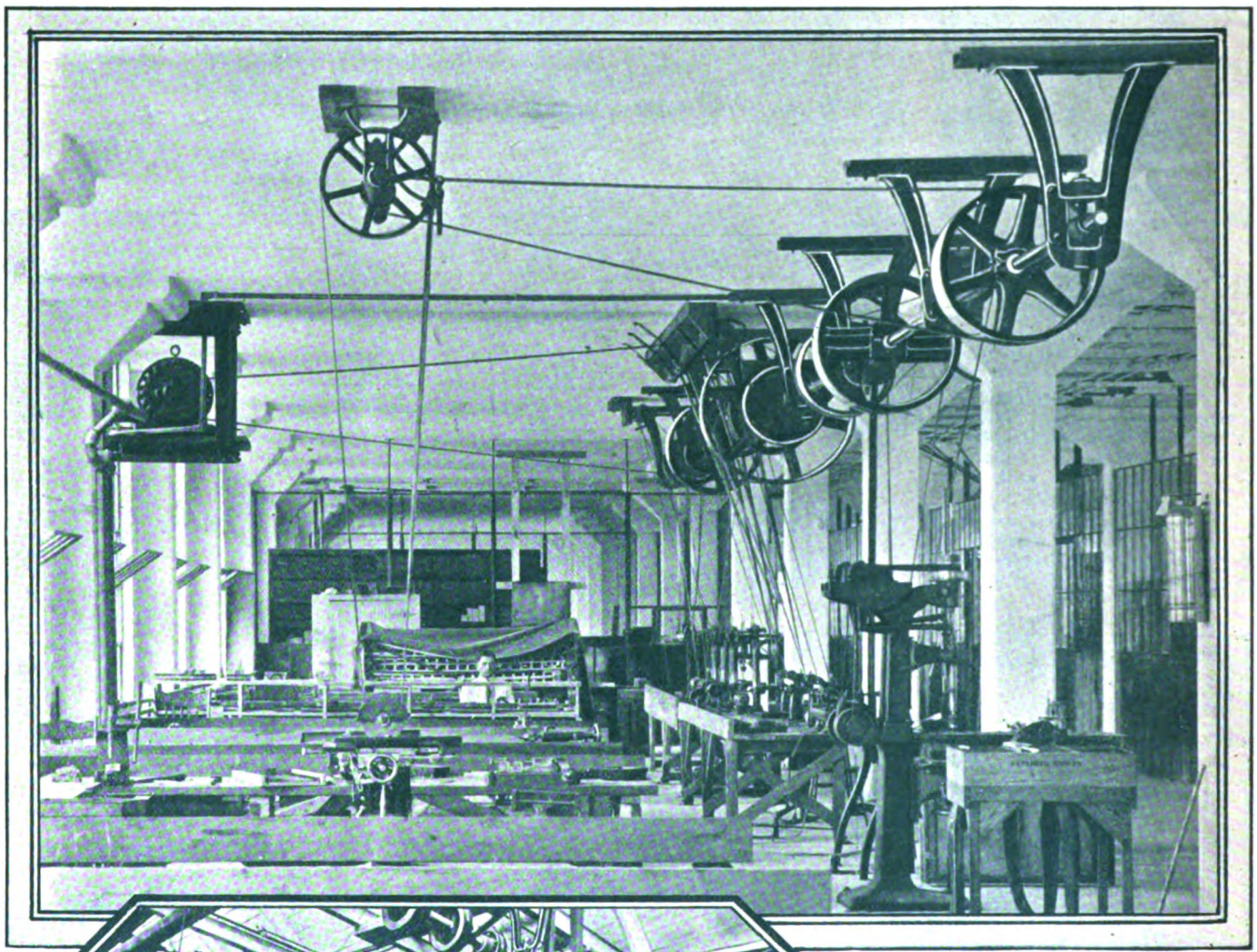
Fig. 9. The reason for making steam hotter than its natural condition when leaving the boiler is simply to enable it to do a maximum amount of work before it passes back to its natural state—water. Extra-hot steam is dry steam, and the heat in dry steam gets a better chance to do useful work.

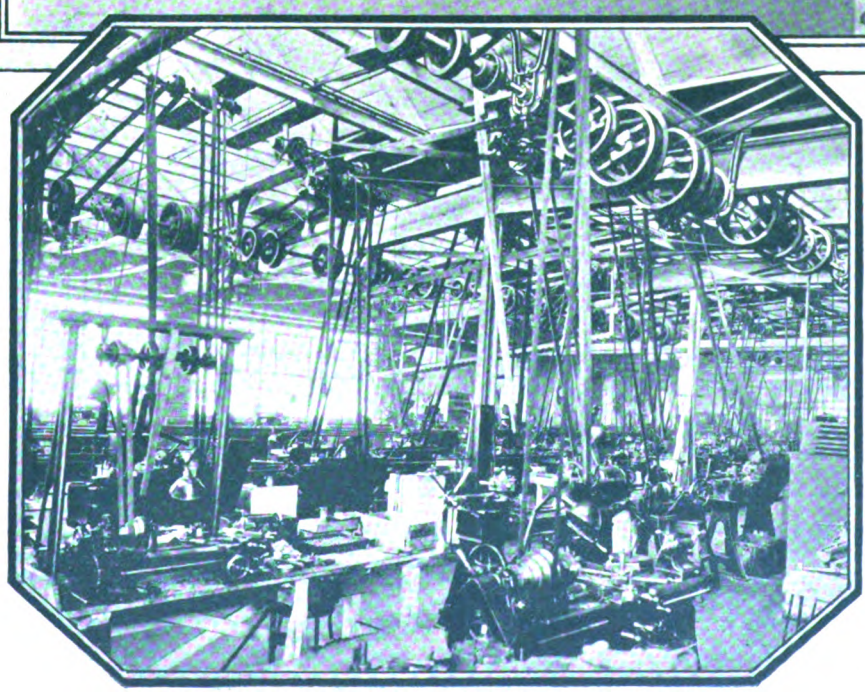
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Is Your Power Transmission System Up-to-Date?

Both Power and Maintenance Costs Are High on the Haphazard Layout

By William Staniar
Belting and Transmission Engineer, E. I. DuPont de Nemours & Co.



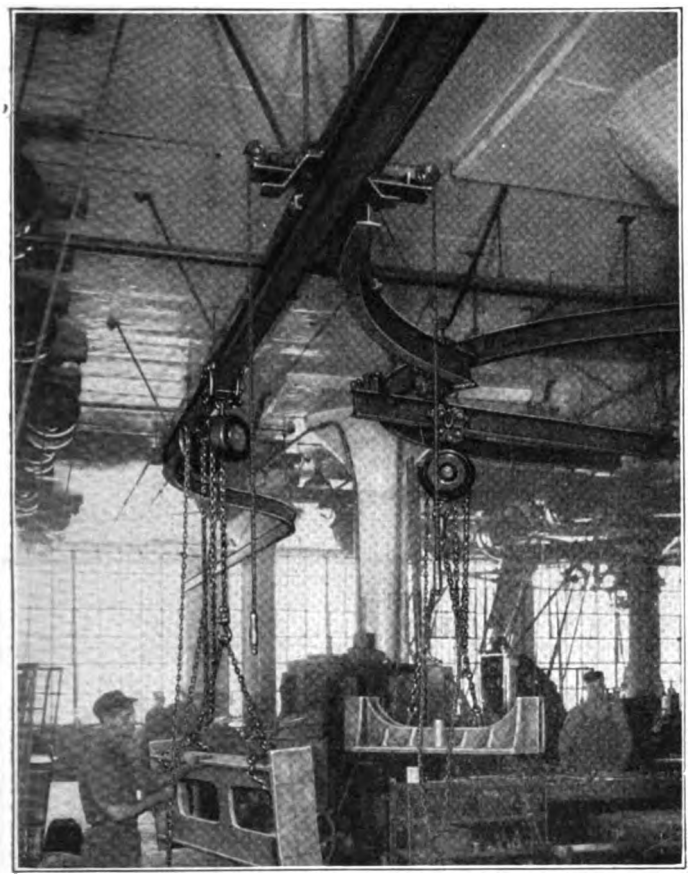


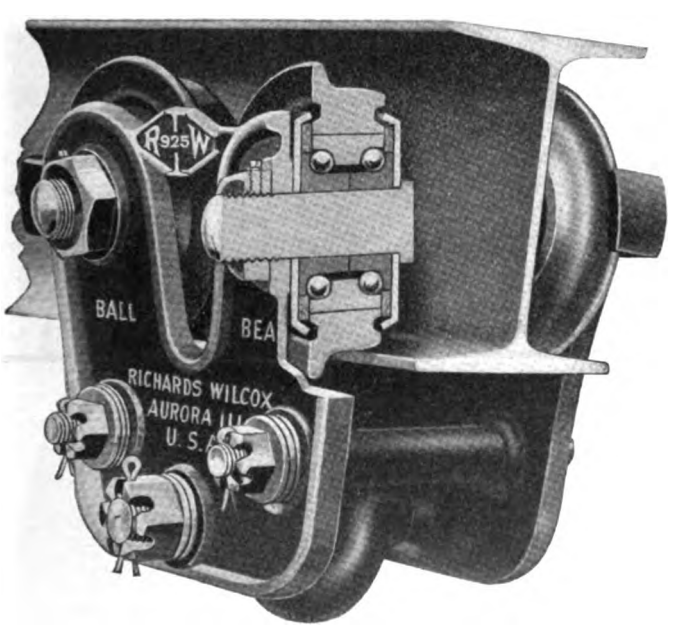
The two illustrations on this page are not "before and after" views of the same plant; they are views of two different ways of doing things, in two different plants. The upper one shows a modern transmission system, utilizing the group drive idea. It is thoroughly up-to-date, well planned, and efficient.

The lower view, selected at random, shows a condition which is all too prevalent in many of our industrial plants. Either through unplanned growth, or through lack of knowledge, such transmission systems are permitted to exist; wasting as much as twenty per cent. of the power generated, and adding to this waste a maintenance cost beyond all reason.

What would a picture of *your* plant show?

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"An I-beam track runs from the shipping platform, over scales, to the freight elevator. In the fourth floor machine shop the track serves the castings supply, planers and drill presses from the freight elevator. Switches and gating with radial track arms enable us to handle parts right onto the planers without the delays caused by blocks, jacks, etc. On the assembly floor 4 radial units are used.

"Although used only intermittently, this OveR-Way system has already more than paid for itself in pay-roll savings alone. In our old plant 12 men handled heavy parts; 3 men now do as much work. With the R-W system 2 men can move a 2-ton casting in an hour; if done manually this would take 5 men at least 4 hours, or a total of 20 man-hours—so we save 90% in handling time. This speedier handling also speeds up production.

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"Although of 1-ton capacity, the OveR-Way system easily handles 100% overloads, when necessary."

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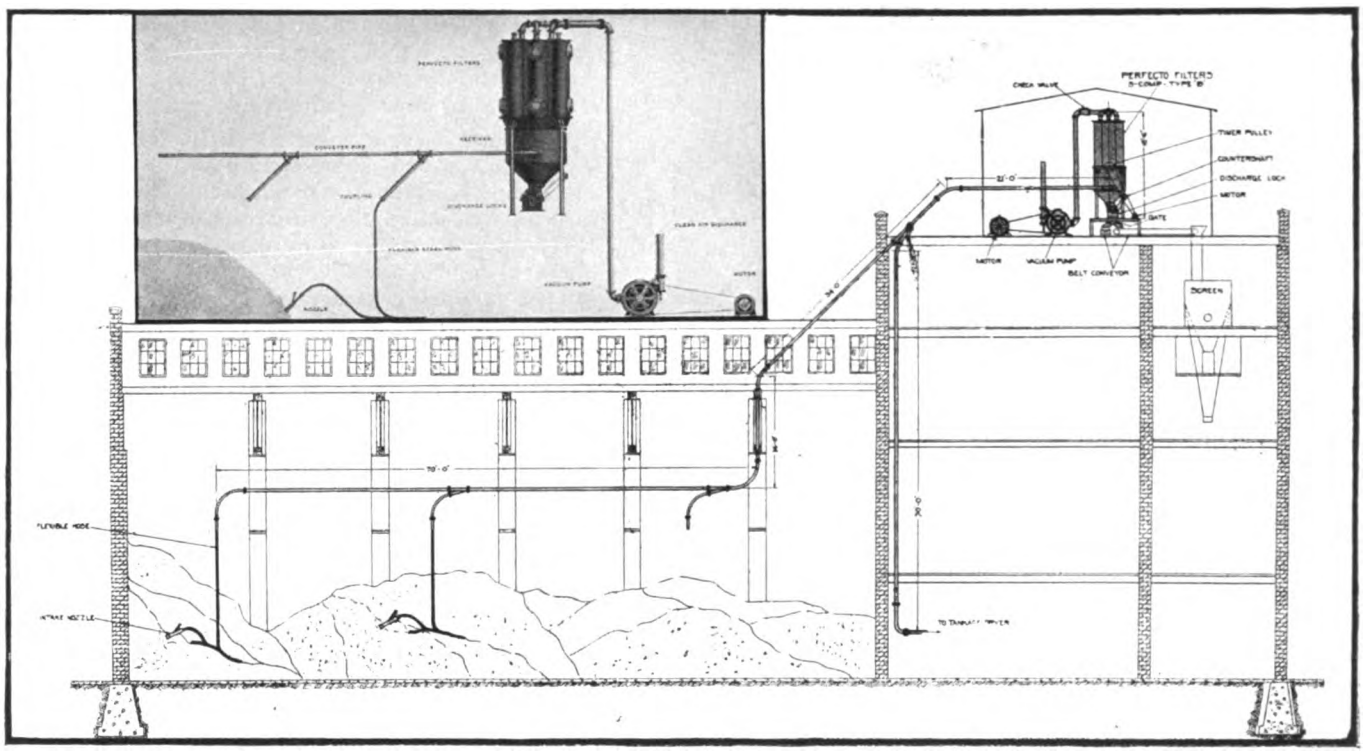
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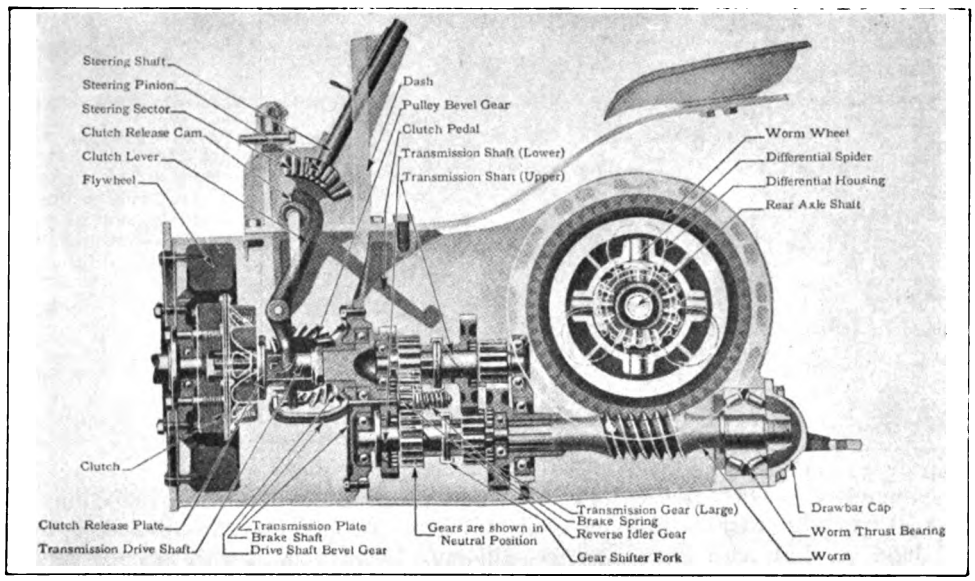


Fig. 1. Transmission and clutch assembly of a modern tractor showing complete details of construction, the extensive use of ball and roller bearings, and the practicability with which all parts can be lubricated.

How to Lubricate Trucks and Tractors

II—*The Transmission, Wheels, and Chassis Parts*

By Allen F. Brewer

IN order to complete this discussion of industrial truck and tractor lubrication as begun with the engine and electric motor in a recent issue, those other wearing elements, such as the transmission, differential, steering mechanism, universal, wheel bearings and so forth require consideration. Too many operators are of the opinion that the engine and the motor are the primary elements requiring lubrication. To be true, they are most important factors, but merely taking care that they are properly lubricated is no insurance that the entire machine will function effectively and economically. These elements are but the means of developing the power necessary for operation. This power, in turn, must be effectively transmitted to the driving elements and these latter must, in turn, function with a minimum of bearing friction, otherwise marked power losses may accrue with direct waste of fuel or electrical energy.

In effect we must go beyond the power plant, for the lubrication of power transmission equipment on the truck and tractor, as well as such other wearing elements

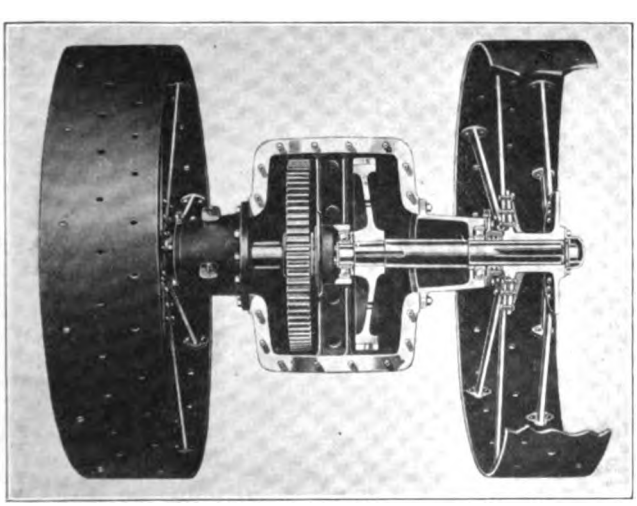


Fig. 2. Sectional view of a tractor rear axle. Note enclosed final drives, the ball bearing shaft mountings, and the dust-tight and oil-tight case.

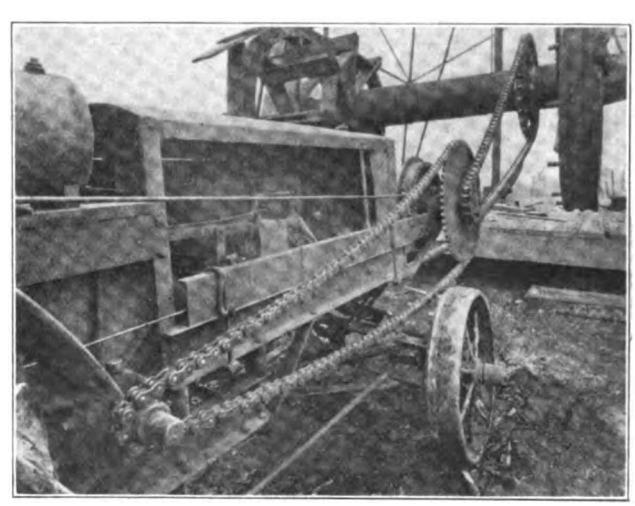


Fig. 3. A modern tractor winch in action pulling casing. Conditions of this nature call for the best of lubrication, especially on those parts which are exposed to dust, dirt and the weather.

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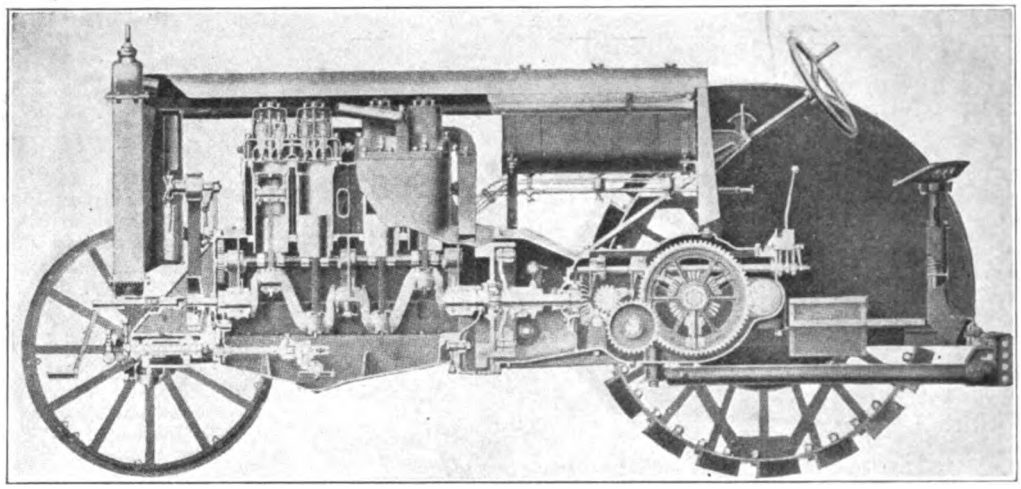
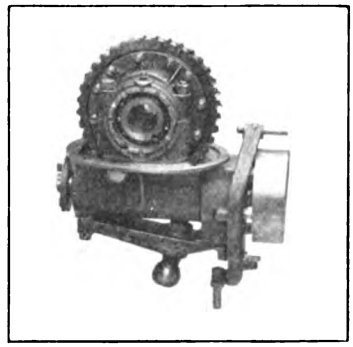


Fig. 4. Sectional elevation of a tractor of the internal combustion engine type. Note relative position of transmission and final drive connections with respect to the engine.

involving friction, is easily as important as that of the former. In the gasoline industrial truck or tractor, just as in the automobile, we will have to deal with some means of bringing about speed changes in the transmission of power from the engine to the tractive elements. Most commonly will this involve an arrangement of reduction gears, although the friction transmission is practicable and extensively used on certain machines.

From a lubricating point of view the geared transmission will require more consideration, due to the fact that both gear and bearing lubrication is involved. As a result in many cases it will be necessary to use different lubricants for these elements.

Fig. 6. The driving unit of an electric industrial truck, consisting of a worm, worm wheel and differential. Note that the latter is removed from the power axle. Details of the ball bearings and housing are plainly shown.



The fact that the frictional transmission eliminates the necessity for gears is, therefore, an advantage, inasmuch as we will only have to deal with bearing lubrication. We must not forget, however, that the differential or final drive of most types will, as a rule, involve an arrangement of gearing or chain connections.

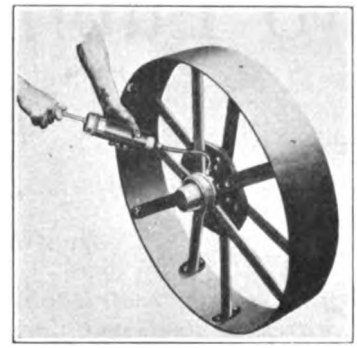


Fig. 5. Pressure lubrication by means of an Alemite grease gun on the front wheel of a tractor. Positive lubrication for a considerable period is thus assured, with but relatively little possibility for the entry of foreign matter.

Of course, where a lubricant must serve both the gears as well as the bearings a dual problem may frequently be involved, for such a product must not only be capable of protecting the gear teeth against wear, but it must also be light enough to penetrate throughout the bearings, whatever their design, and furnish the requisite oil film without any abnormal develop-



Fig. 7. Showing how the gear housing should be periodically lubricated in an electric industrial truck. Note the ease with which this is accomplished.

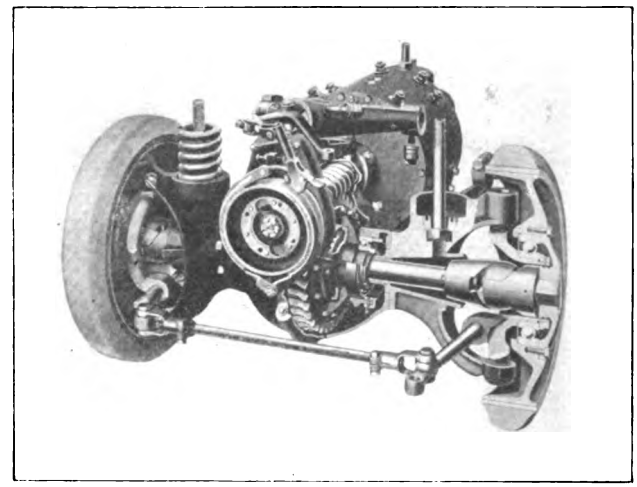


Fig. 8. The power axle of an industrial truck and tractor. Note the worm drive and the usage of self-aligning ball bearings. The compactness of this installation is a feature. There is practically no possibility of lubricant leaking out, or dust or dirt gaining entry to impair lubrication or lead to premature wear.

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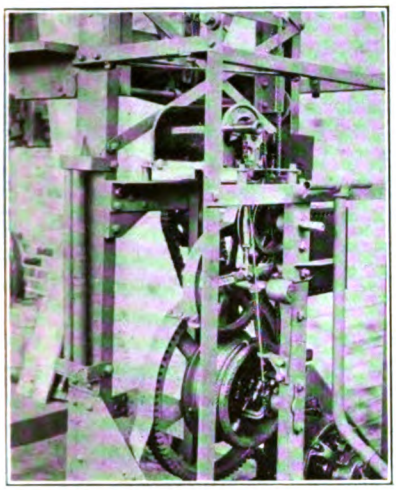


Fig. 9. The working details of an electric industrial truck and hoist. Here gears, chains and wire rope are in part exposed, therefore, careful lubrication and periodic cleaning is essential. This is an extremely practicable device in any industrial plant, and is capable of giving remarkable service as a labor saver.

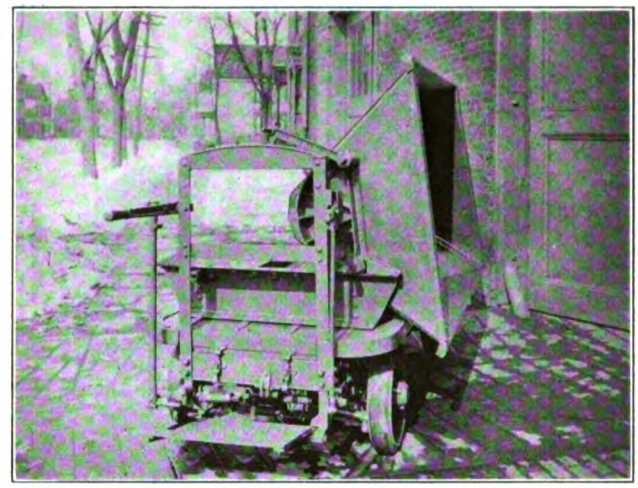
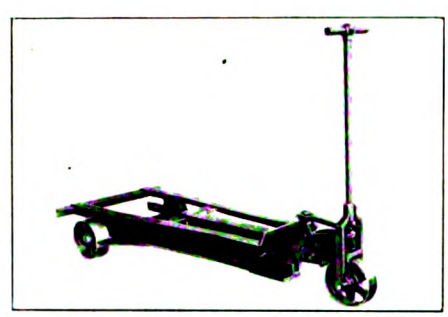


Fig. 10. An example of the service which an electric industrial truck will frequently be called upon to undergo. Where atmospheric conditions are abnormally cold, of course the most careful attention must be paid to selecting lubricating oils and greases of suitable fluidity to withstand the congealing tendencies of low temperatures.

ment of internal friction. This, of course, applies to the lubrication of both transmission and differential gearing. Just how heavy such a lubricant for such service should be will depend on the constructional condition and the type of bearing involved. Certain installation having enclosed ball bearings on the gear shaft will in all probability function best on a straight mineral tractor oil. Others, wherein similar bearings are used, but so located that they can be lubricated independently of the gears, will call for oil lubrication of the latter as above, and for grease lubrication of the bearings by means of some form of pressure lubricators.

It is, therefore, evident that gear and bearing lubrication in both the transmission and differential may frequently require considerable care and attention in the selection of the lubricant by reason of the varied conditions which are involved. We can generally assume, however, that whatever the grade or grades of lubricant used, due care should be taken to see that they are not of abnormally high pour test and that the gear cases are not filled too full.

Fig. 12. Side view of a hoist truck showing plainly the arrangement of gears involved, the wire ropes, winding drums, and other mechanisms. Wherever gears are exposed of course care must be taken to select gear lubricants which will adquately resist not only the throwing-off action of centrifugal force, but also as far as possible any tendency to ball-up when contaminated with foreign matter.



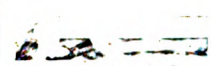


Fig. 11. An industrial truck of the hand type known as a transveyor. To facilitate the easiest rolling the wheels are mounted on ball bearings.

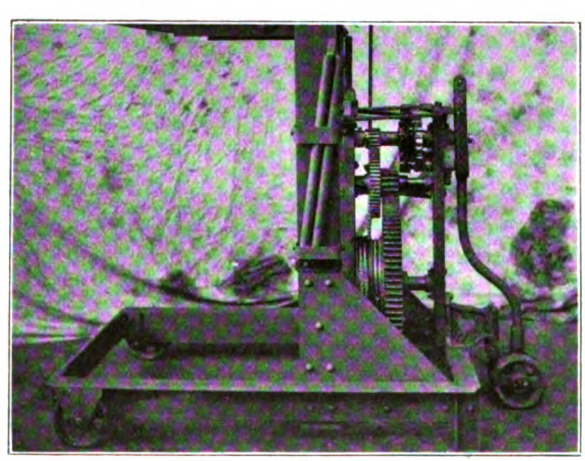
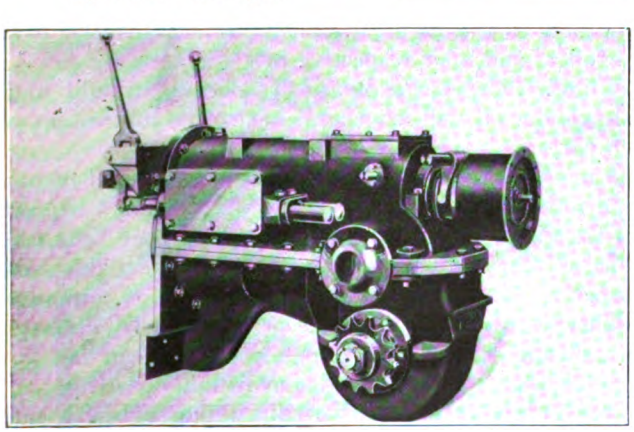


Fig. 13. View of the transmission of a gasoline locomotive. By virtue of its compactness and construction such a transmission is virtually oil-tight and dust-tight.



Low pour test is very essential in cold weather. If an oil does not have this characteristic, that is, if it does not remain sufficiently fluid under low temperature operation the gears may simply form channels in the congealed mass and any lubricant which is thrown to the walls of the gear case may not have the requisite fluidity to return readily to the base. All this may not only preclude effective lubrication and give rise to excessive friction and wear, but also it may require more power in the operation of the gears, especially on starting.

In regard to the differential or final drive, it is interesting to note that while certain of these will be housed apart from the transmission, others will be confined within practically the same housing to form a unit installation. Here it is often practicable to lubricate all the necessary mechanisms with the exception of externally located bearings simultaneously with one grade of oil.

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In addition, there will be also certain types of differentials or final drives wherein the gears and chains will be exposed. This, of course, renders the problem of lubrication relatively difficult, due to the necessity for not only lubricating the wearing elements but also for protecting them against moisture, dust and dirt. A lubricant for such service must be of sufficient body and adhesiveness as to not drip, ball-up or be thrown off by centrifugal force, otherwise it will defeat its object and render re-lubrication a frequent and expensive procedure.

Electric-driven equipment in turn will in general require but a differential or set of final drive gears, there being no necessity for transmission or speed change gearing, such variation being regulated by the electric control equipment. In general, there will be close connection between the motor and driving elements.

Driving gear lubrication in an electric truck or tractor is frequently a problem of serving both the gears and

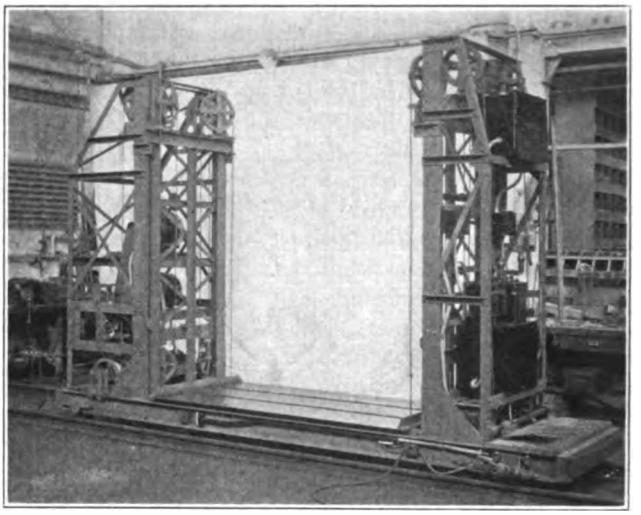


Fig. 14. A type of electric industrial truck of the hoist type. Here again the utmost care must be taken to protect all external wearing parts from the action of abrasive foreign matter by means of effective lubrication. Hoisting cables and sheaves in particular must be protected by a suitable wire rope compound capable of sticking tenaciously, penetrating thoroughly, and resisting any action of heat, water or chemicals.

bearings with the same lubricant as is the case with many types of gasoline or kerosene tractors.

Roller and ball bearings are extensively used to carry the shafting involved, therefore the lubricant used must not only be adaptable to the tooth pressure which may occur but also capable of furnishing the maximum of protection to the highly polished surfaces of the balls and rollers and their respective race-ways.

A light transmission grease or a heavy straight mineral cylinder oil will in general insure the lubrication of such parts.

In many of these installations the builders will recommend renewal of the lubricant, but once a month or even less frequently, where housings are of proper tightness. Twice a year they suggest draining in much the same manner as we would drain the gear cases of our automobile, the system at that time being flushed with kerosene, flushing oil or a light motor oil to clean out any accumulation of gummy matter or metallic particles.

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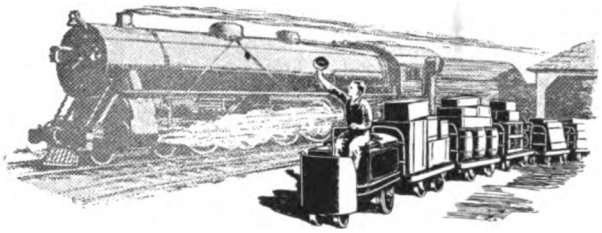
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gear cases. On most installations the lubricants should be carried at the level of the filling opening. Any marked decrease will as a rule be indicative of leakage via certain of the joints. Carrying the lubricant too high, however, may result in excessive power consumption especially where a fairly viscous lubricant is used or operating temperatures may be relatively low.

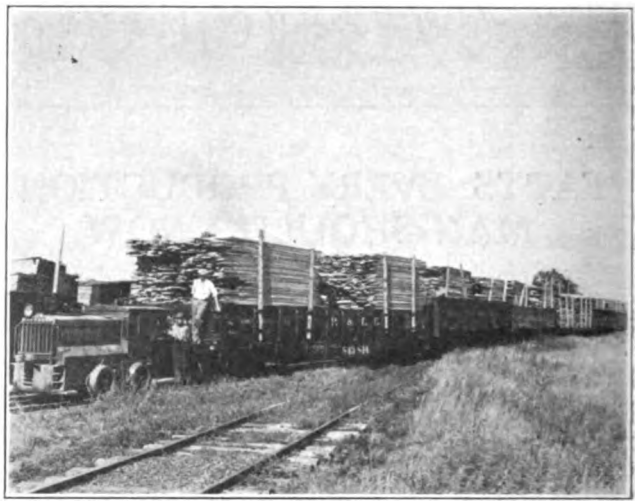


Fig. 15. An example of the service which a gasoline engine locomotive is capable of. Where loads of this character must be handled it is most important that all wearing parts are effectively lubricated, especially those which are externally located and subject to the entry of foreign matter.

It is therefore advisable to look into the pour test of such products when selecting them for gears and main drive units of industrial electric trucks and tractors. This factor is indicative of the relative sluggishness of any lubricant at lower temperatures.

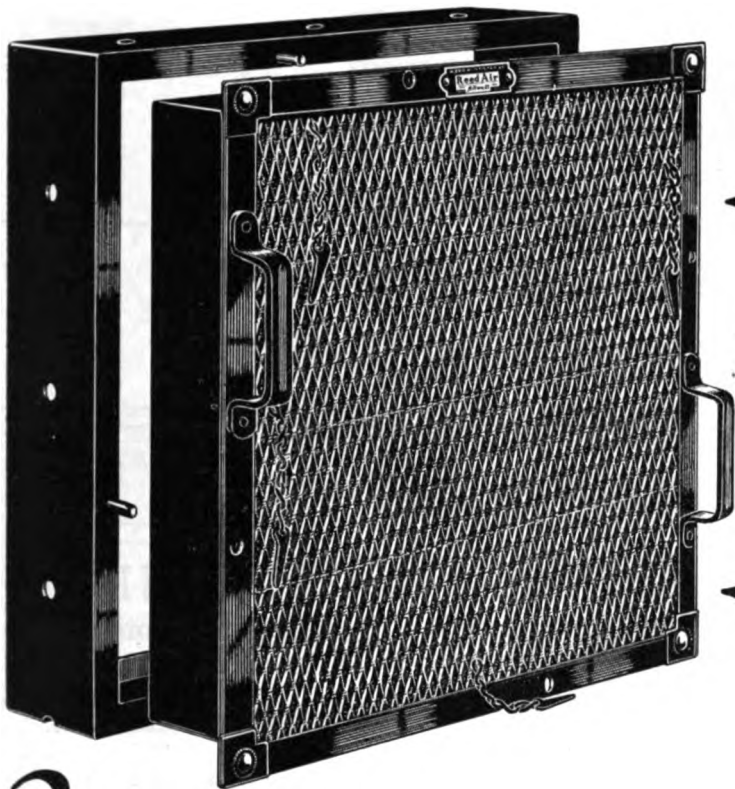
By pour test we mean that temperature at which a lubricant will cease to flow. In a gear case for example, in cold weather a lubricant of high pour test would probably simply channel when the gear teeth pass through it, being so inert as to be unable to readily flow between the teeth or back to its proper level.

Lubrication of other parts on both the gasoline and electric-driven truck or tractor is a grease proposition. Varying in frequency, from perhaps once a week, for the steering mechanisms to twice a year for wheels, bearings, etc., such parts are generally lubricated by means of pressure, the grease being forced in by compression cups or by some form of hand or mechanical pressure unit. In many ways such lubrication is therefore quite similar to that of the automobile chassis.

The industrial truck or tractor, however, will perhaps get better lubricating attention than the average family motor car. It is in many instances part of an industrial plant, and as such is usually subject to rigid engineering supervision, inspection and lubrication.

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REED PERFORMANCE HAS SET THE STANDARD



✦ Highest Cleaning Efficiency

✦ Lowest Operating Resistance

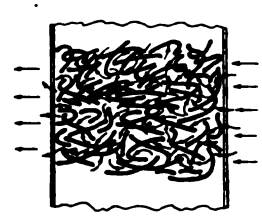
✦ Largest Dust Capacity

3 reasons for REED preference

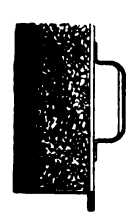
THOSE who know the requirements of permanently successful air filtration always demand these three essential qualities. Five years of research and tests have conclusively proved that no other medium so successfully meets *all three requirements* as split wire (steel wool) used in Reed Air Filters exclusively. This medium insures positive contact of all air streams with the adhesive-coated filaments, thus accounting for the unusually high cleaning efficiency of Reed Filters.

Economy of operation depends, of course, on the degree of *operating resistance* and *not* on *initial resistance*. A filter can be built with an unusually low initial resistance but have such a rapidly increasing operating resistance as to make it impracticable for commercial use. Because of the scientific graduation of media, Reed Air Filters maintain the *lowest operating resistance over the longest possible time* and insure maximum dust capacity besides.

The Reed Blue Book tells the whole story. Send for it without obligating yourself—using the coupon for convenience. Whether you want clean air for general ventilation or highly technical purposes, this book will be of real value.



Countless deflections of innumerable air streams impinging upon the adhesive-coated media insure maximum dust removal.



A scientific graduation in density of media, in ratio to dust elimination requirements, insures lowest operating resistance and maximum dust capacity.

REED AIR FILTER COMPANY, *Incorporated*
211 Central Ave., Louisville, Ky. *Offices in Principal Cities*

Reed Air

TRADE MARK

filters ALL METAL

REED AIR FILTER CO., Incorporated
211 Central Ave., Louisville, Kentucky
Send, without obligating me, a copy of the Reed Blue Book.
Name ..... Company .....
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Eight Durand Features

1: Patented two-piece hinge.
2: Patented multiple locking device.
3: 16 gauge steel door flanged on four sides.
4: Drop forged handle.
5: Durand-Bell Pin Tumbler Lock.
6: Three standard finishes: Olive Green and Gray Enamel or Black Japan.
7: Parkerized rust proof hooks.
8: Choice of four approved types of ventilation.

The Durand Patented Hinge

shown in the encircled inset is the strongest and least conspicuous.

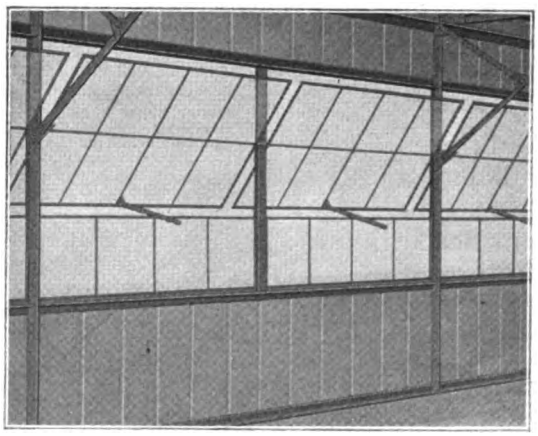
Swing the door open to an angle of 170 degrees and observe how the Durand hinge absorbs the shocks. Take advantage of the Durand representative's invitation to a ride on a Durand locker door. It'll carry you without danger to you or to the door



DURAND
Steel Locker Company
33 South Clark Street
Chicago, Ill.
Representatives in all principal cities.

Ask for Catalog 21. It describes and illustrates Durand advantages.

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for Every Factory Requirement

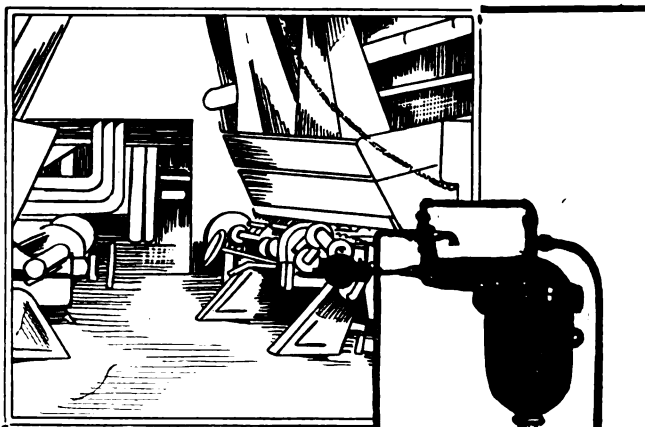
Shops, warehouses, boiler rooms, foundries and machine shops are now being made from Martin Standard Buildings.

Assembled easily, they are made of steel and can be used for years with very little maintenance.

Shipped completely fabricated, with doors, windows, sash, etc., ready to set up.

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The Martin Steel Products Co.
160 Longview Ave., Mansfield, Ohio



You Are Paying For This Protection Why Not Use It?

As long as you depend on hand regulation of boiler feed water you are paying a high premium. The risk against loss of life and property is enormous.

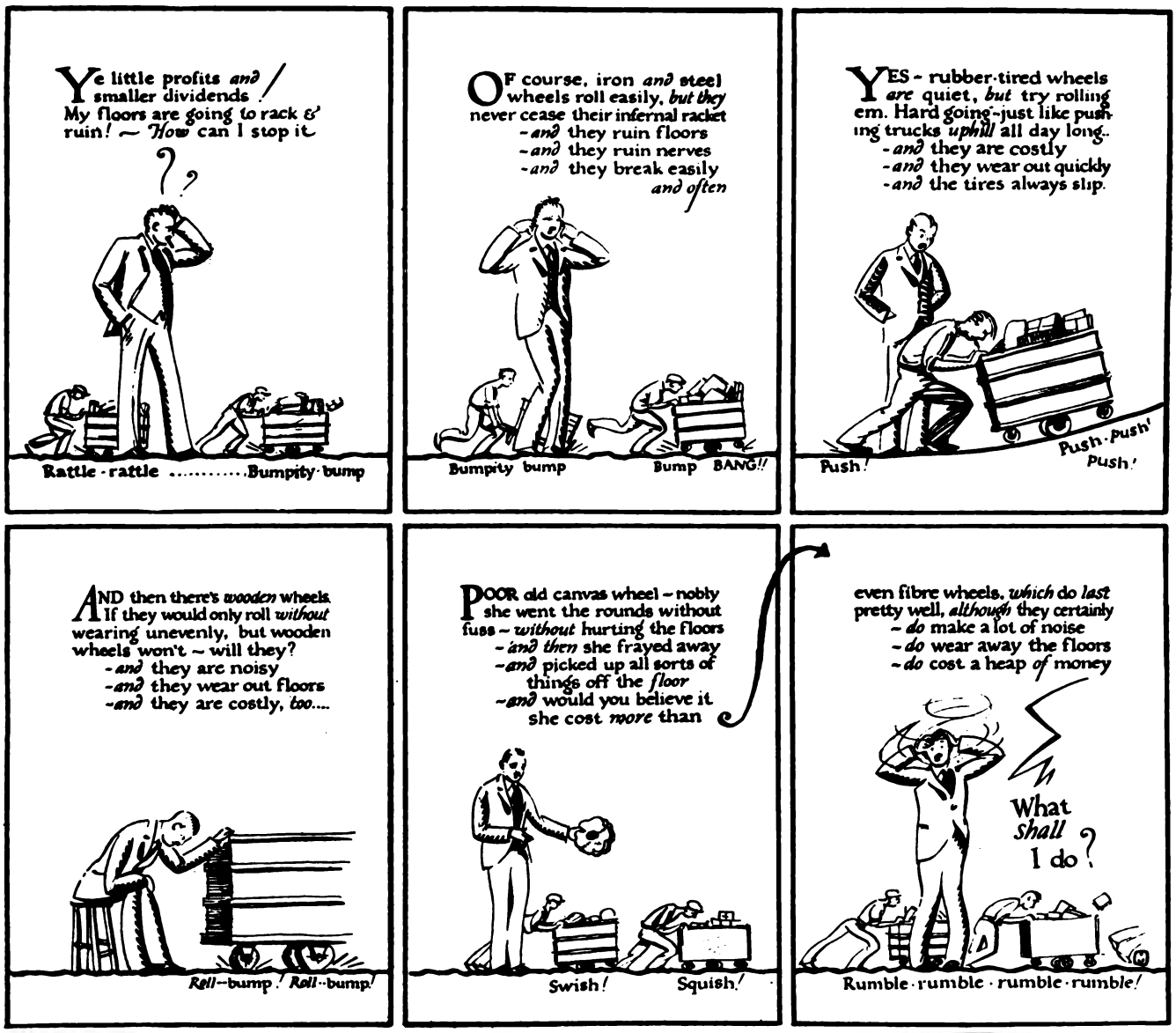
A VIGILANT Feed Water Regulator is the cheapest insurance you can buy. It works automatically—controlled entirely by gravity—no floats, tubes or diaphragms to get out of order.

Is there any reason why your plant should not be safe at all times?

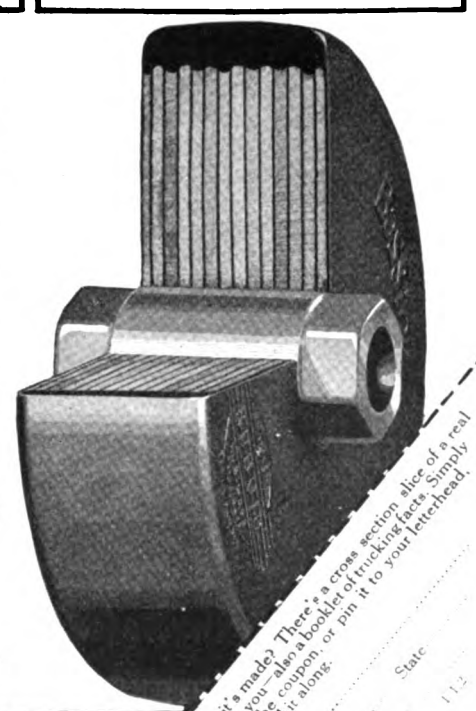
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NOW—here's your answer—*Bassick Ruboid Wheels.* Never before has there been such a satisfactory truck caster wheel at such a reasonable price. Bassick Ruboids are new in construction, materials, performance. They roll easily, quickly, smoothly, noiselessly, without harm to floors. Mail the coupon to get the full facts.



Bassick SEAMLESS RUBOID RUB-WOOD **Wheels**

PAT 1458 379 REG U.S. PAT OFF.

THE BASSICK COMPANY . . . . . Bridgeport, Conn.

See how it's made? There's a cross section slice of a real wheel for you—also a booklet of trucking facts. Simply fill out the coupon, or pin it to your letterhead, and send it along.

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Ruboids Roll Easily ~ ~ Silently!

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Cutting Construction Time in Two

How Concrete, Plus Mechanical Methods, Has Revolutionized the Building Art

By Earle Duffy

"SEND over the steel for the sixth floor," telephoned the construction engineer in charge of the erection of a 19-story reinforced concrete coöperative apartment building in Chicago. The next day an order came for the seventh floor steel and in rapid succession further orders came at intervals of one to three days.

Now in the building industry reinforcing steel is not required every day or so for an entire new floor. At least it usually isn't. But this case was different. Soon the curiosity of an official of the steel firm was aroused, so aroused in fact that he paid a visit to the scene of construction.

And this is what he found —a new world's record in the erection of a reinforced concrete building of this type was actually being made before his very eyes! Not only were the workmen completing the skeleton, but concrete floors were also being laid as the building leaped skyward.

No scene at all akin to the helter-skelter house raising of pioneer days, no pandemonium of mingled shouts and scurrying figures greeted the steel man. On the other hand, the workmen were moving about much as on the ordinary job. They seemed unaware that they were adding an important page to building industry history.

Wherever the steel man looked he saw modern machinery handled by men who knew what they were doing. From the turn of the concrete mixer to the final dumping of the concrete from the two-wheeled buggies into the forms, not a movement of man or machine was wasted. Yet, workmen just as steady and as industrious, and machinery just as up-to-date, may be found erecting other buildings where the speed of construction is not quite so great as it was in the construction of this apartment building.

What, then, was the reason for this unparalleled building speed? Suddenly the steel man noticed something that had escaped his attention before. Where other builders were accustomed to use two and not more than three complete sets of story forms, four forms were being used on this building. While placing the concrete for the tenth floor, the forms were being removed from the seventh floor, preparatory to erecting them on the eleventh. In other words, the placing of concrete was a continuous operation with no delays between the form removals and placements. And this



Fig. 1. A ton and a half of concrete is dumped on the road bed every two minutes by the large bucket which travels on a boom. With modern paving mixers highways may be built twice as fast as they were 10 years ago.

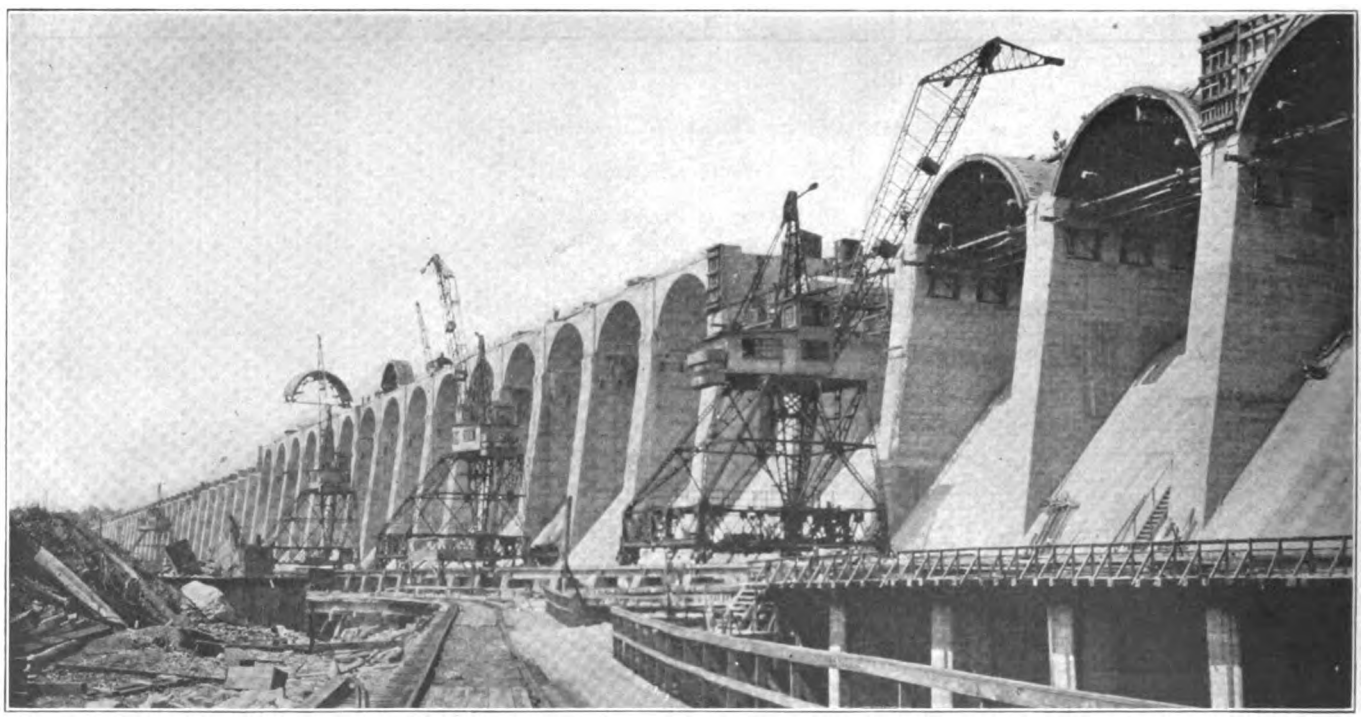


Fig. 2. The inventions of the last twenty years have made it possible to erect such gigantic concrete structures as the Wilson Dam at Muscle Shoals, Alabama. This dam is 4,900 feet long.

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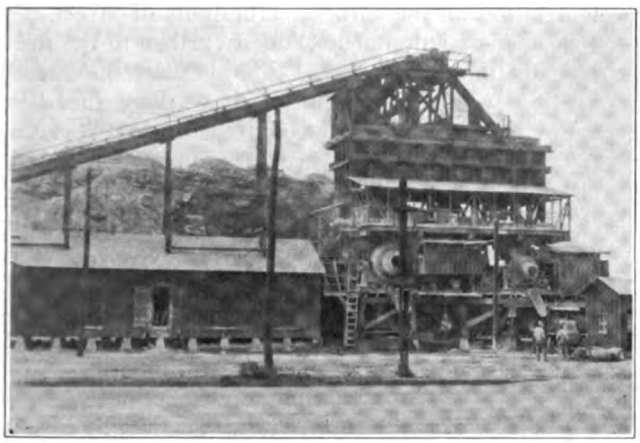


Fig. 3. Enough ready mixed concrete to construct a curb stone or an office building may now be purchased by the builder at the permanent central mixing plant. Many other cities have plants similar to this one at Birmingham, Ala.



Fig. 4. Only approved methods of concrete construction are being used in the building of the three-quarter mile long Wacker Drive. Thousands of tons of traffic will be diverted daily from the busy loop over this sturdy structure of steel bars and concrete.

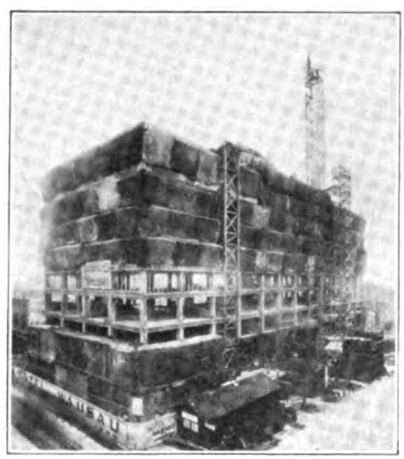


Fig. 5. An actual saving of five months' time is made by the builder who takes the few simple precautions which permit just as good construction in winter as in summer. The Hotel Wausau was built during a typical Wisconsin winter.

was all due to one simple detail—the use of an extra form.

A few minutes of close observation further revealed to the steel man a synchronization of men and machinery that would do credit to the maker of clocks or of automobiles. The use of the additional concrete form, for instance, was just one detail that alone saved a great deal of time. The regular rise and fall of the elevator carrying the concrete buggies was another evidence of this cooperation. Yet behind all this was the planning of the builder who knew when to order his reinforcing steel; who knew how to avoid costly delays by having his materials on hand when they were needed. Synchronization such as that obtained in the erection of this apartment building is as important in the economical building of the factory as it is later to profitable operations within the structure's walls. It spells good management.

Throughout the building industry may be found hundreds of other instances of rapid construction, construction that combines thoroughness of workmanship along with rapidity. The change from antiquated methods has been gradual, so gradual in fact that many of us have failed to notice it at all. Yet an actual comparison of construction figures shows definitely that factories, office buildings, homes, dams, bridges, pavements and other structures are being built twice as fast today as they were 10 or 15 years ago!

Speedy construction in the bustling loop district of Chicago would seem an impossibility, yet the skeleton and floors of the 12-story reinforced concrete Hartman building were completed in 65 working days—more than a story a week. Seventy-five thousand people tramped daily through the



Fig. 6. Conveniently placed materials, efficient workmen, and improved machinery are necessary for rapid construction. This is the Marietta Street building, Atlanta, Georgia.

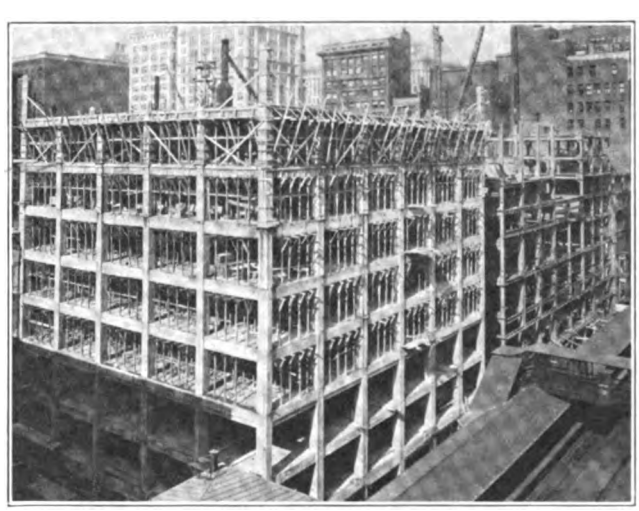
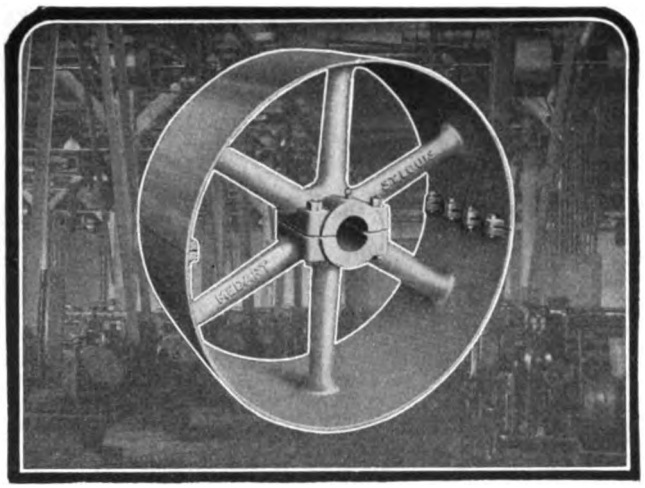


Fig. 7. Along this corner runs an elevated railroad, a street car line, and thousands of automobiles, all in addition to countless pedestrians, yet the frame work and floors of the twelve story Hartman Building, Chicago, were erected in eleven weeks.

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2 in. to 16 ft. Diameter

Cast Iron Pulleys! Standard or special. Any diameter up to 16 ft. Any face up to 50 in. Crown or straight. Any wanted bore. Solid, split or clamp hub. Single-belt, double-belt, triple-belt or extra heavy. With set screws or keyways, or both. Any quantity. Speedy service. That's Medart—one of the first manufacturers of cast iron pulleys in America.

Cast Iron Pulleys are widely used in general service and are particularly adapted to special design requirements. Medart shops have an immense assortment of patterns, modern molding machines, foundry equipment and complete machining facilities—one of the reasons for Medart Service reputation, 47 years old.

Besides cast-iron pulleys, the Medart pulley family includes Steel-rim Pulleys; Split-wood Pulleys; Iron-spider, Wood-rim Pulleys and Hercules All-steel Special Heavy-duty Pulleys.

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Everything in Line Shafting Equipment

elevated station on the corner. Hundreds of street cars and thousands of automobiles added further to the mass of traffic on the two streets. For all that, the speedy construction went on because of these three measures adopted by the contractor: an exact schedule of work and deliveries, an efficient labor organization, and time and work saving methods of handling materials.

So with the lessened building time, the builder of the factory, the home, or the office building may all profit, for in construction work time is the greatest enemy of economy. This is illustrated by the experiences of a Buffalo stove making firm whose entire plant was destroyed by fire during the heavy manufacturing season. Predictions were that the company would not be able to rebuild and begin operations in time to fill their contracts. At the end of two months stoves were again being made in a block long reinforced concrete factory building built with methods similar to those used in



Fig. 8. Modern cement manufacturing methods have not yet appeared in the Valley of the Kings where grinding practice has remained the same for untold centuries. Many turns of this stone wheel are needed to crush the cement rock into bits preparatory to burning in their old style kilns.

erecting the Chicago apartment building. The fall contracts of the stove company were filled.

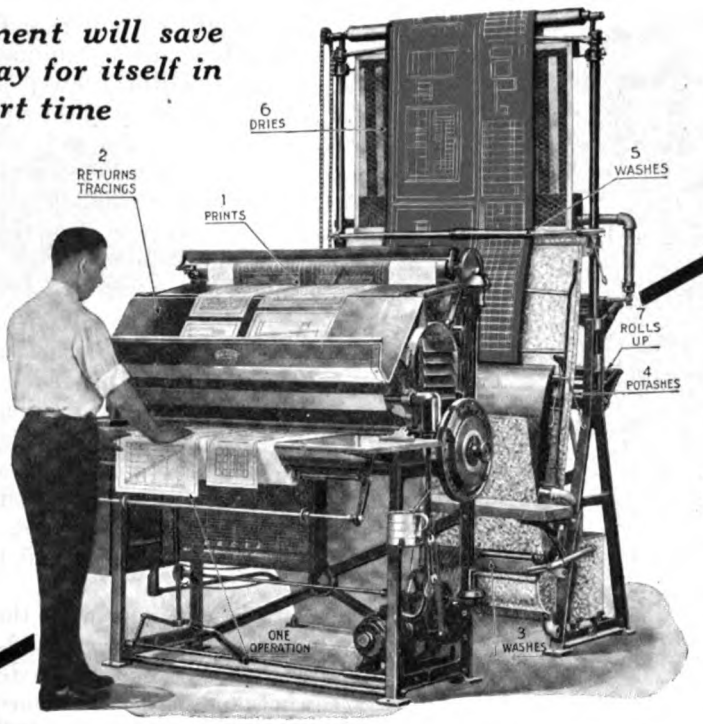
Back in 1910 when better road building was just getting a start, it took a month to lay a mile of concrete pavement. In those days when industrial auto trucking was in its infancy, a road building job of three miles was the talk of the country. Today a mile of concrete highway may be built in 15 days and it is nothing unusual for a 15 or 50-mile contract to be placed. And what is of greater importance is that most paved roads of today are of a uniformly high quality and are as carefully and scientifically constructed as a skyscraper.

From the first experimental use of concrete in paving at Bellefontaine, Ohio, in 1892, the United States has developed the greatest system of concrete paved roads and streets in the world. By the end of 1925 there were some 50,000 miles of concrete ribbons threading in and out cities and towns and out into the open country beyond. What a joy such a highway program would have been to those early good road boosters, Claudius Appius and Julius Caesar; for in their time it took several thousand men to construct a mile of stone road in one year.

More and more builders are coming to realize that the winter's drop in temperature does not mean a check or a halt in construction work. Nowadays it is not unusual to see a reinforced concrete building being erected with heavy canvas enclosing the walls to keep the

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This equipment will save enough to pay for itself in a short time



Pease Peerless Continuous Blue Printing Equipment



Free Catalog Shows How to Cut Blue Printing Costs

NO matter how many blue prints you use in a year, write for this catalog. It is a regular encyclopedia of blue printing information. Pictures and describes the complete Pease Line. No obligation.

"Will it Pay Us to Make Our Own Blue Prints?"

THAT is the question you want answered—and answered truthfully before you consider the installation of your own blue printing equipment.

Thousands of users of blue prints could make substantial savings if they had their own equipment. But they have never investigated the Pease Method. As a result, they are losing hundreds of dollars every year by making blue prints the old, slow method or by sending the prints out to be made.

Save Many Dollars

Pease Blue Printing Machinery will save you many dollars if you can keep it busy but a few hours each day. In fact, the equipment will pay for itself in a surprisingly short time.

With a Pease Blue Printing Machine you can turn out finished prints, on Pease non-fading blue print paper—printed, washed, potashed, dried and ready to use—in *one-quarter* the time it takes with any equipment using independent methods of washing and drying. If you need prints in a hurry, you can depend upon a Pease turning them out. There are no delays. Think of the convenience of having a machine like this at your call.

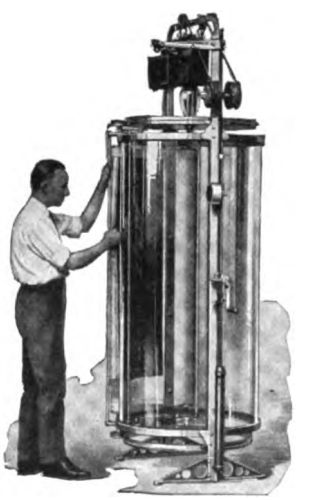
Prevents Errors

When you make your own blue prints, you reduce the possibility of errors to a minimum. You can check every operation, watch every job. You can prevent misunderstandings as to quantity ordered and fix responsibility for using the right tracing. If you send tracings out for blue prints, an error is rarely detected until the finished prints are returned. And then they have to be done over. That means more *lost time.*

There is nothing complicated about the Pease Method. An intelligent office boy can soon learn to operate it. Nothing to break or get out of order. No open wash trays—no wet floors. Low operating costs.

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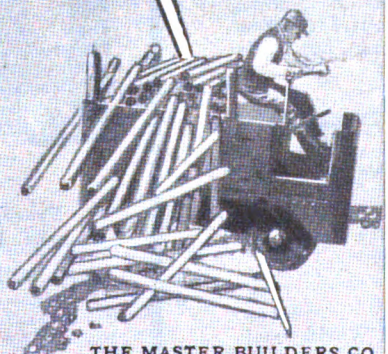
Will mend a hole like this Saturday, ready for use Monday

Use Quickfix Concrete for emergency jobs like Machine Foundations, Platforms, Driveways, Stairs, etc. Gives the ideal wearproof, dustproof, waterproof surface, ready for use in 48 hours.

QUICKFIX makes a permanent concrete patch of flint-like hardness in only 48 hours. Ordinary concrete patches block traffic and delay production for ten to twenty days while they harden. With Quickfix you can Patch the Floor Saturday and Open it Up to Traffic Monday. No costly delays or interference with plant's operation.

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Gentlemen: Send us complete information about:
QUICKFIX—for making permanent, wear-proof concrete patches in 48 hours.
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warmth from the coke fed heaters within the structure. Winter construction means a continued income for the workmen and the saving of interest on the owner's investment. Among the many large structures that have been built in winter are the Lake Placid Club, New York and the American Furniture Mart at Chicago, the world's largest multi-story building. So builders, by ignoring the winter taboo have actually added five months or more to their building year.

Around the queer shaped mass of iron and steel which forms the concrete mixer is gathered a romantic story of a development that had its beginning in ancient times when make-shift shovels were wielded by early Romans and Carthaginian workers in making crude concrete. After the fall of Rome the knowledge of making hydraulic cement disappeared for several hundred years. In 1756 the art was revived by John Smeaton, who succeeded in making a natural cement, which he used in building the Eddystone lighthouse off the coast of England.

Smeaton's efforts gave impetus to the discovery of the method of making Portland cement by Joseph Aspdin in 1824. This English stone mason found that a much stronger cement could be made by burning and grinding raw materials proportioned, not by nature, but by hand. So when the manufacture of Portland cement, so called because of its resemblance to stone from the Isle of Portland, grew to be a prominent industry throughout the world, it became necessary to develop machinery that would facilitate the use of this easily molded stone.

So the concrete mixer was created, a machine with a revolving barrel-like contrivance which stirs the cement, water, stone, and gravel, into a mushy mass. The early mixer was fed by workmen with shovels. Today on every job of any size may be seen mixers which feed themselves by means of a skip. In pavement building the mixer generally travels under its own power right down the road bed, leaving behind it a trail of smooth



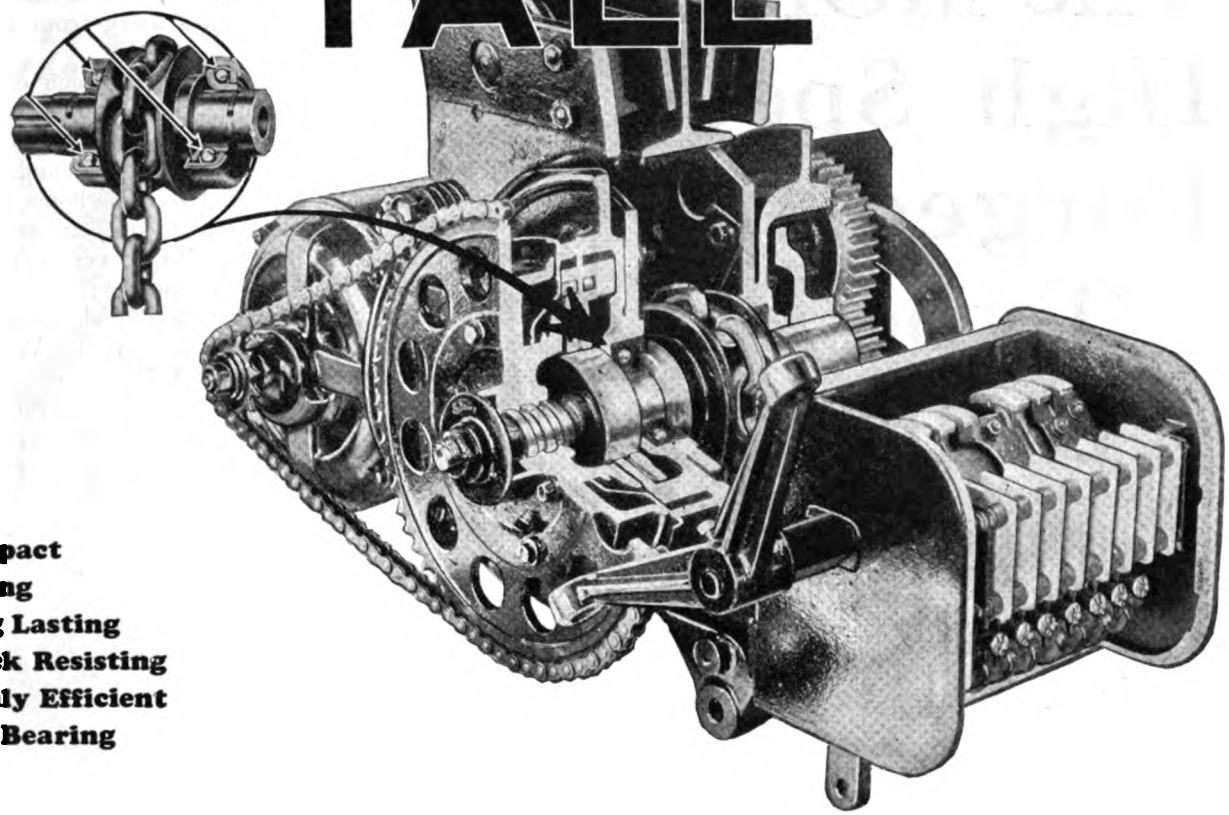
Fig. 9. Although the palace of Augustus, Palatine Hill, Rome, was built 2,000 years ago, the concrete is as firm today as though it had been mixed in a modern mixer instead of with crude shovels. Even the grain of the wood of the rough forms is still visible.

hard pavement for the constantly increasing family of motorists.

The permanent central mixing plant is another new addition to the mixer family. These permanent plants, now frequently located in cities, permit the builder to drive up and get any amount of concrete. The builder

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Long Lasting
Shock Resisting
Highly Efficient
Ball Bearing

Yale Model 20B Ball Bearing

The electric hoist that lowers handling costs

Compact!
Highest in efficiency!
Readily adjustable to:

1. All widths of standard I-Beam flange.
2. Varying headroom.
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Quickly adaptable to any existing overhead system. Side plates of trolley carriage can be spaced on steel bars to fit the desired beam flange.

Yale electrically welded steel chain, furnished for varying lengths of lift. Centralized steel suspension means a constantly balanced load on your trolley wheels and hoisting unit.

Mechanism fully enclosed in oil-tight chamber, compact and easily accessible for inspection without expert service. Ball bearing load sheave, the latest Yale development, adds a big factor for low current consumption and general all-around hoisting efficiency.

Yale Material Handling Equipment includes Ball Bearing Spur-Geared Chain Blocks, Screw-Geared and Differential Chain Blocks, Ball Bearing Electric Hoists, I-Beam Trolleys, Overhead Crane Equipment, and Electric Industrial Trucks, Tractors and Trailers.

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then obtains the benefits of quantity production and at the same time he is assured a uniform quality. Central mixing plants are also being used to great advantage on large highway projects. Concrete may be hauled for 45 minutes or as far as ten miles away from the mixer before it is used.

The concrete placing tower from which concrete is carried by its own weight to all parts of a large structure, is another modern device. Buggies of concrete are hauled to the top of the tower on elevators and the material is dumped into a hopper. From the hopper as many as four or five chutes may lead to small hoppers in different portions of the building. The concrete is then carried in carts to its final resting place.

The last word in efficiency and modernism may be seen on a visit to a large concrete project. Without the discoveries and inventions of the past ten or twenty years a structure of the immensity of the Wilson Dam at Muscle Shoals, Alabama, would never have been attempted. This structure, the largest ever built of concrete, which required 1,400,000 cubic yards of concrete, is indeed a monument to the ingenuity of man.

DISCUSSING the business outlook, the Mechanics & Metals National Bank of New York says, in its February letter to customers:

"Prospects favor a continuing high scale of business activity in the United States. Confidence in the immediate outlook finds support in a healthy trade and financial condition, and were it not that circumstances like the anthracite strike and the unsatisfactory price relation between agricultural products and manufactured goods have had a repressive effect, there would be enjoyment of good times and a spirit of optimism throughout the nation.

"Business in general is moving forward under a rapid momentum, and many qualities contribute to its cheerful aspect. The widespread employment of labor at high wages; the continuing demand for building construction and for automobiles; the export movement; the strong banking situation; the helpful attitude of the government to business as a whole; the facilities for retail credit; these and a variety of other forces are familiarly mentioned in every discussion of the foundations of the present activity. The maintaining of this activity is the hope of every one who is reaping a benefit, either in the way of profits or steady employment, and as a favorable sign of the times it is worth pointing out that avoidance of speculative excesses, save in a few outstanding instances, is contributing to fulfil that hope.

"Prosperity is never, of course, a condition of dug-in permanence, and it is an indication of the prevailing recognition of this fact that the bad as well as the good influences of the moment are constantly being kept in view. The temptation is always strong, when things are going well, to forge ahead and seek opportunities for larger profits, but movements toward rapid expansion are daily being combated by recitals of the factors which might counteract the present tide, and therefore there is a marked degree of restraint in most of the plans which are under way in the field of business. This spirit of conservatism is not anything new; it has resisted the opportunity to inflation since the latter part of 1922."

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—"the Pioneers in the Industry"

Made Right Since '76



THE first Metal Case Broom was made by Joseph Lay over 50 years ago—today the finest metal case brooms are made by The Joseph Lay Company. Seven times in fifty years, the demand for Lay Brooms has necessitated the enlargement of factories or the building of new manufacturing plants. This growth has been steady, substantial rather than spectacular. Lay Brooms are built with brains, upon honor and sold at moderate prices. The response to this strict policy of fair dealing has made our success.

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In Practically Every Industry

Over 90% of the steel industry, 40% of the railroads and over 4,000 industrials use, re-order and recommend Lay Brooms in preference to all other makes.

The history of Lay Brooms in actual use is indeed remarkable. Their superior effectiveness, long life and economy are a matter of comparative record in hundreds of plants.

Their annual savings are surprising both in less labor cost for fewer sweepers and in cleaner floors.

The entire Lay line is built on practical knowledge of the uses of brooms and of the needs of the men who purchase them. They are

Well Built from Handle to Tip

Lay brooms are perfectly balanced—sweep a larger floor area in a given time. The extra wide, flexible sweeping tip gets into cracks and corners—gets the dirt which increases fire hazards and insurance rates. The strong metal case is firmly *stapled,* not nailed as is the usual practice.

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Rubber manufacture today begins at the tree!

The United States Rubber Company is the largest single producer of crude rubber in the world.

Every pound of rubber that comes from our great plantations in Sumatra and Malaya is treated from the time it leaves the tree with a distinct view to the type of product into which it will be made—and the service which that product must perform.

In 1911 we started our own plantations in Sumatra, Dutch East Indies. Today, the United States Rubber Company operates the largest rubber plantation in the world, with over seven million trees in actual cultivation.

A recent report by Herbert Ashplant, noted rubber authority and Government Rubber Mycologist of Southern India, states:

> *"Of all the rubber areas visited none produced so much unusual information as the Plantations of the United States Rubber Company in Sumatra. Kisaran, headquarters of these plantations, has become the Mecca of all planters who wish to keep abreast of recent rubber research."*

Trade Mark

United States

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We have been growing rubber on our own plantations for fifteen years. Today, the finest rubber produced anywhere in the world goes into the products carrying the famous "U. S." trade mark. For example—

"U. S." Mechanical Rubber Goods for every industrial need

The United States Rubber Company has been manufacturing Mechanical Rubber Goods for over seventy-five years. From coast to coast in every field of industrial activity, the "U. S." trade mark is recognized as a guarantee of maximum service. The "U. S." Line of Mechanical Rubber Goods is the most comprehensive line of its kind on the market.

Belting for Transmission, Conveying and Elevating

The United States Rubber Company, by careful and intensive research, has perfected compounds to meet all phases of belt service. Whether the belt must operate in zero temperature or extreme heat, in dry atmosphere or damp, subject to corrosive chemicals or the abrasive wear of sharp-edged materials —a "U. S." Rubber Belt is built to meet the service.

We wish to emphasize the importance of installing the right belting in the right place. Whatever may be the peculiarities of the drive, there is a "U. S." Belt particularly designed to fill your need.

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We have given special attention to the development of a complete line of hose for every industrial need. Whatever your hose requirements may be, you will find a "U. S." Hose suited to your needs. Included in the "U. S." Line are hose for the following services: acid and pneumatic tool, auto radiator, chemical, coke, creamery, fire and mill, gasoline, garden, filling station, oil, oxy-acetylene, sand blast, spray, steam, water suction, vacuum and many others.

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High pressures and high temperatures—the continual strain of increased industrial activity in every field—all of these have combined to place greater responsibility and importance upon packings of all styles.

United States Packings are the perfected result of years of experience. To standardize on the "U. S." Line of packings means an assurance of always getting maximum service and uninterrupted operation from your engines.

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Rubber Company

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The Economy of Electric Arc Welding and Cutting

By Francis A. Westbrook

ELECTRIC arc welding has been known and used to some extent for several years in certain fields but it is only just coming into general use as an industry or as a well recognized process in a wide variety of manufacturing operations.

Arc welding is a great labor saver in many instances where it can take the place of riveting and in making water tight joints or seams where caulking would otherwise be necessary. It is also a very important means of economy in the repair of broken parts and the strengthening of parts which have been worn thin, both because it is the only means by which the life of many kinds of equipment can be prolonged and because it is easy to do in almost any location, as well as requiring very little time to perform.

Thus arc welding is very attractive to ship builders. It is applicable to practically every part of ship construction and is now a practice recognized by Lloyds and the American Bureau of Shipping.

As the actual accomplishments in connection with ship building are very suggestive of its possibilities in other directions it is worth while to note a few of them here.

In the first place electric arc welding is used to considerable extent for forgings of stern posts, rudder frames, engine parts and also for making bends and offsets in angles, etc. Where used in place of riveting it is generally felt that the human element of uncertainty in construction is lessened because of the elimination of rivet holes which must be accurately located and the elements of weakness in riveted members which arise when the holes do not match fairly.

The first all-welded, self-propelled sea-going ship was the Fullager, constructed by the Commel-Laird Company, Birkenhead, England, in 1920. After 18 months of very hard service, including heavy loading and very rough seas, none of the welds showed any signs of opening. In fact, repeated tests on electrically welded ships have shown that arc welded joints are consistently superior in ultimate strength to riveted joints and that they are, furthermore, air and water tight up to the breaking point. Riveted and caulked joints begin to leak at something like 10% of the breaking point.

A very spectacular welding job was the repair of the engines on the German ships taken over by the United States Government when war was declared. The broken parts were cut out, the edges cleaned, steel studs fitted on the edges of the original castings and broken out parts replaced with steel castings. The latter had beveled edges so as to form a wedge shaped space with the original casting, which space was then filled in with welding material. The welding was then continued to the studs and adequate reinforcement thus secured to withstand all stresses. In this manner a job which would otherwise have taken a year at least was done in a few months.

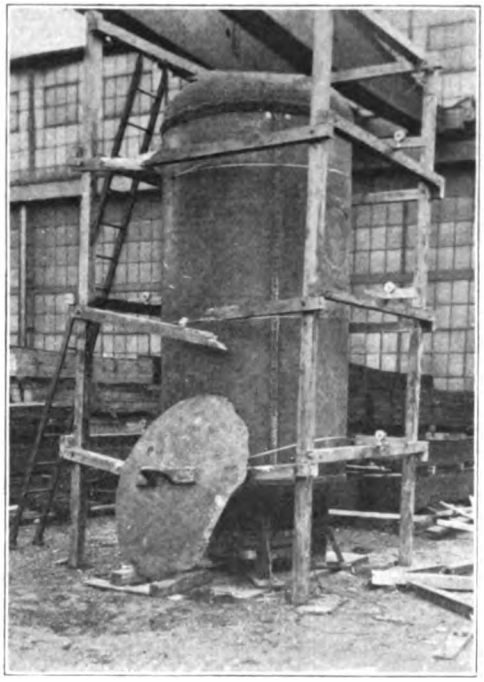


Fig. 1. An electrically welded pressure tank, which, under breakdown test, showed that the metal of the head gave way, while the welds held intact.

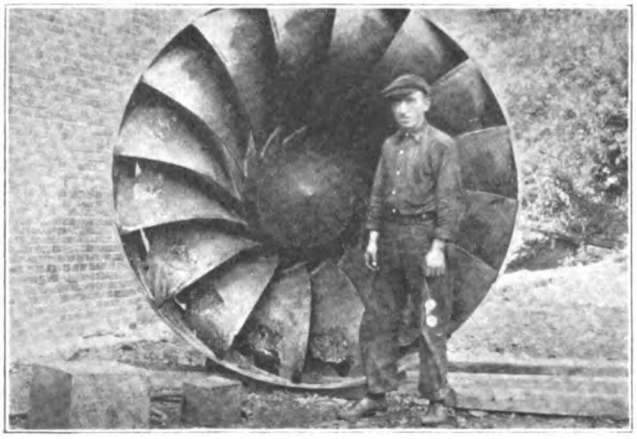


Fig. 2. Here is a water wheel runner whose badly corroded blades will be made as good as new by electric welding.

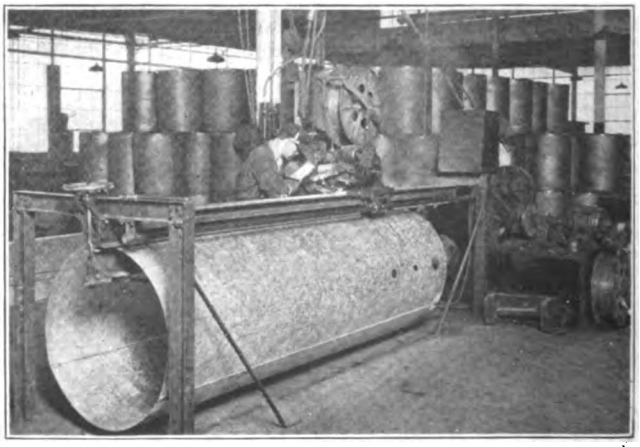


Fig. 3. Electric welding is coming into use to replace riveting on galvanized iron tanks, resulting in both cheaper and better work.

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Fig. 4. Instead of dismantling this steam shovel and sending the broken part away, electric welding makes a permanent repair, right on the job.

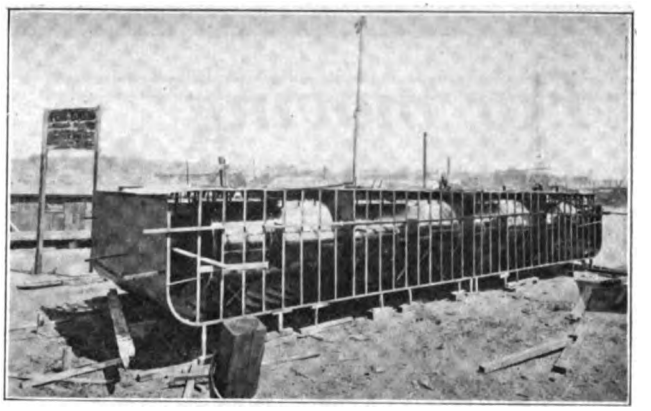


Fig. 5. A tanker, under construction, showing the 3/16" deck plates being laid. This job is electric welded, instead of the older method of riveting.

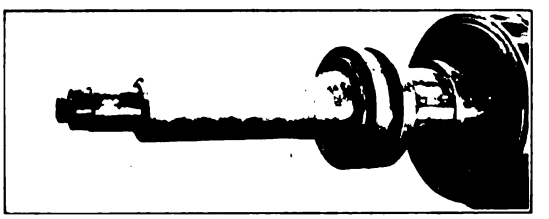


Fig. 6. This shaft was repaired by arc-welding and re-machining. The use of special electrodes makes possible all manner of repairs like this.

Arc welding is also useful in converting ships from coal burning to oil burning (as was done with the Aquitania), especially in making oil compartments for fuel oil storage. Damaged parts of a ship may also be cut out, repaired and welded back in place without impairing the original strength and with very much less lost time than would otherwise be possible. In fact the practice has been successfully followed, in the construction of new ships, of fabricating large sections in the shop, thus reducing the slower work on the ways to a minimum and saving time and expense, because the welding may be carrier on in the most convenient position.

On account of the great strength of welded joints, it has been found that important economies could be effected by "tack" welding—that is, short welds with spaces between—where water or air tightness is not a factor. For a ship specially designed for all electric welding, it is estimated that a saving in steel is possible of more than 25% compared to a riveted ship. This is because all excess material such as flanges for riveting, etc., can be omitted. There is also a saving of something like 20% in man hours of labor.

A 1,200 ton all electric welded barge, 125 feet 9 inches long, 16 feet 4 inches beam and 7 feet 9 inches depth, actually constructed in Great Britain in 1918 showed a labor saving of 245 man hours and more than 1,000 pounds of steel over a similar riveted vessel.



Fig. 7. Obviously the repair of a break in such a position as this one on a punch press, requires strength; and electric welding supplies that in full measure.

Railway Repairs

Electric welding has also been found very well adapted to railway repair work. It has been used to its greatest extent in welding flues of locomotive boilers into the flue sheets, but it can be used for a great many other purposes, such as repairing cylinders, steel trucks, frames, decks, etc. The arc is extremely efficient in cutting rivets in steel cars, it being possible for a good man to cut no less than 1,600 rivets in 10 hours.

Steel Industry

Cutting and welding by means of direct or alternating current arcs is already well established in steel mills

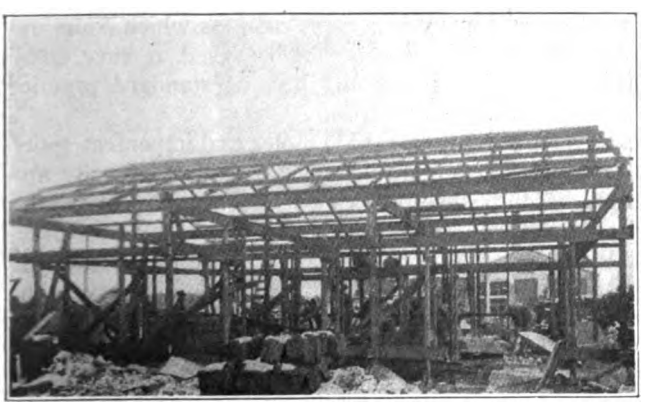


Fig. 8. General view of a structural steel building erected by the C. B. & Q. R. R. at Eola, Illinois; all joints being arc welded instead of riveted.

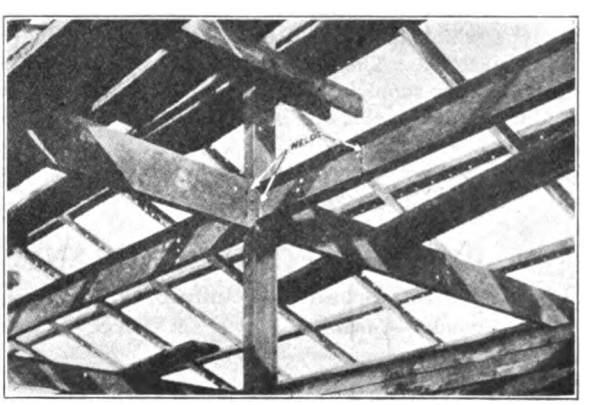


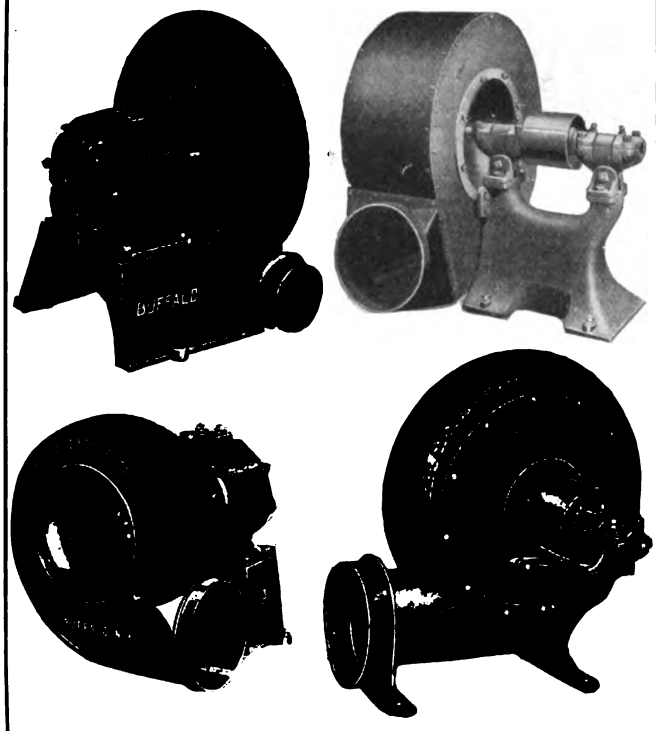
Fig. 9. Showing how roof truss supports are joined to central columns, in the welded structure. A considerable saving results from elimination of fins, etc.

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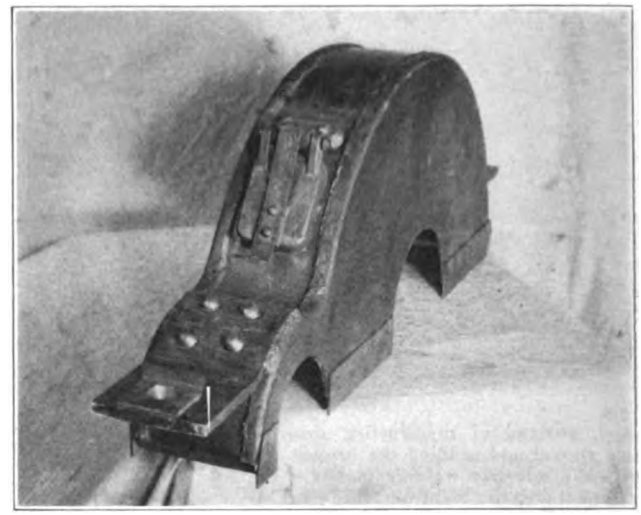


Fig. 10. An electrically welded gear case housing. Such work results in a product easily fashioned, yet as strong as though it were one piece.

and has been proven to be a great labor saver. Its use is being continually extended for an increasing variety of purposes. For instance, electric arc cutting is very useful for cutting up scrap, for removing hot or cold fringe and overflow from ingot moulds, as well as for similar purposes with rolling mill products, especially where mistakes have been made. One of the great advantages of arc cutting is that it will cut brass, cast iron, aluminum and all metals, whereas gas will only cut steel containing a certain percentage of carbon.

Another use for the arc is being rapidly developed and that is for the removal of seams in billets, especially of steel alloys, instead of chipping them off by hand.

Arc welding is used in steel mills for a great variety of repairs such as broken gear teeth, worn and broken key ways, worn armature shafts, misdrilled holes, lack of bosses, in addition to others which have already been mentioned. The fact that it is possible, where a part has worn thin or a hole has been misdrilled, to simply fill in the hole by depositing more metal and then machining over it, or other similar possibilities, gives the electric arc a very wide range of usefulness which may easily be applied to all sorts of purposes, depending very largely on the imaginative ability and ingenuity of the operator.

Foundries

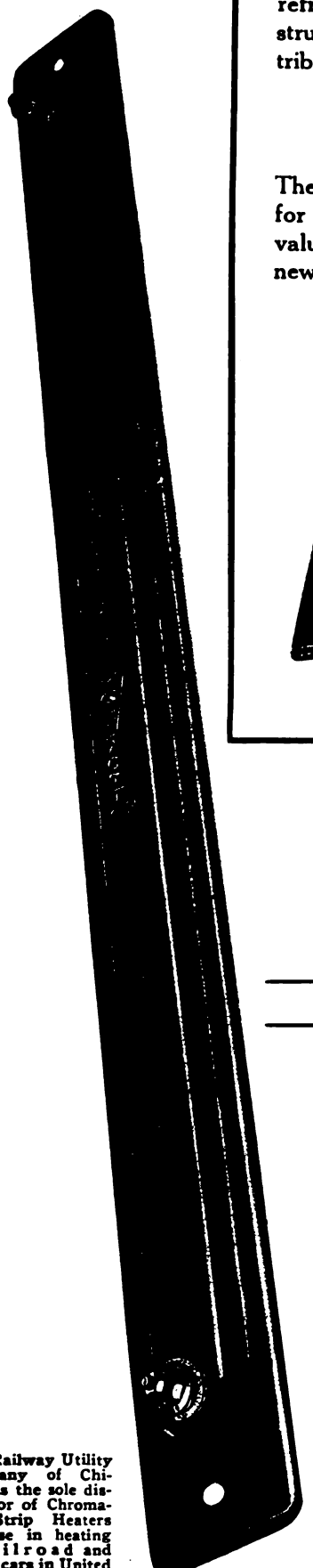
Any product of iron or steel can be welded by the metallic arc and many expensive castings which come out of the moulds with defects can be saved at very small expense. This has practically become standard practice in many important foundries.

Electric arc welding of blow holes and imperfect spots, building up to size and finishing out edges, is easily and cheaply accomplished. Burning out flooded core holes and other kinds of flooding are also profitable and practicable processes. Nicking so as to cause clean breaking in castings or billets is another valuable application of the arc which can be carried out with great accuracy and very satisfactory results.

Machine Shops

Broken down machines may in many cases easily be repaired by arc welding. The process has the great advantage that it is generally not necessary to move or send

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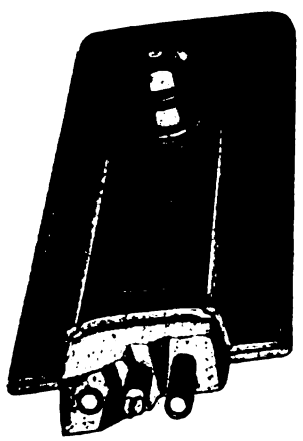


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Chromalox refractory sheathed strips, rings and space heater with embedded resistor and the equipment and process used in their manufacture are fully covered by patents issued and pending. Our rights will be rigidly enforced.

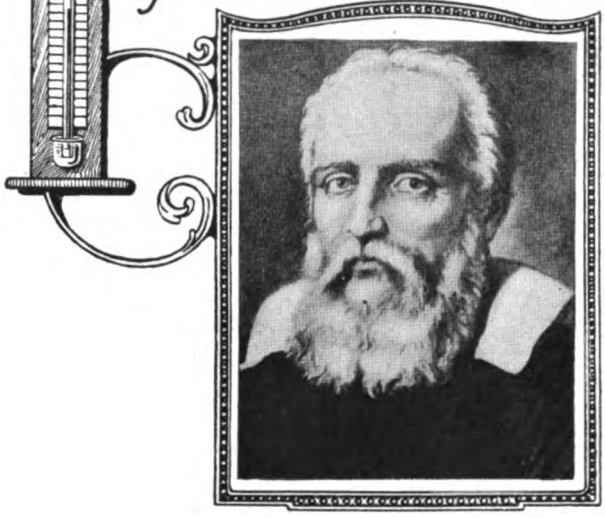
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TO Galileo and his thermoscope, industry owes much of its progress and efficiency. This crude instrument, the world's first thermometer, was a forerunner of the present-day heat measuring instruments, without which many modern processes would be impossible.

Just as Galileo's invention was a vast improvement over medieval methods of guessing, so is the Motoco Industrial Thermometer a big step forward in modern heat measuring. Motoco's degree of accuracy and reliability would have startled the old Italian scientist.

Coupled with this accuracy is a dial that can be read easily at a mere glance. Bold, black figures, deep graduations and bright red pointer stand out clearly 20 ft. away. There is no danger of misreading or guesswork with a Motoco, and the Motoco costs no more than high grade armored glass-tube thermometers.

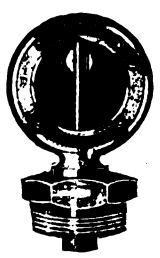
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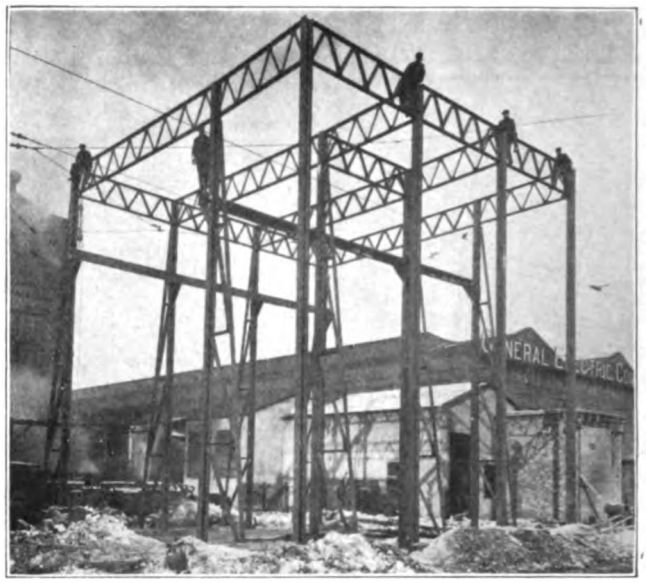


Fig. 11. A case of a doctor taking his own medicine; the General Electric Co. uses arc welding in erecting a steel structure for an outdoor transformer bank.

away the damaged machine as the welding apparatus can be brought to it. Such break downs as cracks in the machine bed, broken feet, arms, brackets, casings, cylinders, frames, etc., can be repaired in this manner. Worn parts such as motion blocks, bushings, journals or shafts can also be built up or filled and remachined. Even electrical machinery can be repaired in this way without removing the windings because the heat does not spread sufficiently to cause damage.

Of course, the reclaiming of castings found defective upon machinery is possible, and results in great savings.

It is even practicable to weld different kinds of alloyed steels together.

Boiler and Tank Shops

The welding of almost all kinds of tanks and boilers, and repairs to the same (except high duty fired boilers) is now practically an established and recognized practice. In this kind of work arc welding is far superior to riveting because it is a one man job, while riveting requires layout, punching, fitting and a gang of riveters and a slip-up with any one of these throws production out of gear. The kind of products to which arc welding is particularly applicable are oil refinery equipment requiring tightness, gasoline tanks, gas plant equipment, concrete mixers, industrial cars, dump cars, steel railroad cars, feed water heaters, transformer casings, odd shaped tees and branches, etc.

Structural Steel and Iron Works

As will be evident from what has been said regarding the application of electric arc welding to shipbuilding this process is very useful in connection with structural steel and iron work. This applies to such diverse products as ladders, window frames, ornamental work, all sorts of special shapes, etc. By replacing riveting it is very often possible to combine several separate jobs into one run of welding.

Buildings

Electric arc welding has now progressed to such a point that the C. B. & Q. Railroad has erected a steel

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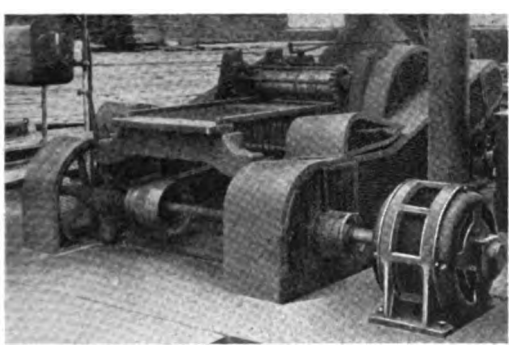
Ettco High Speed Tappers place at the finger tips of the operator instant control of speed and driving power. At the least sign of difficulty he can ease over the hard spot and save the delicate tap, when using the Ettco Attachment. Can you think of anything that will increase production on small holes, and save more taps than this? Ettco Tappers usually show production increases of 100%. On through-hole work, with gun taps, 300% increases have been made.



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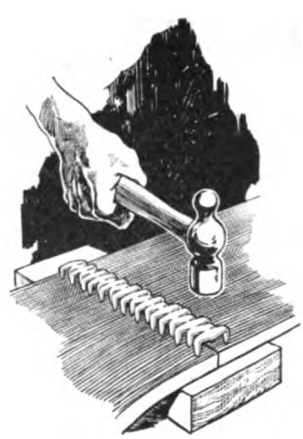
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A Hammer is all you need



IT'S easy to repair broken belts with Bristol's Steel Belt Lacing. Anybody can make a strong smooth joint quickly.

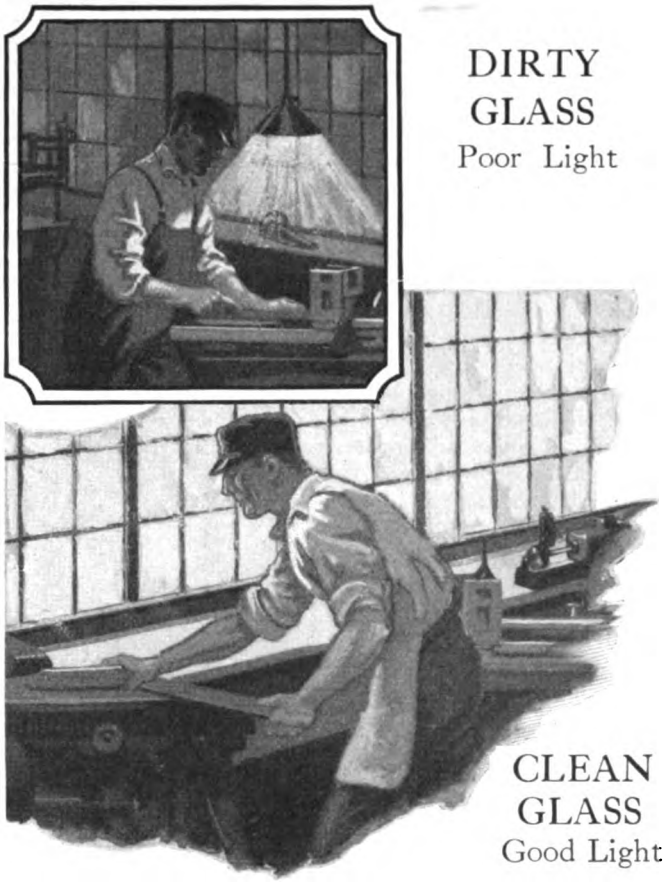
The big advantage is—*a hammer is the only tool needed.* Simple — Convenient—Saves Time.

There is less expense to charge to "idle machinery" when you use Bristol's Steel Belt Lacing. A design for every kind and size of belting.

Write for illustrated Bulletin CE-719

THE BRISTOL CO. Waterbury, Conn.

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Skybryte in bbls. $2.50 per gallon freight allowed.

Company .....
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building at Eola, Ill., with all joints made by arc welding.

This building is very interesting and indicative of what arc welding really means in the way of economy in these days of high labor and material costs.

It is a 60x40 foot, one story, mill type building and has been made from scrap structural steel pieces welded together to form members of proper size, and these, in turn, were welded together instead of being riveted.

Of course, preliminary test welds were made to determine their strength, with very satisfactory results. The illustration (Figs. 8 and 9) shows how the different members were joined together. Gusset plates and reinforcing bars were omitted because these tests showed them to be unnecessary. Tack welds at the heel and toe of the angles for attaching the roof purlines to the rafters were all that was required.

After the welded building was finished a similar one with riveted joints was constructed. The costs were carefully kept in both cases and the results are shown in the following table.

ARC-WELDED BUILDING

Preparation

Reclaiming, Collecting and Handling Material	$253.61
Material, 25,619 lbs. at ½c	128.10
Preparation Total	$381.71

Erection

Welder's Time and Material	$ 94.86
Cutting, Fitting and Erecting	309.63
Erection Total	$404.49
Grand Total	$786.20

RIVETED BUILDING

Preparation

Engineering Shop Details and Drawings	$ 120.00
Shop Fabrication	745.00
Material, 27,100 lbs. at ½c	135.50
Preparation Total	$1000.50

Erection

Erection Riveting	$ 339.00
Erection Total	339.00
Grand Total	$1339.50

Saving in favor of arc welded building 44%.

From the above it will be seen that the greatest saving is in structural material (because scrap could be used), layout and shop fabrications. No punching, reaming, riveting or shop fabrication was necessary because the steel was cut to length on the job. The erection costs of the arc welded building are higher than for the riveted building because in the former case all fabrication was done on the job, whereas in the latter case a good deal of this was done in the shop.

Electrodes

The reason why electric arc welding can be used for a great variety of purposes and with all kinds of metals and alloys is because of developments in electrodes and their flux coverings. Different kinds of electrodes are required under different circumstances. It is not practicable to enter into a discussion of this important detail here, but data are furnished on what kind of electrode to use for any given service by manufacturers of arc welding equipment.

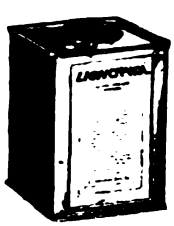
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Decrease your plant's repairs
Increase your plant's efficiency

These are the five ways that many foremost industrial plants have done it

1 Make your concrete floors dustproof and wearproof. A treatment of Lapidolith, the original concrete floor hardener, will do the trick. Lapidolith is a liquid, chemical compound that may be applied to concrete floors as easily as water. It changes an easily worn out, dusty concrete floor to a fine, dense surface as hard as flint. A floor treated at night is ready for business in the morning. Lapidolith will give you permanently dust-proof, wear-proof concrete floors. It is effective on old floors as well as new.



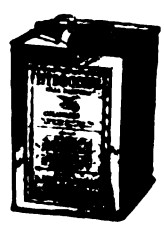


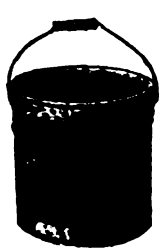
2 Protect your wood floors against splintering, rotting, or drying out. A dressing of Lignophol will add years of wear to any wood floor. Lignophol will work wonders with even an old, apparently worn out wood floor. It is a preservative dressing that penetrates the wood fibres and restores their natural gum and oil. It does away with all need for messy floor oils that do no more than lay the dust, and have to be applied again and again. One treatment of Lignophol will last for years. Lignophol preserves wood floors and eliminates future floor repair expense.



3 Cut down your painting bills. Cemcoat is a paint that will save you a great many repainting bills. It stays white long after other paints turn yellow, and may be washed again and again. It is especially suitable for brick, plaster, or concrete walls as it is not affected by the free lime usually found in these walls. It will not crack or peel. Cemcoat is made for both exteriors and interiors. It comes in white and colors.

4 Guard your buildings against dampness. Hydrocide Colorless, applied to the exterior of a building, effectively keeps out all moisture in even the wettest weather. Not only is it a perfect damp-proofer, but it preserves the natural beauty of the walls as well. It is absolutely invisible. As it contains no paraffin it will not run in hot weather. It will permanently and effectively damp-proof and water-proof your buildings.





5 Stop roof leaks before they become dangerous. Stormtight is an adhesive, rubberlike substance that stops leaks instantly and permanently. It may be applied by anyone to any roofing material. Stormtight will not only stop leaks that have already started, but if applied to the whole roof will insure against them ever starting. A coating of Stormtight has saved the cost of a new roof again and again. It will pay you to keep some Stormtight on hand.

The Fisher Body Company's plant in Detroit. This concern has used Sonneborn products for years. Photo by MacGregor and Vallin.



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Well-known industrial plants all over the country have used some or all of the above products for years. The Ford Motor Co., Swift & Co., The Bethlehem Steel Co., and the Standard Oil Company of New York are representative of these concerns. Sonneborn products have helped them reduce their maintenance costs. They can do the same for you. Send for more detailed information and a free demonstration sample. Use the coupon.

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What Makes the Difference in Tool Values?

Why First-Class Tools Cost More to Make—and Much Less to Use

By F. C. Eibell

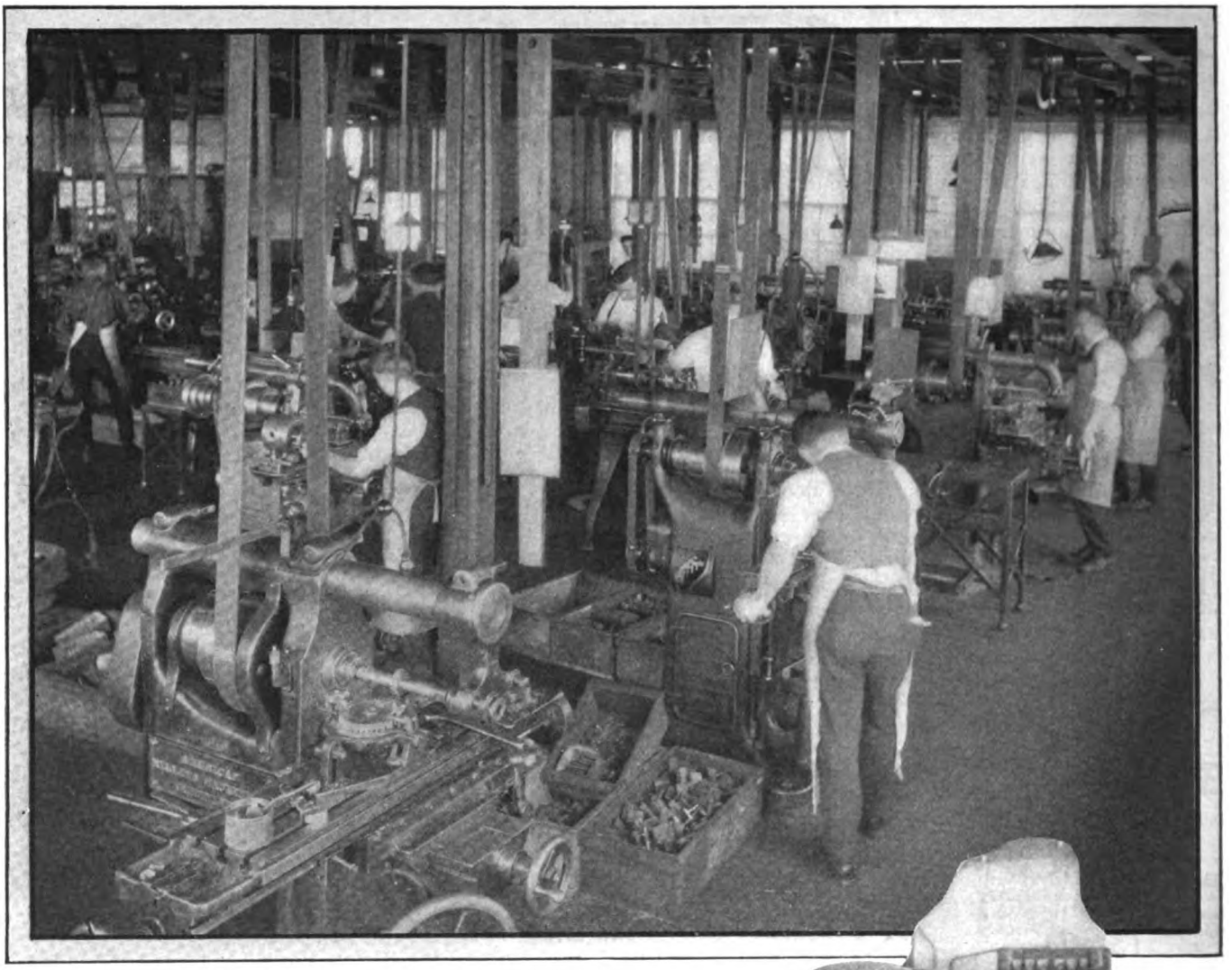


Fig. 1. A general view of one of the milling departments in a large plant. With all the highly developed organization, modern machines, skilled labor, and first class material; production is, in the last analysis, dependent upon the quality of the cutting tools. These must be accurate in design, of the proper steel, correctly tempered and hardened and ground; else they impose a tax in lowered production on an investment many times their cost.

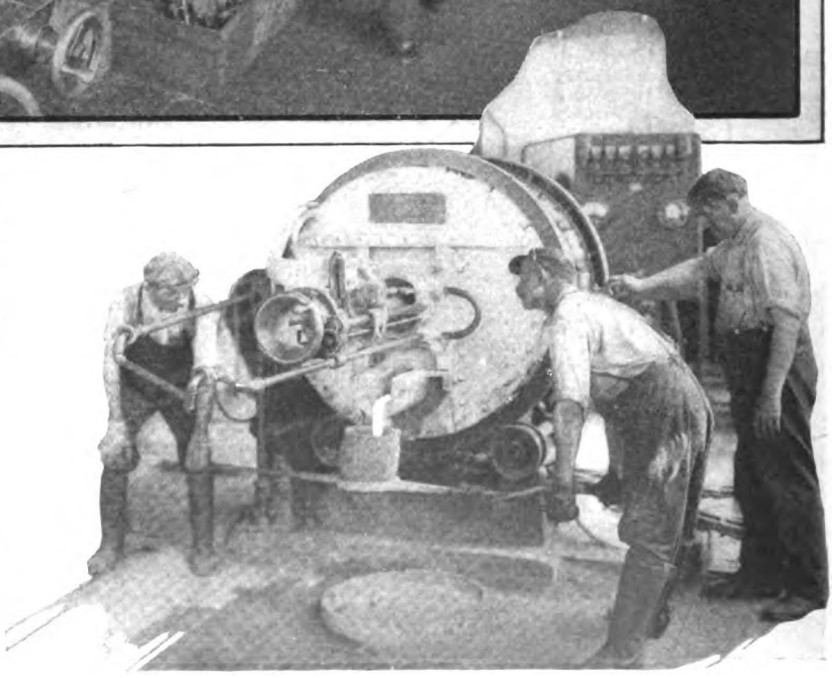


Fig. 2. The electric furnace, with its close control of temperatures, has given tool makers a means of improving the alloy steels which have revolutionized metal cutting practice.

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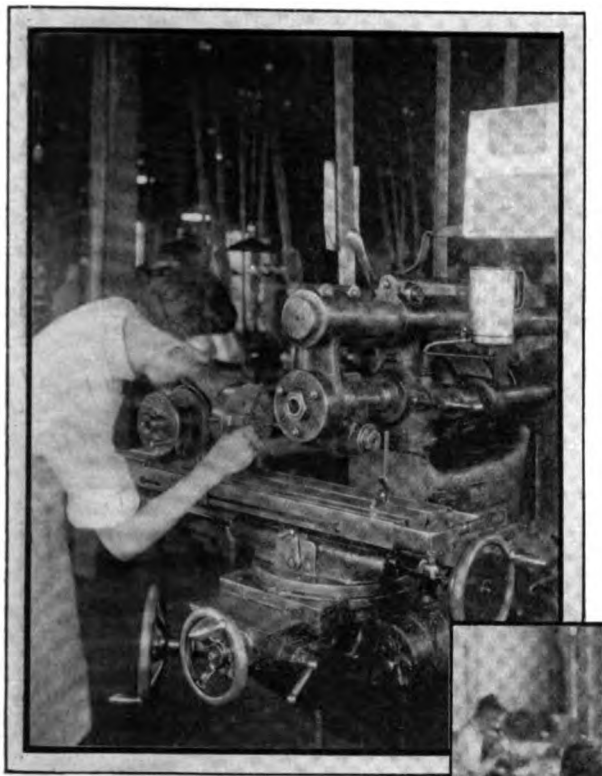


Fig 3. At the left—This milling machine represents a large investment; the mechanic who operates it, also, represents an investment in the time and money spent in training him. To make an efficient producing unit, the cutting tools supplied to this "team" must also be first-class.



Fig. 4. Tool inspection, in a plant which puts its reputation behind its tools, is more than a cursory formality. The large dial and simple operation of this "amplifier" enables the inspector to check finished ground work to an accuracy of 1/10,000 of an inch.



Fig. 5. At the right—An important, and expensive part of good tool making lies in checking for accuracy. Where products are to be accurate, the tools themselves must meet the same standards of accuracy—often within one ten-thousandths of an inch.



Fig. 6. At the left—a semi-automatic work holder for buffing and polishing. A set of change gears permits controlling the work so that it is in process for 10, 12, 15 or 20 seconds, as required.

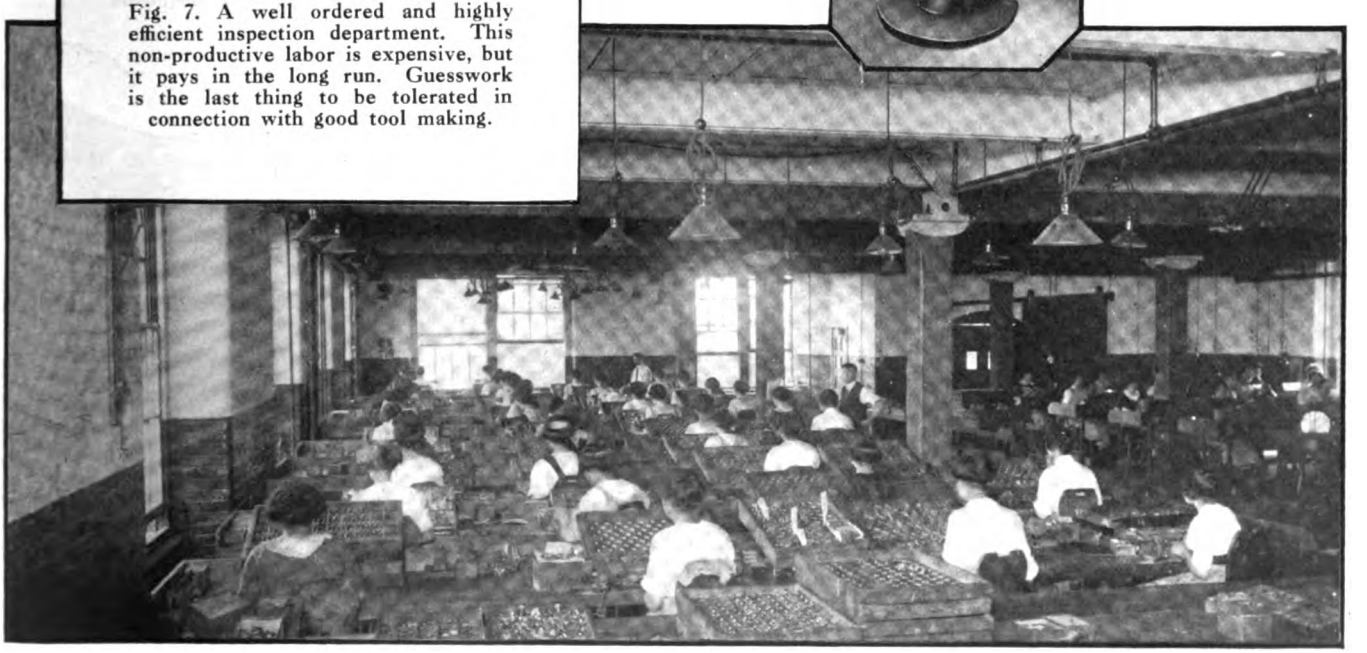


Fig. 7. A well ordered and highly efficient inspection department. This non-productive labor is expensive, but it pays in the long run. Guesswork is the last thing to be tolerated in connection with good tool making.

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Fig. 8. At the left —The human element, in tool making, is an important factor. Nowhere in all industry, do artisans take more personal pride in their work, than in our better grade tool factories. Themselves users of good tools, only perfect workmanship satisfies them.

Fig. 9. At the right —an electric furnace which has given unusually good results in the tempering of springs and small parts. Electrically controlled, it turns out a product uniform enough to meet the exacting demands of makers of fine tools.



Fig. 10. At the right—Die-making is an art in itself, and one that requires the highest degree of skill. Good dies are one of the most costly items in the equipment of the tool maker.

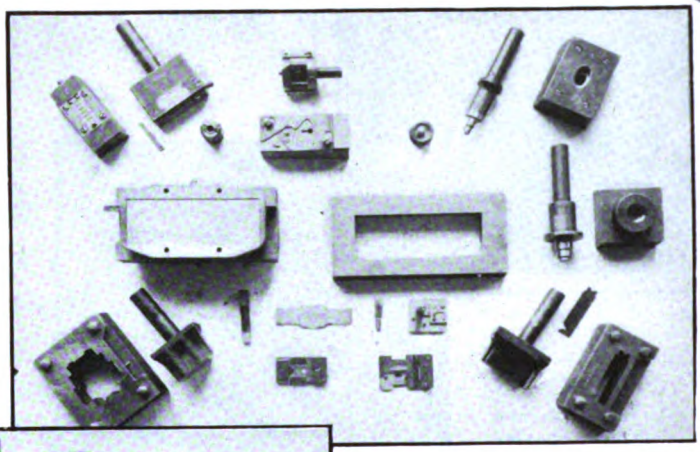


Fig. 11. Below—A group of products of the tool maker's art. To the layman, they may seem insignificant; to the man who uses them, they quickly reveal the care in design, selection of steel, and expert workmanship which go into the making of first-class tools.

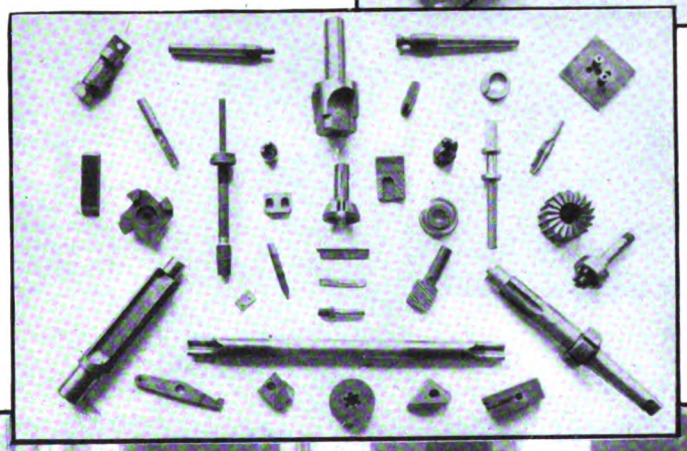


Fig. 12. Machine tool design is one of the most important departments in the tool manufacturer's plant. On it, he is dependent for new designs and improvements; which either originate here or must be worked out to practical results by these men, most of whom are capable mechanical engineers.



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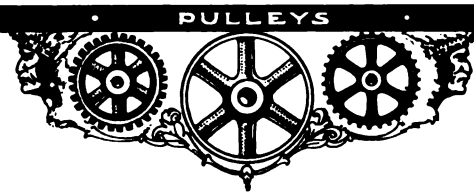
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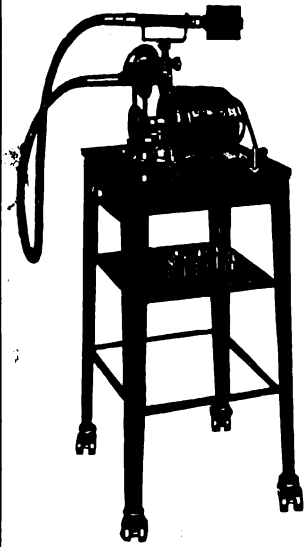
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Safety and Common Sense

Why Not Cultivate the Habit of Doing Things the Safe Way?

THE safety idea has long since passed the stage where it was an experiment of dubious financial value. It has proved its worth not only as a humanitarian measure, but as an economic one; and the admonition "Safety First," or its newer and perhaps better version "Safety Always," meets the eye at every turn, in almost any factory. In fact, we have grown so accustomed to it, that we are prone to forget.

At least three out of every four accidents which do happen are preventable by the exercise of nothing but ordinary common sense. These three accidents have, each of them, a simple obvious "if" attached to them; and usually that resolves itself into "if he had only *thought*."

The average modern plant is usually well protected, mechanically, against the more obvious sources of injury to its workers. Belts, flywheels and gears are guarded; machine tools are equipped with devices designed to prevent accidental injury to the operator, and the electrical system, too, has been highly developed along the same line. These things have been done, and they have helped to reduce the total of industrial accidents. But, obviously, no matter how far a plant may go in providing mechanical safeguards, it will still have to contend with the highly fallible human factor. And especially is this true in connection with the handling and storing and moving of materials about the plant.

An elevator, for example, can be operated carefully, or carelessly. In the one case, it is a potential killer. Passenger elevators can be—and most modern ones are—equipped with safety gates and interlocking control which prevents moving of the car while the gates are open. The average freight elevator in constant use in a factory, however, is not so readily adaptable to these automatic safeguards. Under such conditions, the most rigid supervision is necessary to assure safe operation; and even then, it is surprising how many otherwise intelligent men think nothing of sticking their heads into the shaft to see whether the elevator is up or down—until one of them provides the horrible example which cures the practice in that particular plant. The really valuable foreman or superintendent would be the one who could cure the practice without waiting for the "horrible example."

The two illustrations on this page furnish an interesting contrast. In Fig. 2, it would be possible for the man to get hurt; but he would have to do something decidedly out of the ordinary, to accomplish it. That is because, in unloading these assembled motors from conveyors to boxcars, the entire job is done mechanically, with equipment so designed as to involve no human labor risk. In Fig. 1, on the other hand, is a chap whom no casualty company would want to sign up for a policy. He might push loaded trucks up an incline, day in and day out, and never get hurt; but if his foot slipped, or any one of a dozen simple things happened, neither he nor the load would be in good shape after it was all over. No management should permit such obviously dangerous "stunts."

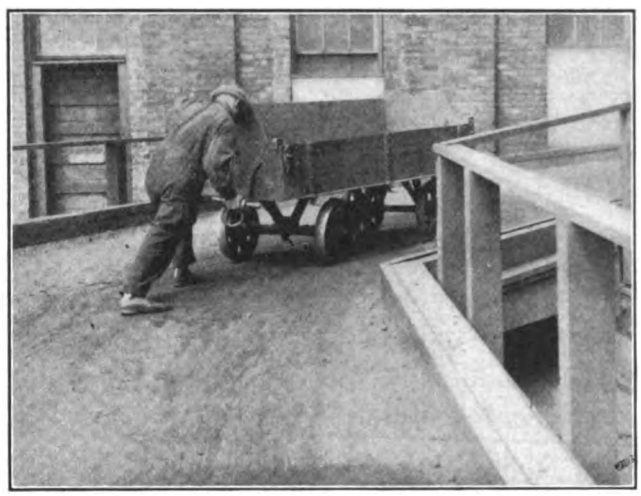


Fig. 1. The handling of heavy buggies, trailers or four-wheel trucks should be done by some form of power driven tractor, especially when traveling on an inclined plane.

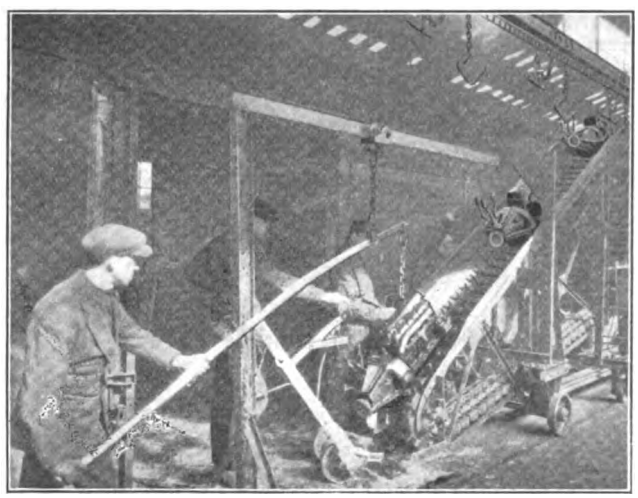


Fig. 2. Here is a complete safe operation of unloading assembled motors from conveyors to box cars. Note that all handlings are done by special equipment.

On the opposite page, Fig. 6 might prove an inspiration to the man who gaily stacks up bales and barrels with no regard to Newton's discovery. Every package has such a thing as a center of mass, and it is worth thinking about. It is easy to stack things in a safe and orderly way: even easier and quicker than the haphazard way, once one gets the habit. We are all creatures of habit, and the very best way to cure a bad habit is by concentrating for a time on a good habit to take its place.

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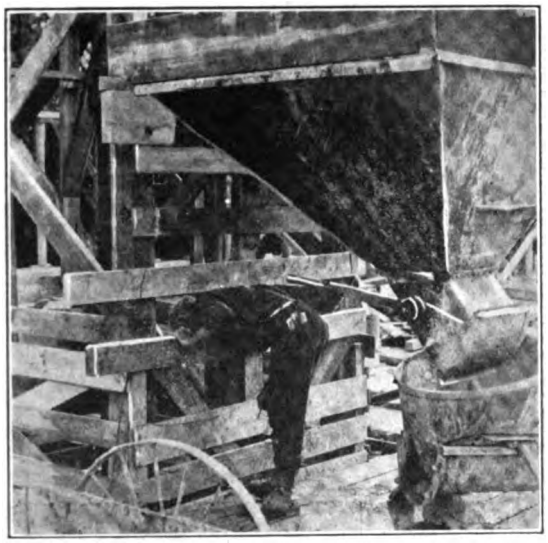


Fig. 3. Some men get hurt because of someone else's carelessness, others on account of their own damn foolishness. You wouldn't stick your head in the hangman's noose, so why put it in the elevator shaft?

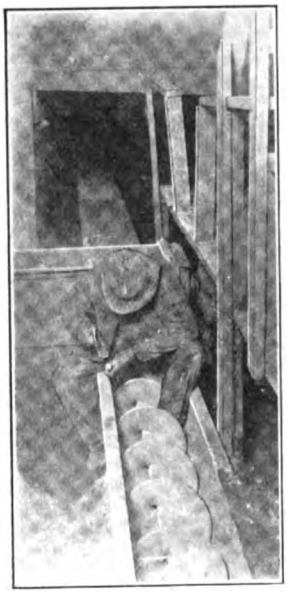




Fig. 4. Even with the best safety precautions, such as tagging the starter box, it is well to keep one's foot out of the machinery when making repairs.

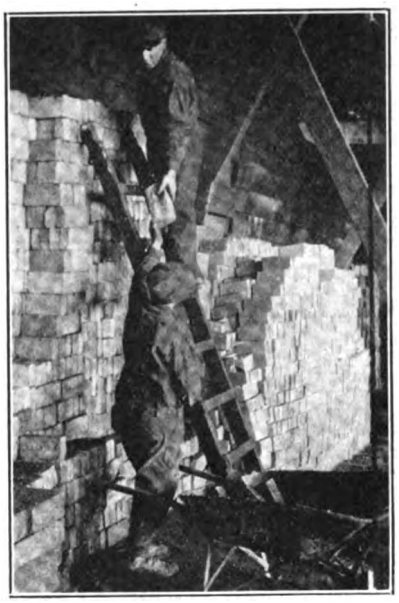
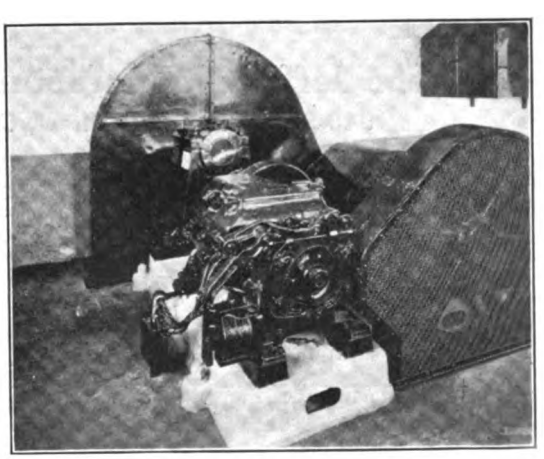


Fig. 5. Taking down a pile is as important as properly building it up. Whether the material being handled is bricks, or boxes, does not matter. Always take off the top tiers first and keep the rows at fairly even heights when unpiling.

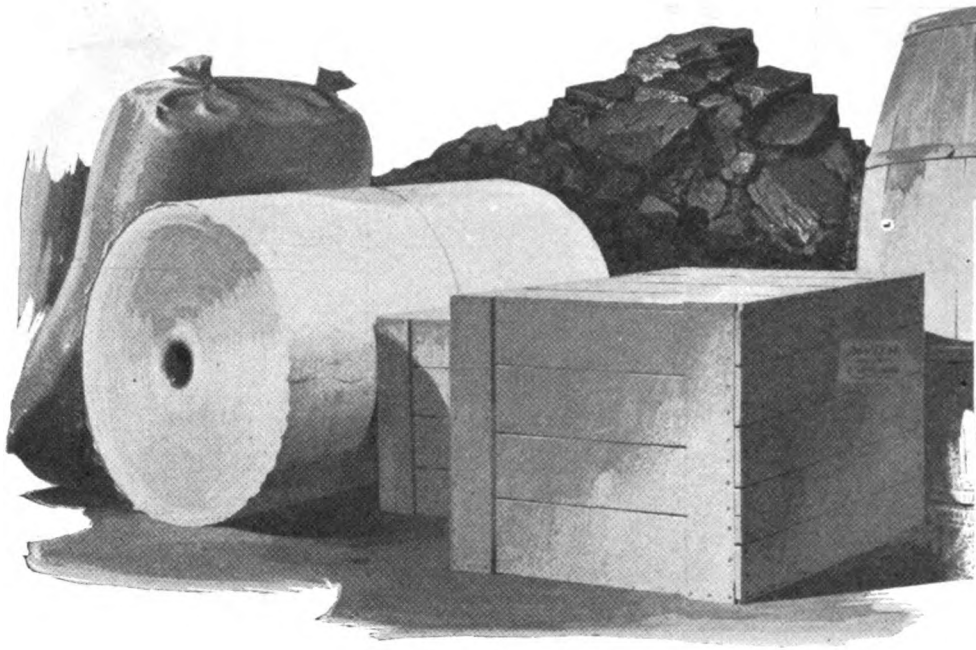


Fig. 6. Handling paper and barrels, particularly in storage when piling and unpiling, is an important operation. Carelessness often results in the collapse of a pile and injury to the workmen.

Fig. 7. Gear guards, chain guards and other similar devices, as well as proper electric wiring, automatic brakes, etc., play an important part in the safe operation of materials handling equipment.



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Wood Apron Conveyor handling Sacks of Lime in Filtration Plant



Flat Belt Carrier handling Boxes of shingles in warehouse

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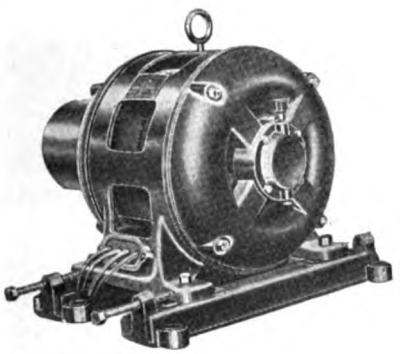
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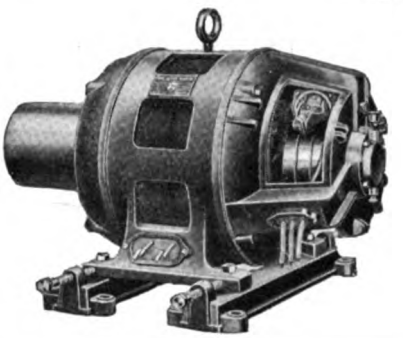
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An Added Guarantee of Service

STAR MOTORS







The motor is the heart of any equipment that must be depended upon for steady, reliable service.

It is the motor that determines the extent of the work and the amount of production possible from any machine—hoist, elevator, crane, pulverizing equipment, extractor or any other mechanical device.

STAR Ball Bearing Motors have been chosen by hundreds of manufacturers as *the* motor that will hold up the reputation of their product. There's a reason for this and it will pay you to learn why.

STAR BALL BEARING MOTORS give the assurance of steady, dependable low cost power, with maintenance cut down to the minimum.

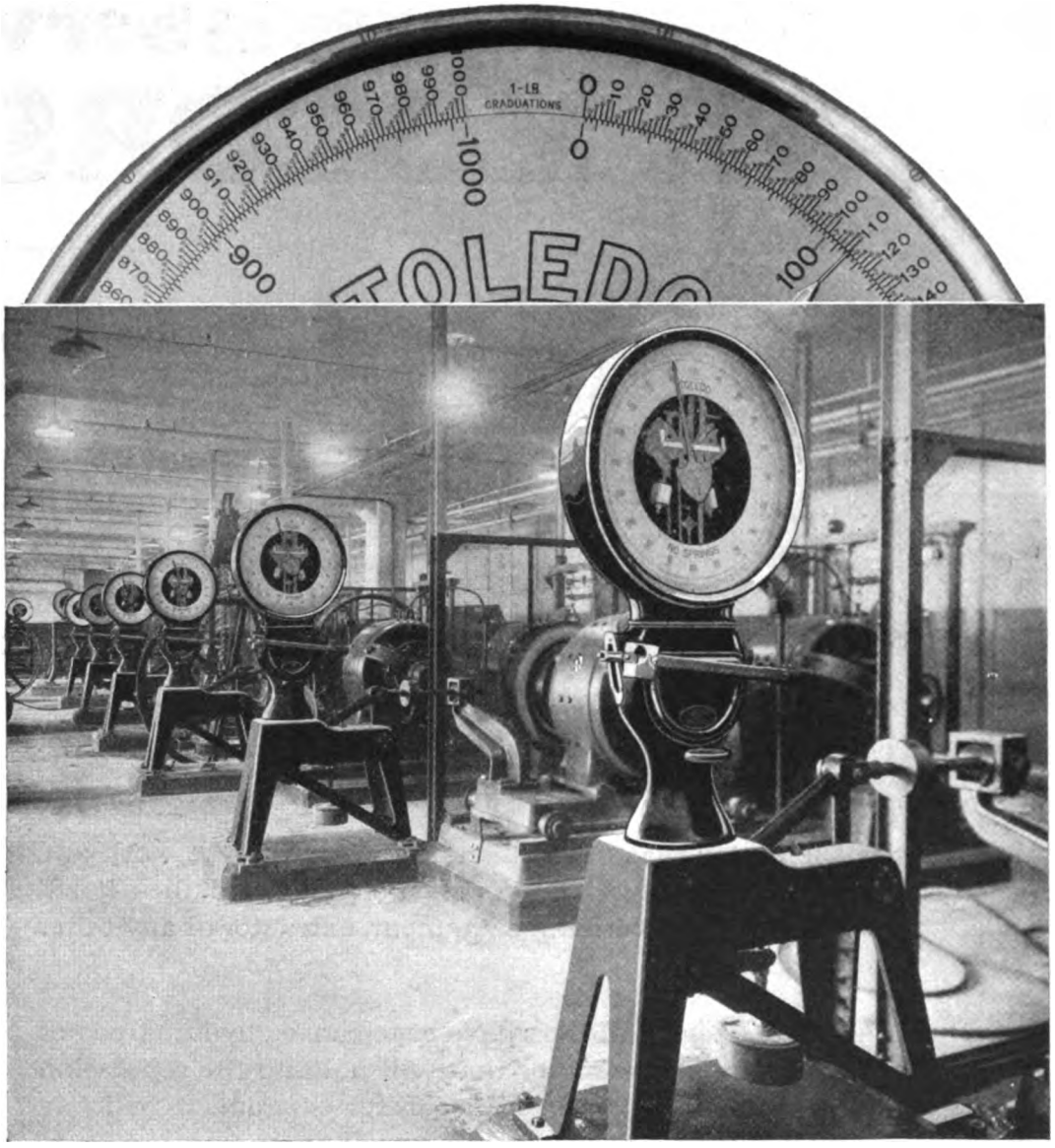
STAR MOTORS are manufactured for all commercial purposes, both in A. C. and D. C.—in sizes from 1/4 to 100 H.P. inclusive, horizontal or vertical shaft construction.

Our engineering department is ready to consult with you in regard to your particular motor requirements.

STAR ELECTRIC MOTOR CO.

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REPRESENTATIVES IN THE PRINCIPAL CITIES

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Experience of Those Who Have Used An Article An Unfailing Guide Post to Those Who Have Not

BY the constant use of from one to many Toledo Scales, thousands of manufacturers bear witness to definite, valuable advantages derived from Toledo weighing systems. These users were first attracted by the offer of this company to save them money, create good-will, and protect their interests by the accurate measurement of their materials and products.

Their experience unmistakably points the way by which you also can enjoy the same advantages.

Your request for specific information will lead to the stopping of hidden losses which result from human and mechanical errors in the measuring of your materials.

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Toledo Scale Company, Toledo, Ohio
Canadian Toledo Scale Co., Limited, Windsor, Ont.
Manufacturers of Automatic Scales for Every Purpose
Service Stations in 106 Cities in the United States and Canada

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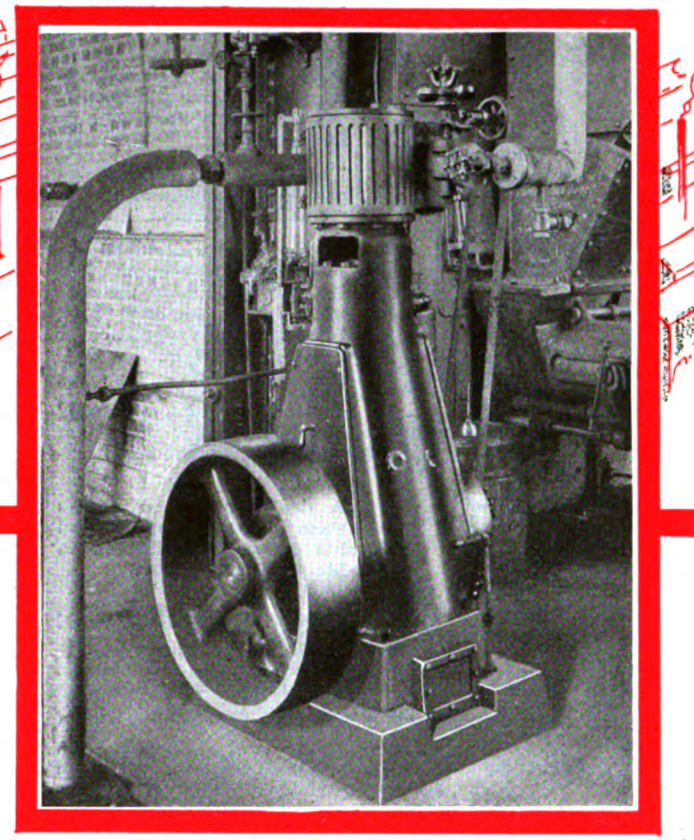
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TROY ENGINES



For Driving
Stokers
Fans
Blowers
Pumps
Generators



Thirty-five years
of Economical Power Generation

ANOTHER mile-stone on the road of efficient power generation has been passed. Another record year. Hundreds of plants now realize the exceptional features that TROY ENGINES can give on driving fans, strokes, boilers, blowers, pumps and other boiler equipment, as well as electric generators.

For 35 years the TROY organization has been engaged in the building of steam engines and good engines only. Specialization in the one line has produced a high quality engine at a reasonable price. Because of our economical production methods, ideal labor conditions, our own foundry, and the location which makes low freight rates possible for both raw and finished products, we can produce such high quality at low cost.

Troy Engines have the self-compensating, steam tight valve which automatically clears the cylinder of any condensation. They are oil and dust proof—entirely enclosed. Bearings are always assured of a continuous supply of oil through the Troy Automatic lubricating system.

Built in sizes up to 200HP both in horizontal and vertical types.

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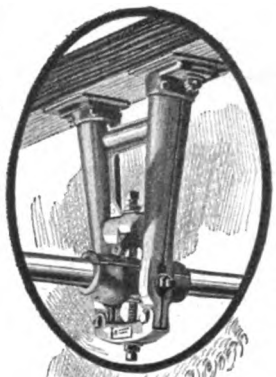
Dependable Power **TROY ENGINES** *Absolute Safety*

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WHEREVER the hum of industry is heard, there you will find "American" Pulleys. More than six millions of them are transmitting power in nearly every country in the world.



There are single plants equipped with as many as 25,000 "American" Pulleys.

Back of such widespread use must be value, economy and the test of time—in the case of the American Steel Split Pulley, this test spreads over nearly thirty years.

When you install "American" Pulleys and "American" Hangers in your plant, you are making a protected* investment.

A dealer near you carries them in stock. You will find his name and address in MacRae's Blue Book.

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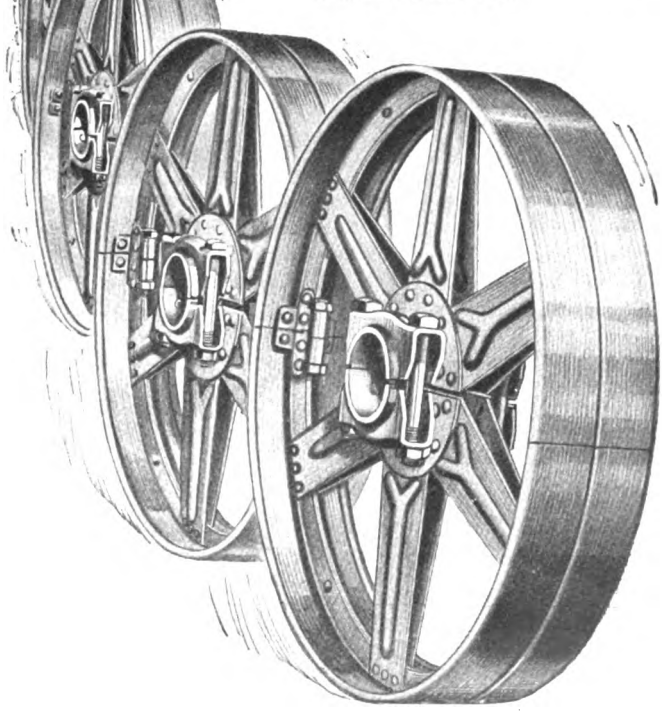
Manufacturers of Steel Split Transmission Pulleys, Pressed Steel Shaft Hangers and Pressed Steel Shapes.

4200 Wissahickon Ave. Philadelphia

*Both "American" Pulleys and "American" Hangers are guaranteed. Write us for a copy of this unusual guarantee.

AMERICAN
PRESSED STEEL HANGERS PATENTED | STEEL SPLIT PULLEYS PATENTED

The American Pressed Steel Hanger combines unusual strength and rigidity with accurate alignment adjustments, light weight and graceful design. Write for a copy of "The Hames of Horsepower."

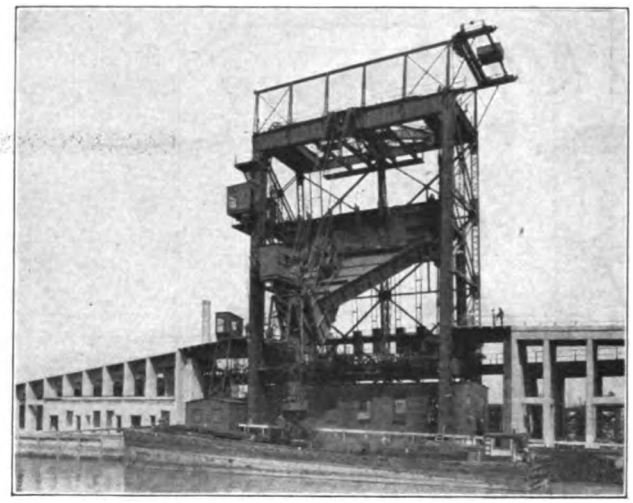


The World's Largest Coal Dumper

ALMOST important addition to the extensive facilities of the Reading Company's 3,800-mile railway system at Port Richmond, its Philadelphia harbor terminal, has been made during the past year with the installation of the world's largest coal car dumper. This piece of machinery, capable of handling forty 100-ton coal cars each hour, is located on Pier 18, Philadelphia Harbor, and to a great extent is electrically operated, while all control apparatus is electrically actuated.

The Reading System serves all principal cities in Eastern Pennsylvania and connects with many trunk lines traversing the state. The huge new dumper operates to serve freighters with export coal, barges for coastwise trade, and smaller craft for direct delivery to the industries of the Port of Philadelphia.

Cars to be dumped are pulled up a 12 per cent. grade



onto the dumper cradle, and are hoisted vertically to the hopper. A main operator stationed in a cab near the top of the machine has a clear view of the car as well as the ship into which it is to be emptied. From here the raising of the car is controlled, as well as the height of the pan into which the coal is to be dumped. Hoisting machinery is operated by steam, while the pan is governed by a 150 hp. Westinghouse electric motor.

At the end of the pan into which the coal is dumped there is a telescopic chute, with an operator to control its movement stationed in a cab directly over the ship's hatch, so that proper direction of the flow of coal can be obtained. The entire operation is controlled electrically and with surprising flexibility, which assures proper draft of the ship fore and aft. The pan and telescope mechanism is hoisted clear of receiving ships before and after docking by a 275 hp. motor, protected with limit relays and full magnetic dynamic breaking controller.

In connection with the car hoist, a large thawing house is maintained on the dock for winter weather. Four tracks pass through the building, having a total capacity of 48 cars. A temperature of 200° F. is maintained in extreme weather, which quickly thaws the coal for dumping into waiting barges or ships.

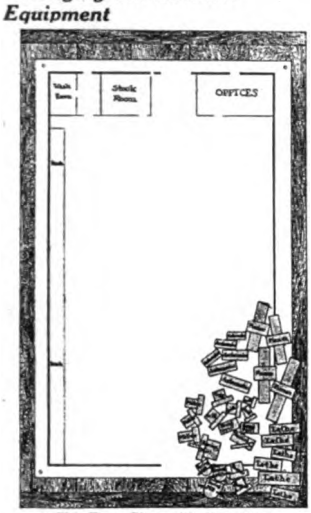


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WHY SCHIEREN BELTS LAST LONGER

PLANT LAYOUT

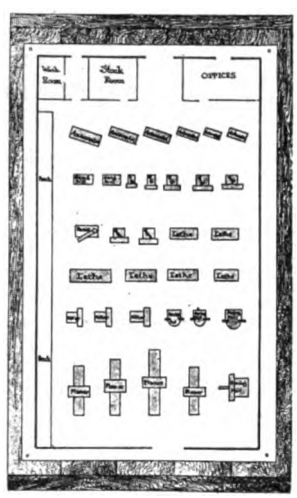
Arranging the Machine Equipment



The Floor Plan with Templates

In planning the arrangement of mechanical equipment in a plant, so many factors must be taken into consideration that it is almost impossible to secure the most practical layout in the first drawing. Various changes in arrangement suggest themselves as the work progresses, which usually means several redrawings. Much time, paper and effort is frequently wasted by proceeding in this way.

The more satisfactory method and one which means a considerable saving in time in the end is to proceed as follows: Prepare a floor plan of the factory with all obstructions such as columns, immovable fixtures, etc., indicated; also, to the same scale, outlines of the floor space occupied by each machine, which may be cut out to form templates. These may then be placed on the plan and are readily moved about as desired until the final arrangement is arrived at.



The Arrangement Completed

Page 55

50 pages of *new* Belting Economies

These 50 pages will help you to save on belt costs. Send for them. Every operating man in your plant can use them to effect new belting economies. We have divided this information into 4 sections. Here they are in a nutshell.

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Send us the names of your operating men on a letterhead. Or sign the coupon yourself. There is no charge or obligation.

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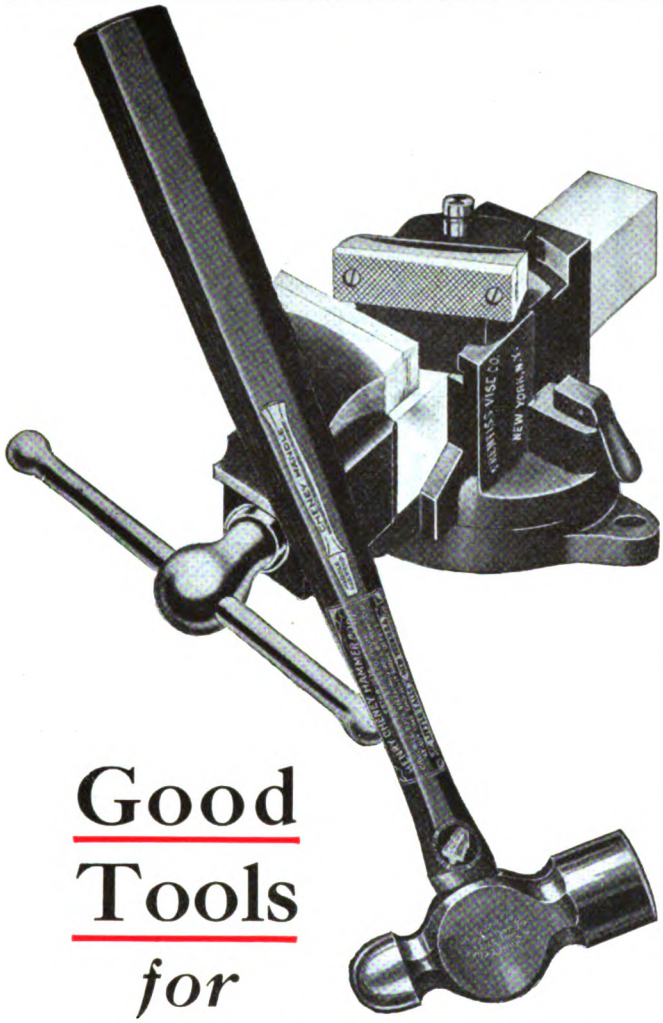
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Good Tools *for* Good Work

Prentiss Vises and Cheney Hammers make a combination that for hard work—day in and day out—is hard to beat.

Neither the jaws on a Prentiss Vise nor the head of a Cheney Hammer can ever come loose. Both Vise and Hammer have excess strength of material. Each is designed and made by men who know what workmen want.

If you're a tool and equipment user or buyer, try this combination. It means better work with less effort.

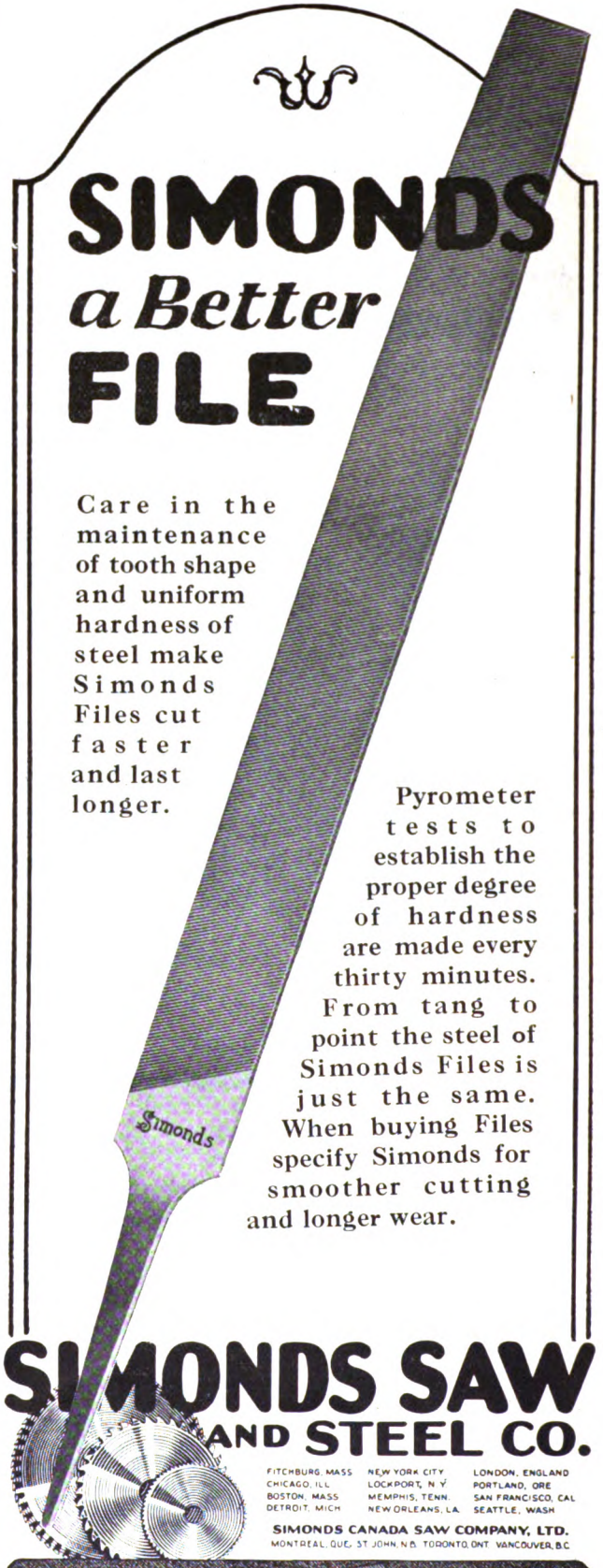
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PRENTISS VISE CO.
106 - 110 LAFAYETTE ST. NEW YORK CITY
CHENEY HAMMERS

8608

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Care in the maintenance of tooth shape and uniform hardness of steel make Simonds Files cut faster and last longer.

Pyrometer tests to establish the proper degree of hardness are made every thirty minutes. From tang to point the steel of Simonds Files is just the same. When buying Files specify Simonds for smoother cutting and longer wear.



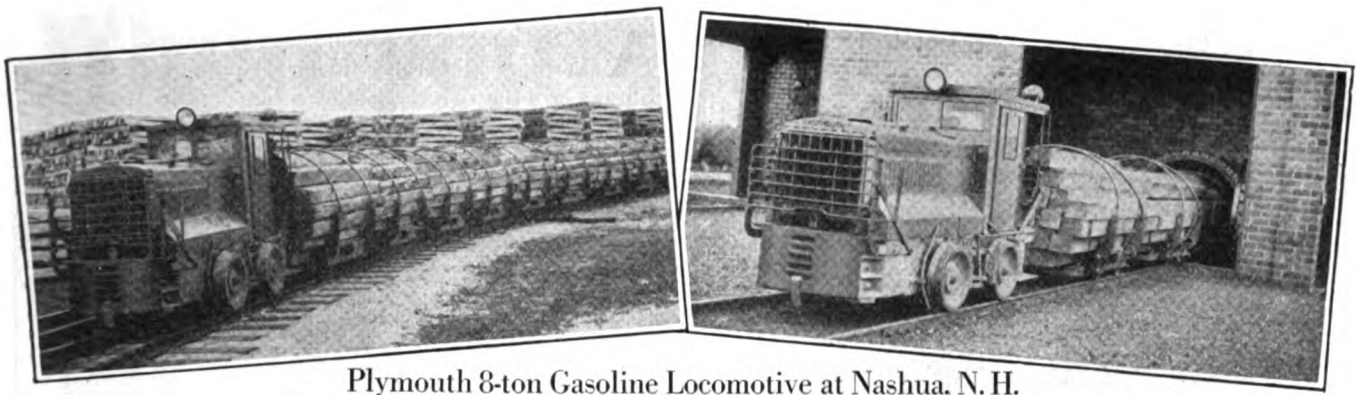
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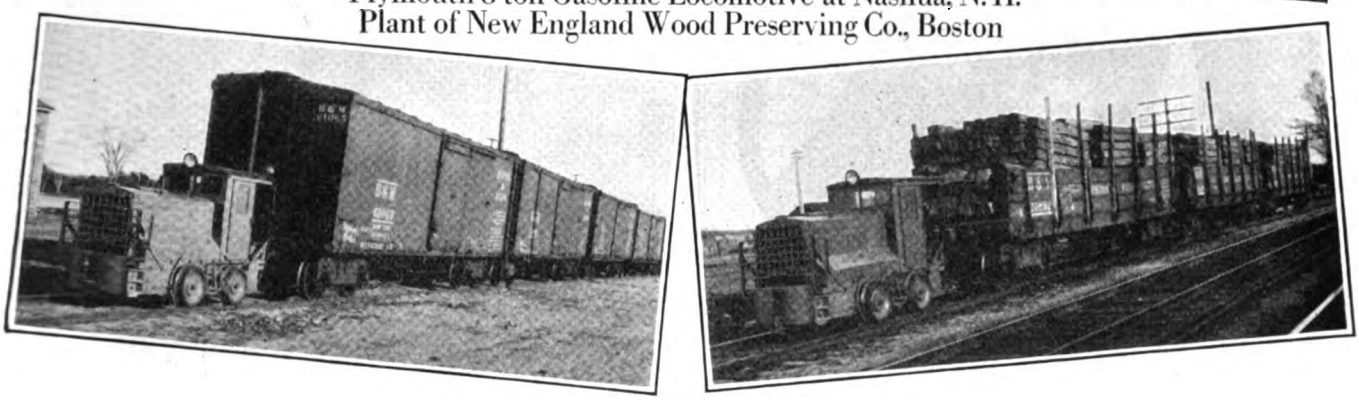
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Plymouth 8-ton Gasoline Locomotive at Nashua, N. H.
Plant of New England Wood Preserving Co., Boston



Plymouth Cuts Haulage Cost

This is a gasoline motor age. In no field of engineering has there been such rapid strides as in the development of the gasoline motor. Always ready, no coal to haul, no "firing up," no boiler troubles, no "stand-by" expense—the gasoline motor is rapidly displacing antiquated haulage methods.

The Plymouth Gasoline Locomotive is the pioneer in industrial haulage. It is the pace-maker with more speed, more power and more years of service.

Made in 3 to 20 ton sizes, and in any track gauge, to meet every requirement. No matter what the enterprise or industry, if haulage is a problem, then the Plymouth is the solution.

Write for Catalog and Performance Bulletins.

THE FATE-ROOT-HEATH COMPANY
Plymouth Locomotive Works
PLYMOUTH, OHIO

New England Wood Preserving Co.
Boston, Mass.

April 23, 1925

The Fate-Root-Heath Co.,
Plymouth, Ohio.

Gentlemen:

Our Plymouth 8-ton Gasoline Locomotive has given very satisfactory service.

Most of the time it is used for hauling trains of ties and timbers about our yard, and into and out of our treating cylinders. Although they do not all show in the photo, there were twelve tram cars in this train and the total weight, loaded, was about 133,000 lbs.

Heretofore this hauling was done by a large steam locomotive which is now used for handling standard railroad cars.

On several occasions, when our large steam locomotive has been laid up for repairs, we have done all of our switching with the Plymouth, hauling as high as five box cars, each loaded with 350 hardwood ties making a total gross load of approximately 525,000 lbs.

Very truly yours,
NEW ENGLAND WOOD PRESERVING CO.
(Signed) E. S. Park.

PLYMOUTH
Gasoline Locomotives

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An *Industrial* Fire Fighter

Both Portable and Automatic

Get the fire before the fire gets you

OCECO Fire Extinguisher

Safe on Electrical Equipment —Non-Freezing

ACCLAIMED the most powerful and efficient extinguisher on the market, the Oceco has met with 100% approval—industrial plants, power houses, oil, paint, grease factories and warehouses, chemical plants, etc.

This 40 quart non-freezing fire extinguisher furnishes plants exactly the protection they need. 10 gallons of liquid ejected by an equal quantity of air under pressure of 100 pounds. Pressure discharge sufficient to allow operator to remain 25 to 40 feet away from fire.

Equipped with 25 feet of specially constructed hose for handling the solution. Large diameter wheels for easy moving of extinguisher over rough ground, railroad tracks, etc. Guaranteed to give satisfaction.

Offered on 30-day test

So efficient in all tests made by many large concerns who have used it, that we will ship one of these extinguishers to any responsible company for a thirty-day test, with privilege of returning, if not found to give thorough satisfaction.

THE OIL CONSERVATION ENGINEERING COMPANY
877 Addison Road CLEVELAND, OHIO

The Oil Conservation Engineering Co.,
877 Addison Rd., Cleveland, Ohio.

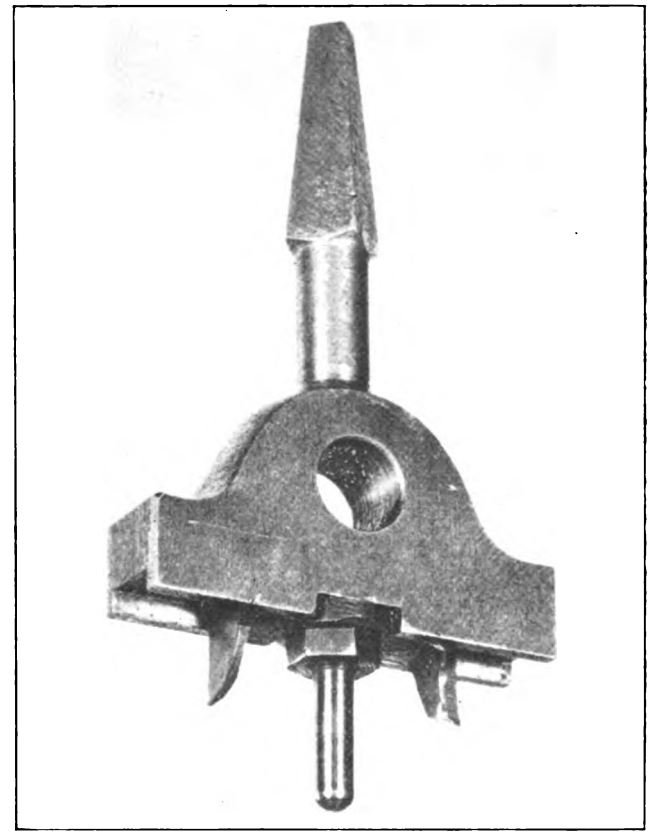
Please send further information about the Oceco Automatic Fire Extinguisher to

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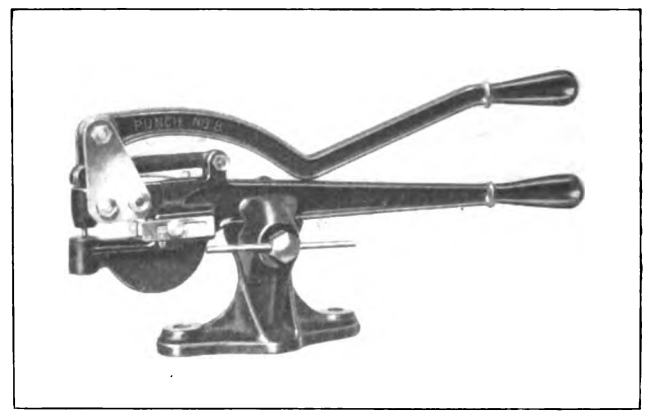
Two Useful Special-Purpose Tools

AMONG recent additions to the line of the W. A. Whitney Manufacturing Company, Rockford, Illinois, are the two tools shown here. The Model No. 8



Lever Punch is designed for quick punching of holes up to ¼" in sheet steel up to ⅛" thick, and is especially adapted to close corner work.

The "Speedy" hole cutting bit, fitting the ordinary bit



brace, cuts round holes through metal or other material, and is especially useful in connection with pipe fitting work.

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When you're in a hurry



The chick never needed such speed till the hawk got just above his tail.

In industry, oftentimes, the importance of early delivery is never realized until equipment is needed in a hurry.

Perhaps, today, early delivery of an elevator or a conveyor is as important to you as the shelter in the coop is to the chick.

Perhaps you have shopped around and have been met with the when, as and if of delivery.

There is no when, as or if to the delivery of Rex Q. D. Conveyors.

Q. D. means quick delivery. By quick delivery we mean 50% of the time that is ordinarily considered good for this sort of equipment.

You will find the particulars on Rex Q. D. Elevators and Conveyors in the side column. If you need the equipment, don't let time fly.

REX Q. D. CONVEYORS

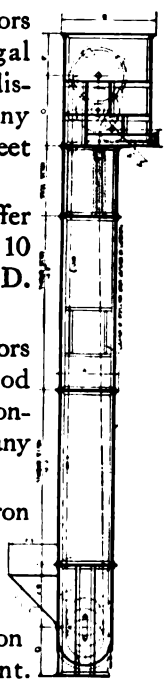
CHAIN BELT COMPANY

711 Park Street Milwaukee





Rex Q. D. Elevators and Conveyors



Rex Q. D. Elevators include centrifugal discharge, positive discharge elevators, any heights up to 60 feet on centers.

Frequently we can offer a delivery date of 10 days on these Q. D. Elevators.

Rex Q. D. Conveyors embrace both wood and steel apron conveyors, any width, any length.

On the Rex Q. D. Apron Conveyors we can make deliveries in 50% of the time heretofore required on this sort of equipment.

We are able to offer this unusual delivery date because of:

1. The time consuming engineering details are completed.

2. The partial completion in the shop of the standard head and foot sections, intermediate sections, casings and structural steel supports. It is only necessary to produce complete the special section to give the required lift, or the required length.



The line drawings above show the stages to which the work is already advanced.

If you need Elevators or Conveyors, mail the coupon today.

COUPON

CHAIN BELT COMPANY
711 Park Street
Milwaukee, Wisconsin

Please send me full information on

☐ **Rex Q. D. Conveyors**
☐ **Rex Q. D. Elevators**

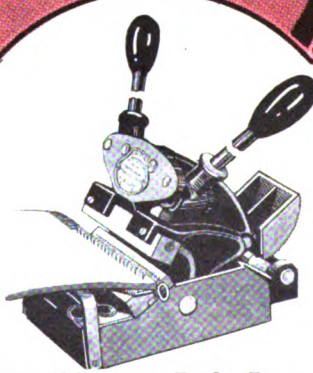
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The Clipper Belt Lacer

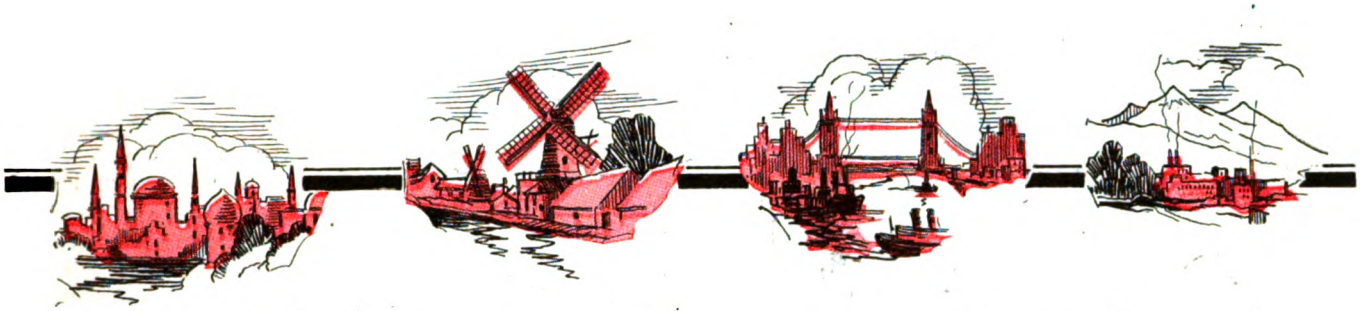
Universally recognized as the most efficient lacer in the world. Guaranteed indefinitely—kept in perfect working order free of charge, provided Clipper Belt Hooks are used exclusively in its operation.

Over 210,000 Clipper Belt Lacers now in use. More than 1,800 sold every month in the year.

QUALITY
CLIPPER
BELT LACING

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Clipper Products Are Used Throughout the Manufacturing World

IN every section of the world, wherever factories hum and wheels go round, belts are being held securely and efficiently with Clipper lacings.

One third of the enormous daily production of 4,000,000 Clipper Belt Hooks is exported over seas and into foreign lands. A large part of the world's belting is fastened with Clipper Hooks.

It is evident that Clipper Belt Hooks must sell at very reasonable prices in order to meet foreign competition in foreign countries. These reasonable prices are possible only because of large scale production.

But price is not the only reason for the popularity of Clipper Hooks. They are produced with the utmost care, of the best fatigue-resisting steel to withstand the greatest strain. High grade special machinery is employed to make each hook as mechanically perfect as possible.

Clipper Pins, both rawhide and special, are the best we know how to make.

We are convinced that the Clipper "Special" Pin will outwear any substitute for the rawhide pin now on the market.

Clipper joints have a staggered double grip, thus distributing the tensile strength over a wide section of the belt.

Clipper Belt Lacers are sold under a perpetual guarantee that they will be kept in perfect working order free of charge provided Clipper Belt Hooks are used exclusively in their operation.

Standardize on Clipper—for increased production, economy, quality and satisfaction.

Clipper Belt Lacer Company

GRAND RAPIDS MICHIGAN

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BARRETT LIFT-TRUCK

Barrett Handling Equipment



50% Speedier 25% Easier Lifting

Manufacturers in more than 310 different industries handle material with Barrett Lift-Trucks because Barretts mean

50% speedier handling
25% easier lifting
Complete elimination of waste in material handling
Lower operation cost

These savings, effected by the use of Barrett Lift-Trucks, make other material handling methods costly.

Write for FREE booklet which tells how and why Barrett Lift-Trucks will save vou money.

"Steeleg" Platforms for Lift-Trucks

Barrett "Steeleg" Platforms increase the speedy operation of trucking systems. Strongly built with rigid steel legs and maple top-boards—every board end steel gripped—nothing to become wobbly. Built in all sizes to fit all Lift-Trucks.

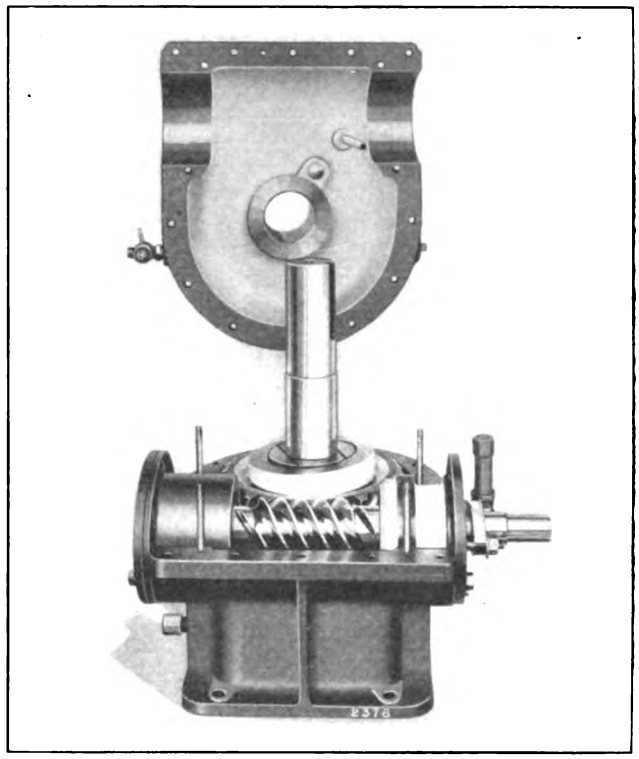
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EASIEST LIFT—BY ACTUAL TEST

A Worm Reduction Gear for Vertical Shaft Drive

THE accompanying illustration shows a worm reduction gear for vertical shaft drive recently developed by the De Laval Steam Turbine Co., of Trenton, N. J. The gear casing supports the worm bearings and also the lower bearing of the driven shaft, while the upper shaft bearing is held by the casing cover. This oil is carried at such a level that the worm and gear wheel dip into it, thus insuring copious lubrication. The lower wheel shaft bearing is always immersed in oil and has spiral grooves to insure circulation of the oil.

To provide oil for the upper wheel bearing and thrust plate, a small reciprocating oil pump is incorporated in

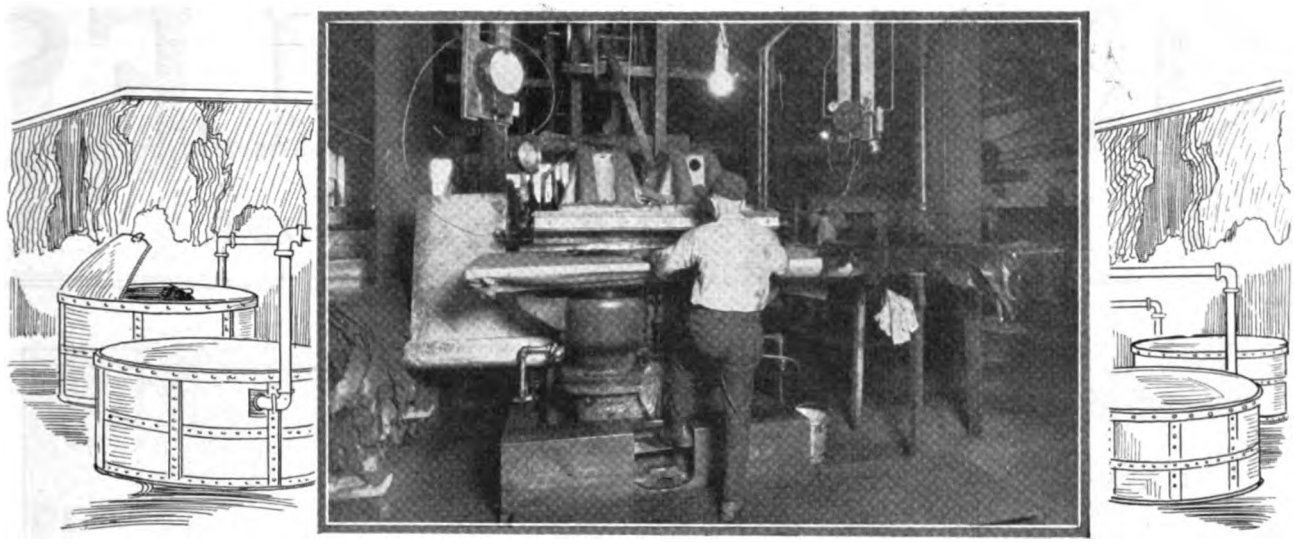


the casing cover. The plunger of the pump projects downward against a cam, just outside of the thrust plate of the bearing. The rotation of the cam actuates the plunger, which, by means of ball check valves, draws in oil through the suction pipe projecting from the under surface of the cover down into the oil in the casing. Suitable filling and drainage openings, together with a try-cock, provide for control of the oil level. With this type of speed reducer, inspection of the oil level at long intervals is said to be about the only attention required.

For larger size reductions, where the worms run at fairly high speeds, it is not desirable to immerse the worm and wheel on account of fluid friction, and a positive pressure oiling system is therefore used to feed oil to all the bearings and to the worm threads and gear teeth at the contact points. A full line of these drives is made and drives can be had with the shaft extending either upward or downward.



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A Variation in Temperature of 30° Reduced to 2° to 3°

This was one result by 5 Tycos Temperature Regulators and Recording Thermometers used on 5 hydraulic presses of a large hide and leather company in Chicago, Illinois.

These instruments were used in the final operation in the production of shoe leather—that of pressing the leather. For securing the best results, the steam heated plates of the hydraulic press should be held at a constant temperature ranging from 165 to 190 degrees, depending on the stock. If the plate is too cold, work must be done over, if too hot, the quality of the leather is inferior. Before these five Tycos Instruments were installed, the temperature varied as high as 30°—now the variation is within 2 to 3 degrees.



Tycos Automatic Temperature Controls for all Industries

In addition to having an absolutely uniform temperature, these Tycos Temperature Regulators and Recording Thermometers have given this company three additional advantages:

1. **Leather is turned out that is uniform in quality—an improved product.**
2. **It has eliminated the necessity of pressing any of the leather more than once—saves production.**
3. **Saves the labor cost which was required under the old method—this amounted to $936 yearly.**

This instance is a typical one. We can tell you of hundreds of others. Your factory managers no longer must worry about problems that involve temperature. Let Tycos Temperature Control regulate your heating processes. Then there will be no spoilage. Specify the temperature control that is saving management millions every year and also frees them from endless worry.

No temperature problem is too difficult for Tycos because experience from every industry has contributed to its solution. Whatever your process—there is a solution for it here at Tycos if it involves in any way the use of temperature indicating, recording and controlling apparatus. For seventy years—we have played the part of taking the control problem from the shoulders of factory management. Consult our nearest representative. There is one in every industrial center in this U. S.

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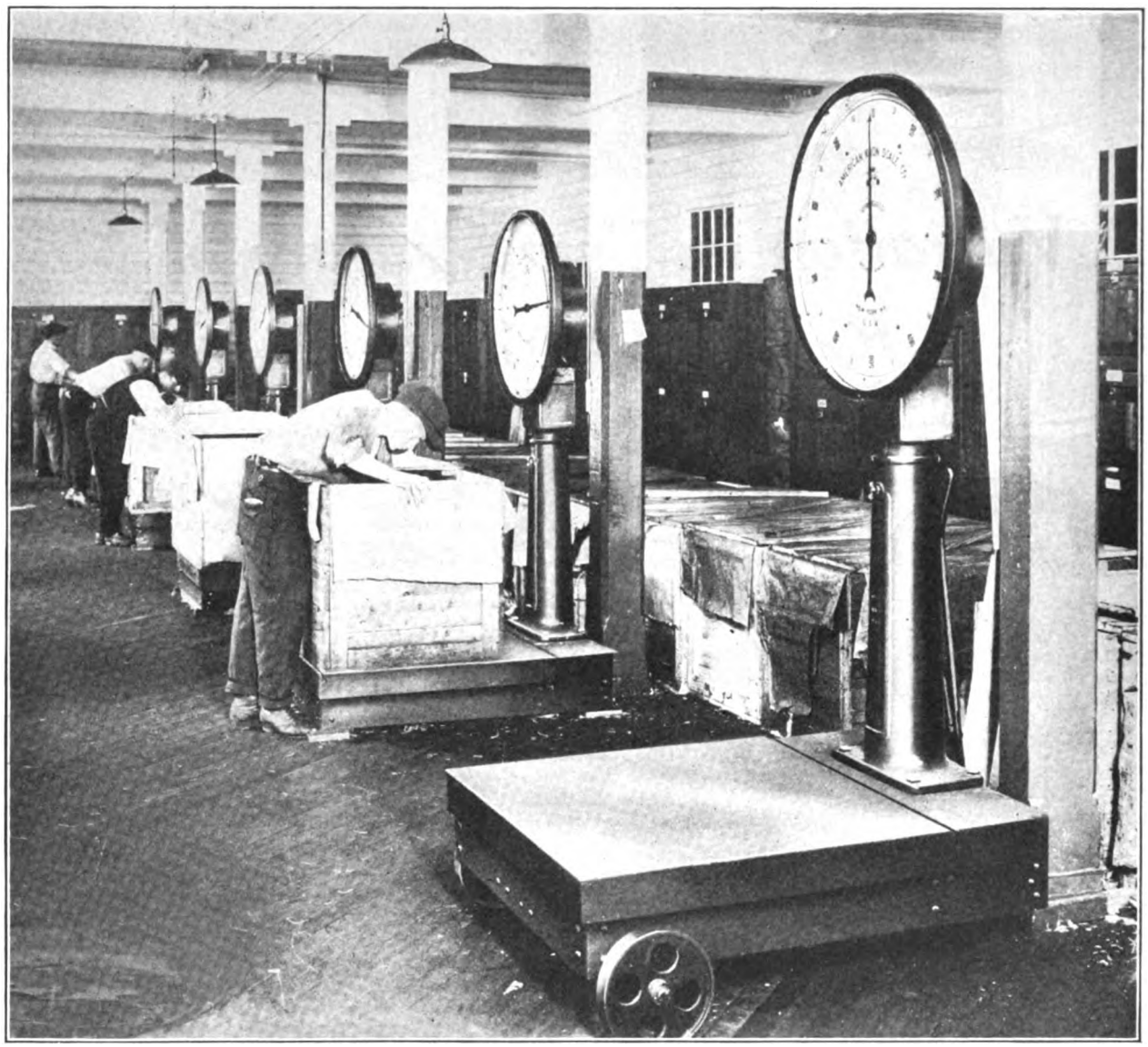
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Fifty KRON SCALES expedite the shipping of finished products in this plant, because no time is lost in weighing.

The empty boxes are placed on the scales and as soon as they are loaded sufficiently the weights are shown on the dials. Another example of **Load and Look.**

Kron Scales will weigh anything instantly, accurately and automatically. Remarkably simple in construction—no weights to juggle—no beams —no springs. Simply load and look.

Write for a copy of our 62 page catalog describing all the various types.

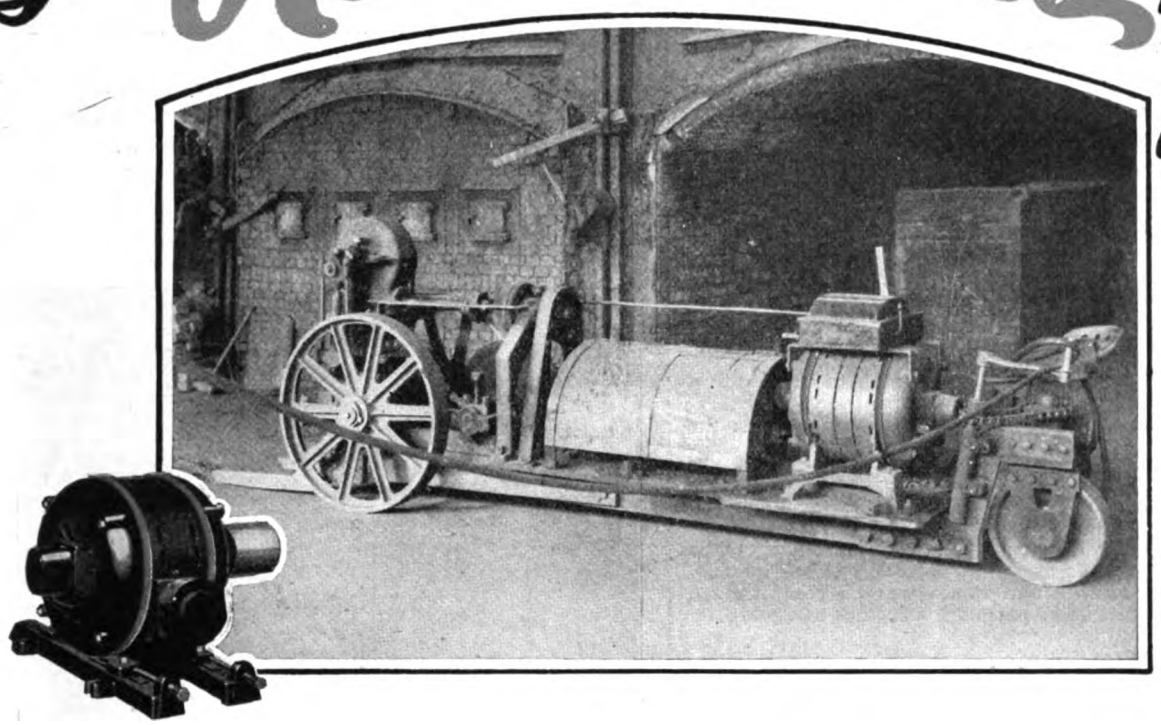
KRON SCALES

The American Kron Scale Co.
430 East 53rd Street New York City

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Give Red Bands your hard jobs



"Red Bands Stand Up Under Adverse Conditions That Would Wreck Many Motors"

says R. E. Black, Master Mechanic, The United States Mall. Iron Co., Toledo. "For over 4 years we have been using Howell Red Band Motors. Following a fire 2 years ago, we replaced many of the destroyed motors with Howells. At present we have 10.

"A 15 H. P. Howell (4 years old and a fire survivor) is used on a charging truck in our annealing room, handling all 17 annealing ovens. The loads run about 2 tons, and the jarring and vibration are a hard test for any motor.

"A 20 H. P. and a 15 H.P. drive blower fans for dust collecting. A 20 H.P. (another fire survivor) runs a forced draft fan in our furnace room. A 15 H. P. in the core room drives a line shaft for mixing sand, etc. A 10 H. P. is used on a fanning machine, another on a grinder. A 5 H. P. drives a machine in the pattern shop.

"A 40 H. P. Howell has been driving 16 tumbling mills for 18 months—exposed to the dirt and dust of this type of work. All the Howells are giving dependable service under conditions that would wreck many motors."

Howell Red Band Motors are made in all types and sizes from ½ H.P. to 100 H.P. Sales and Service blankets the nation. Catalog on request.

Howell Electric Motors Company
Howell, Michigan

63

Howell RED BAND ELECTRIC Motors

Make Good On The Hard Jobs

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5 steam trap weaknesses ☐ eliminated!



WHEN you install the Armstrong, you put an end to all steam trap troubles. It's a simple trap. It's the only trap with operating on the inverted, submerged bucket principle—that's patented.

See how it works. Steam entering the water-filled trap buoys up the bucket, closing the outlet at the top. When water enters and fills bucket, it condenses the steam in the bucket—the bucket sinks—the trap discharges. Simple, isn't it? And here's the weaknesses eliminated.

1 *No air-binding . . .*

Air-binding is a bugaboo common to many traps. In the Armstrong, air and gases entering the bucket rise to the top of the trap through a vent in the bucket. They pass out with the discharge. Air-binding is absolutely impossible.

2 *No scored valves . . .*

Because of the quick movement of the bucket, the valve of the Armstrong opens and closes quickly, avoiding scoring and steam waste. Heat treated chrome steel valve parts are a further safeguard.

3 *No clogging . . .*

Many traps get clogged with dirt and grease. Not so the Armstrong; you don't even have to blow it out. Sediment, oil and other foreign matter rise to the top and are discharged.

4 *No steam waste . . .*

The Armstrong discharges no steam. Steam entering the Armstrong never leaves the bucket—it can't escape.

5 *No excessive weight . . .*

The Armstrong because of its far greater capacity is very small in size. That decreases first cost and shippping cost—cuts heat loss through radiation. It makes unnecessary the use of foundations or brackets. The Armstrong can be supported by the pipe line.

90 day free test

We'd like you to test an Armstrong for 90 days. Install it, try it out, then return it collect, no questions asked. Send the coupon and we'll send a trap.

Please ship, prepaid, an Armstrong for 90 day test. It is understood that when test is completed the trap is to be returned collect

Size of trap .....Size of pipe connections.....

Maximum pressure.....(Do not neglect to state maximum)

Firm .....

Address .....

.....

Signed..... position.....

☐ Send the catalog only; send no trap

Mail to Armstrong Machine Works, 326 Maple Street, Three Rivers, Michigan II 2-R-RTG

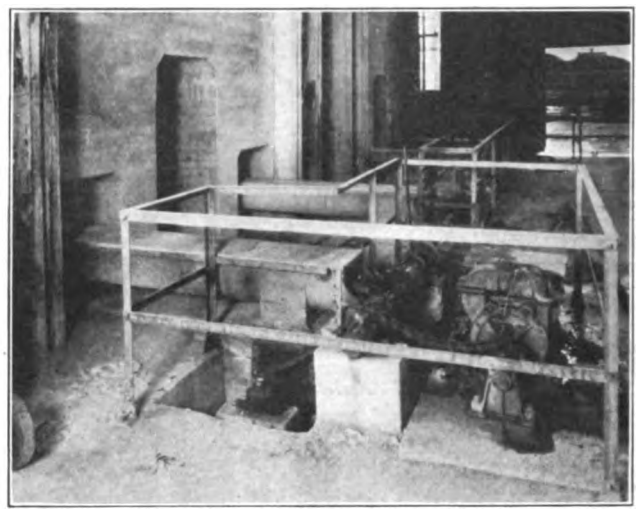
Handling Materials at 1,500° Fahrenheit

A Screw Conveyor That Handles Cement Clinker

THE handling of highly-heated material by means of conveying equipment embodies special conditions which do not ordinarily have to be taken into consideration.

For this reason, the screw-conveyor installation just completed for The Standard Portland Cement Company at their plant at Painesville, Ohio, may be of interest.

The material handled is hot cement clinker at a temperature 1,500 degrees Fahrenheit. The clinkers are discharged from the kilns directly into the four parallel



screw conveyors shown in the illustration. Three of these screw-conveyors are 60 ft. long and the fourth is 65 ft. long. These four parallel conveyors discharge into a cross-conveyor which runs at right angles to them. This cross screw-conveyor carries the clinkers to a centrifugal pump which in turn delivers them to the coolers.

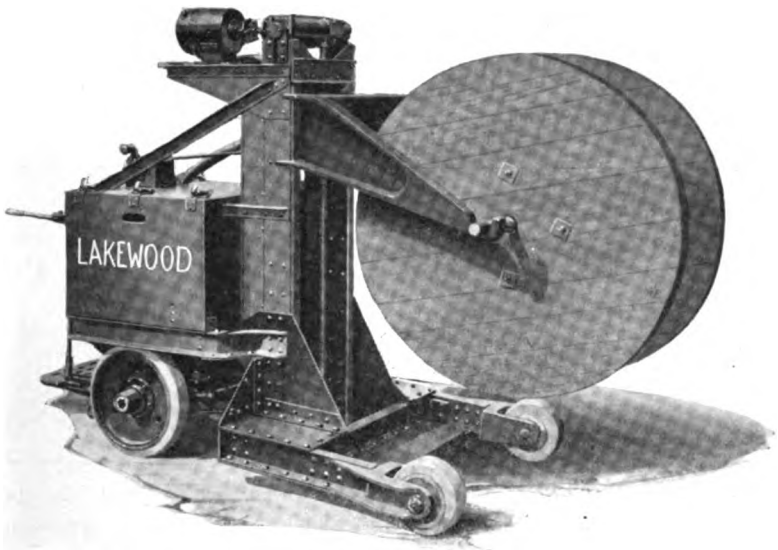
The high temperature of the material handled necessitated special provision being made for expansion, and for unusually rigid support of the shafts and flights to avoid warping, etc.

All five conveyors are driven from the same motor; the cross conveyor by mean of a speed-reducer and chain, and the four parallel conveyors from countershafts through bevel gears. Each parallel conveyor is equipped with a jaw-clutch cast integral with its bevel-gear so as to permit it to be cut in or out independently.

The cross-conveyor runs in a concrete trough built into the floor. This makes it possible to anchor the countershaft, and by making the bearings of the parallel screw-conveyors integral with those of the countershaft, the drive ends of the parallel conveyors are also anchored firmly in alignment. The parallel conveyor troughs are made from 3/16" steel plate. All screws are 10" diameter and 3/8" thick, and are also made from steel plates. The feet of the troughs are made from cast-iron riveted to the troughs and set on ½" thick steel plates. These plates are anchored to concrete piers, and their ends are bolted to cast-iron guides which allow the trough to slide and yet to maintain perfect and permanent alignment. In order to allow for the heat-expansion of the screw, this

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A Lakewood Tier-Lift for every purpose



This truck handles reels of wire, up to and including 54″ in diameter.

Write Lakewood first for special purpose trucks.

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CLEVELAND, OHIO
Originators and Patentees of the Tier-Lift Truck

THERE'S NOTHING LIKE STEEL
For Strength—for Service—for Safety





MEDART
ST. LOUIS

Steel Shelving

Wood Shelving is as obsolete as the letter press. Everywhere Medart Steel Shelving is used instead. It is adjustable, stronger, lasts indefinitely, reduces fire risk—saves space, steps, time, loss and overhead. Write for Shelving Catalog S-7, describing uses, styles, sizes and finishes.

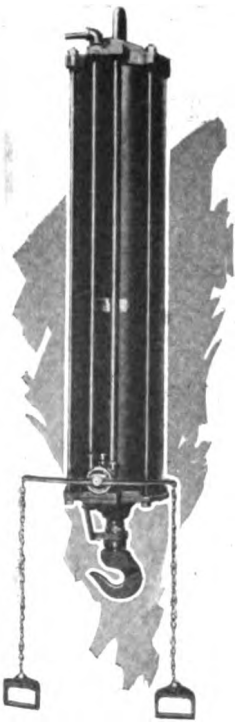
Steel Lockers

Once Medart Steel Lockers were considered a luxury. Now they are a necessity in every modern establishment. They win good will of employees and prevent thievery and discord. Medart Steel Lockers are made in a complete variety of types, sizes and finishes to meet the needs of any buyer. Write for Locker Catalog A-13.

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is cut back 3" from the hangers; the total amount of expansion arranged for being 2½" on the troughs and 5" on the screw.

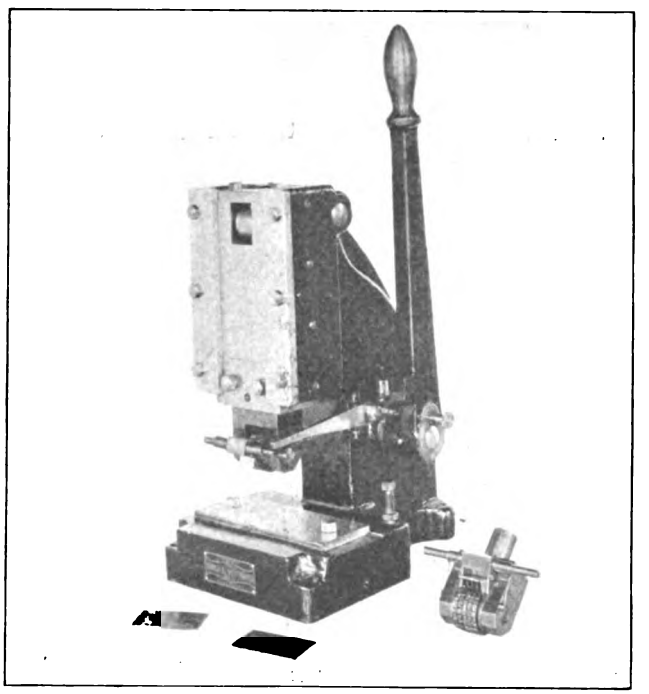
All hanger bearings are made of chilled iron, and each of the main shaft bearings is bronze-bushed. The top of each conveyor is covered with a steel plate covering flanged over along the edges. These flanges extend down into troughs along the sides of the screw-conveyors, and are formed by riveting angles to the sides of the troughs. In order to prevent the dust from scattering, each trough is provided with a sand-seal by filling it with sand.

A New Number Stamping Press

THIS press, recently announced by the Noble & Westbrook Mfg. Co., Hartford, Conn., is particularly designed for use in connection with numbering machines for the numbering of metal plates or other metal parts.

Due to the reasonable cost of this press, the makers point out, a numbering head can be kept in the press at all times and numbering done as occasion requires. It is, therefore, not necessary to tie up the use of an expensive power press or to keep changing the set up of the press.

Either consecutive serial numbers worked automatically with each stroke of the handle or the same number

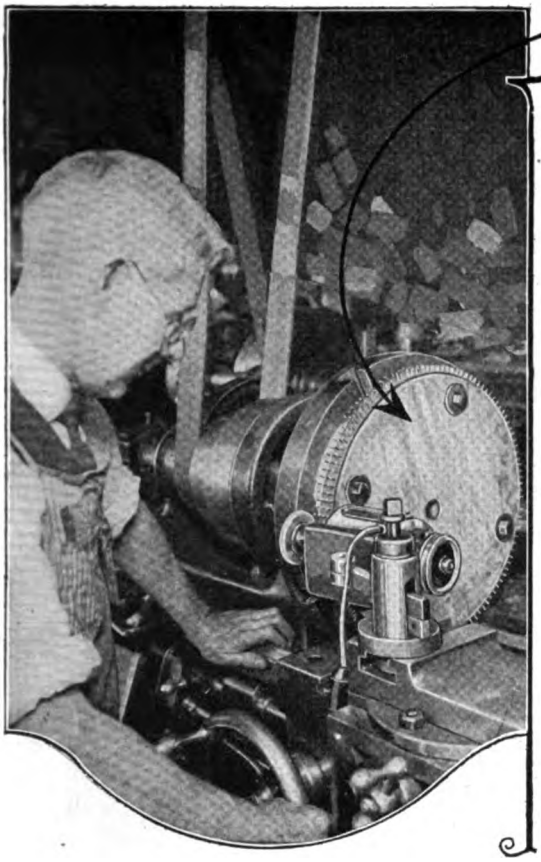


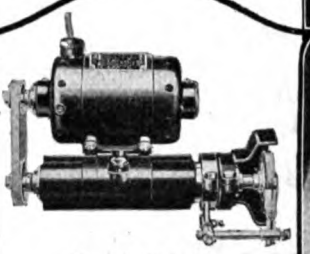
can be stamped indefinitely as required. Power is applied through the handle by a lever with a toggle joint movement which makes the action smooth and easy.

The ram of the press is heavy and substantial and has a gib to take up any wear.

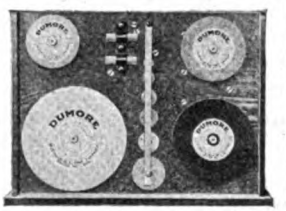
While the press is primarily designed to take numbering heads, it is also suitable for any work such as light blanking, stamping or lettering, as it has plenty of power and is accurately made. While made in one size only at this time a smaller size will be added later.

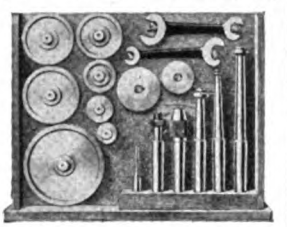
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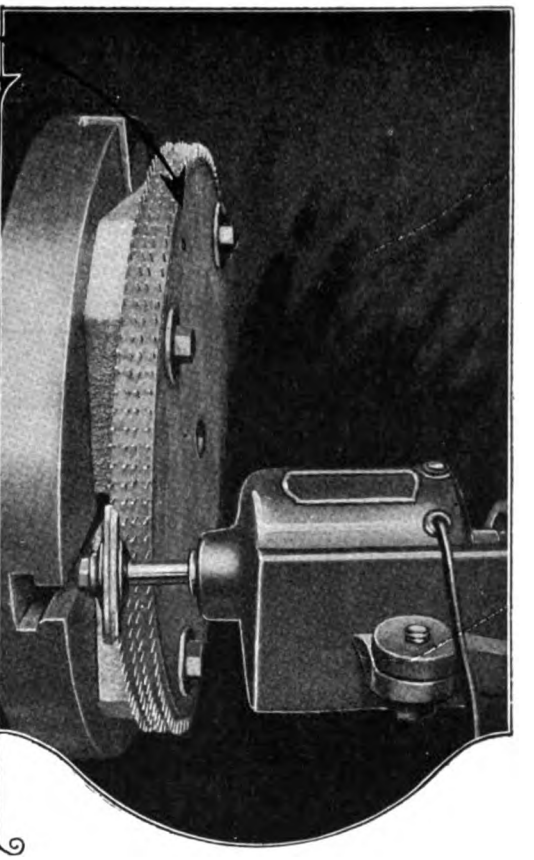


No. 3 Grinder





Wheel & Spindle Equipment Furnished with Dumore No. 3 Multi-Speed Grinder.



Dumore Saves the Day on "Tricky" Jobs

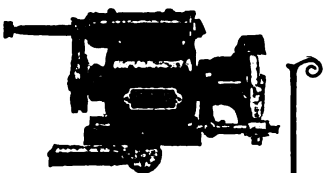
Here's how a Dumore High Speed Grinder made a hard job easy for a special machinery shop in the East.

A leather belt studded with 1/32" steel pins had to be "tapped off" to exactly 3/8" long.

They stretched the belt on a circular wooden frame, and bolted it to the face plate of the lathe. Then they set the Dumore High Speed Grinder up on the tool post, accurately adjusted it for distance—and proceeded to handle a delicate grinding operation without difficulty.

Simple? Nothing to it! Dumore convenience and accuracy simplifies all kinds of "tricky" grinding.

WISCONSIN ELECTRIC COMPANY
70 Sixteenth St., Racine, Wis.



Dumore No. 2—AG Grinder
For general tool-room use. Length of internal spindle 3". Spindle speed 10,000 to 30,000 R.P.M. Self-aligning ball bearings. Comes completely equipped.



Dumore No. 1—JG Grinder
An inexpensive tool for garage, repair shop or tool-room. Speed 15,000 R.P.M. Length of arm 4¼". Extension spindle 2". Grinder pivots on base.

This Free Book Will Cut Your Grinding Costs

Here's a book for the practical mechanic—chock full of time and money saving short cuts that will help you solve those trick grinding problems that come up so often. Actual photographs of grinding set-ups that have cut costs for others.

No obligation—just ask for it on the handy coupon below.

Dumore High Speed Grinders are sturdy, easy to move, and operate on either AC or DC current. 6 styles and sizes.



DUMORE

HIGH SPEED GRINDERS

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I'm interested in cost-cutting grinding stunts and short cuts. Send me your booklet, "Hitting the High Spots."

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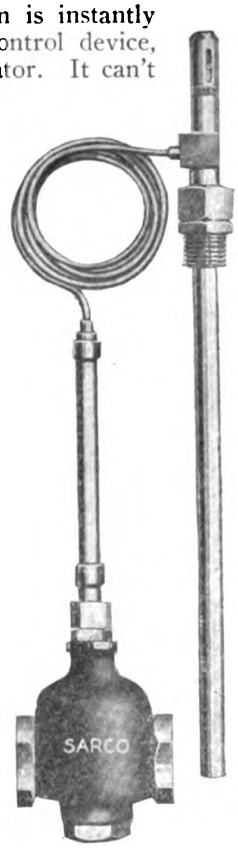
DON'T GAMBLE with Temperatures!

In many manufacturing processes which call for the use of liquid solutions at given temperatures, it is sheer gambling to depend upon the uncertain "human element."

Sooner or later the man who is "infallible" proves that he is *not* infallible. And then—he takes his hat and coat off the peg, and walks out of your plant with a pink slip in his envelope.

But does that save your goods? And does it save your good name? How many times in the past have inferior goods gone out to undermine your reputation.

All doubt in this connection is instantly ended by that reliable, sure-control device, the Sarco Temperature Regulator. It can't make mistakes. It can't go wrong. Once set for a given temperature it maintains that temperature faithfully. It gives you the positive assurance that your solutions are neither too hot nor too cold—that your goods will not be ruined in process of manufacture, day or *night*.



Simplicity is the keynote in the construction of this instrument. The prime agent in the control of heat volume is an expansion-and-contraction element controlled by a super-sensitive liquid. There are no outside devices to invite breakdown and expensive repair. No electricity, water or compressed air. The Sarco is entirely self-contained. Compact—small in size—durable. And lower in price than any other temperature regulator.

Sold on 30 days' free trial. For full particulars, write for Booklet No. R-67

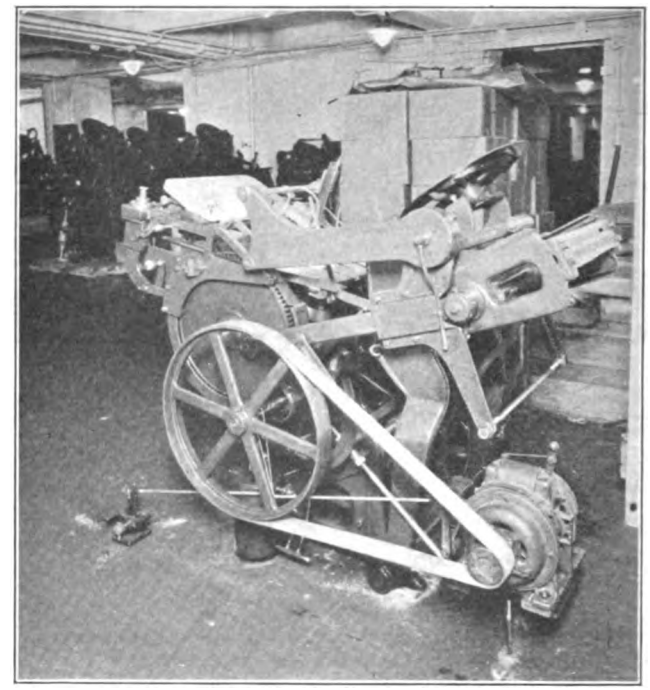
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Buffalo Chicago Cleveland Boston Detroit Philadelphia
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SARCO TEMPERATURE REGULATOR

A New Motor for Wide Speed Range on Alternating Current

A RECENT new General Electric motor, bearing the type designation BSR, is designed especially for driving job presses in printing establishments, but is also recommended for other duties where the requirements call for an adaptable machine to operate on alternating current with a wide speed range and convenient and efficient methods of control. The BSR motor is of the compensated repulsion type, having a high starting torque, and speeds are changed by shifting the brushes, thus eliminating current waste in resistances and simplifying control generally.

The new motor is designed for use on alternating current, single-phase, 110- or 220-volt circuits, although it can be operated from any one phase of a two-phase or three-phase circuit. Thus the motor can be adapted to

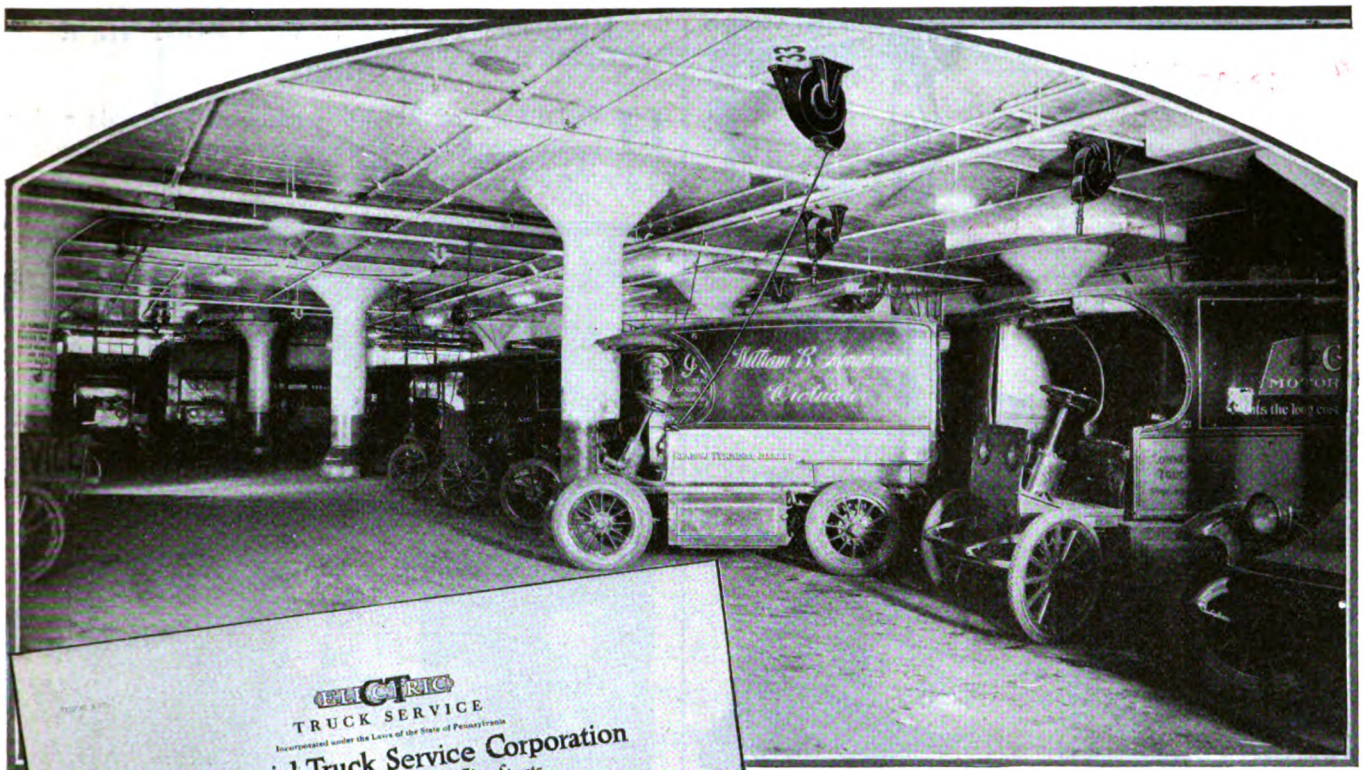


any one of six possible circuit conditions. Two wires only are needed for connections.

Motor speeds can be varied over a wide range, a handle at the motor varying the position of the brushes by moving the brush yoke. Thus, on job presses, press speeds can be reduced from a value suitable for feeding in at the highest possible rate to approximately a third of maximum speed.

One of the features of the BSR motor is the use of a specially designed control for the convenience of the press operator. In addition to an arrangement for foot control, the necessary control mechanism has been incorporated in a pedestal which may be located at any point most convenient to the pressman. With this pedestal the motor can be started or stopped with a push button, and the speed varied with a handle projecting from the top. The pedestal is of strong construction and not liable to damage by accidental interference from the operator or from the movement of trucks loaded with paper or other material.

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ELECTRIC
TRUCK SERVICE
Incorporated under the Laws of the State of Pennsylvania

Commercial Truck Service Corporation
General Offices—Franklin and Vine Streets
Philadelphia July 24, 1926

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Gentlemen:

When we built our new Electric Truck Service Station in Philadelphia we aimed to make it the finest equipped electric truck service station in the world. With that end in view we investigated the most modern and efficient devices obtainable so that our new service station, besides being the largest would also be the most up-to-date in every way.

A valuable part of our equipment are the Junior Reelites installed in our truck charging departments. These Reelites have proved very satisfactory and efficient.

They make for safety and economy as a time saver and reduce cable replacement to a minimum.

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We shall be glad at any time to show anyone interested through this modern C-T Electric Truck Service Station and demonstrate to them the efficiency of your product.

Very truly yours,
Martin Melia
SERVICE ENGINEER

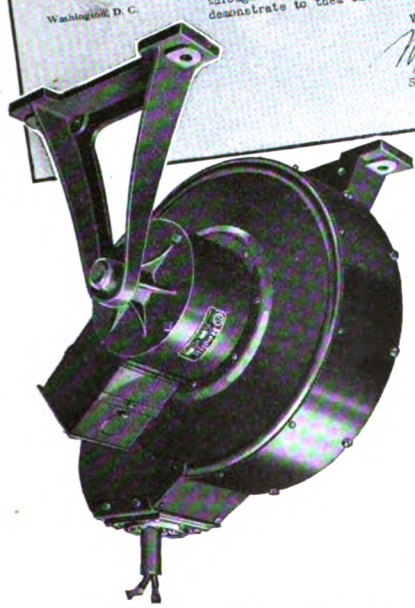
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If for power — there's Mogul type Reelite with its smooth action, unreeling and retrieving cable; if for light in inaccessible places, the Reelite gets there in jiffy time with no dragging cords. There's not a manufacturing plant but can profitably use Reelite.

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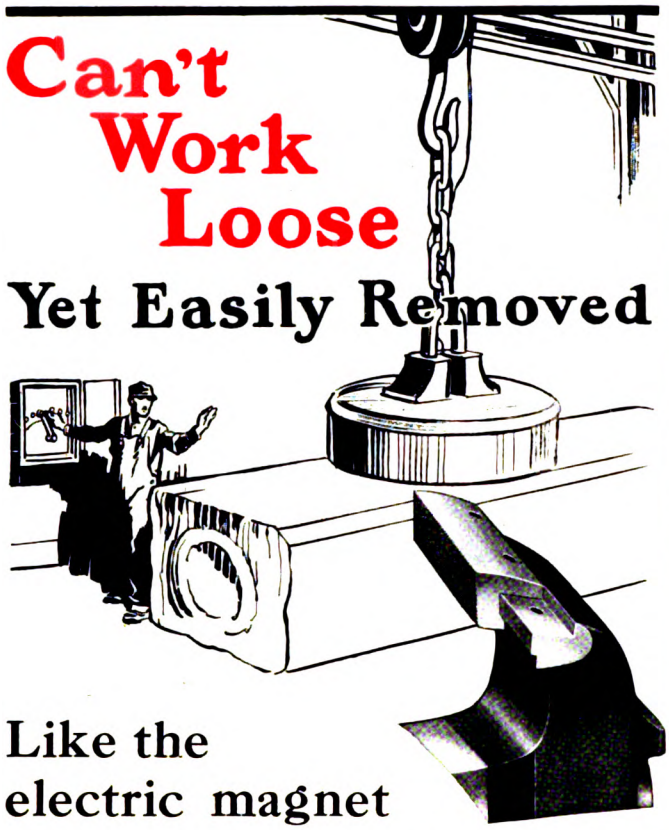
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Like the electric magnet

which can exert great gripping power or release its load at will, the jaws of a Parker Vise are fitted tight to stay on a lifetime or they can be easily removed if necessary.

Parker vise jaws are made of steel, carefully milled and fitted, and pinned on. Their construction has been a feature of this famous vise for 85 years. Parker also makes brass and copper finishing caps to cover rough jaw faces. The caps are described on page 20 of the Parker Catalog 57-A, a complete, and handy sized book which should be on your file for reference. Write to the Parker Co., attention of W. R. B., for a copy.

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Master Vise Makers
Meriden, Conn., U. S. A.

PARKER VISES

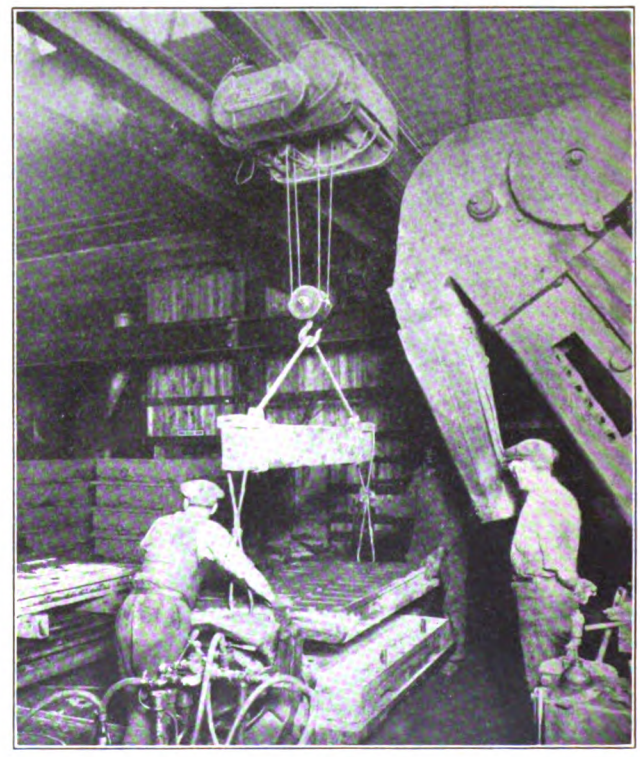
"Grip Like a Grizzly"

Electric Hoists Save Labor in a Foundry

HANDLING of 733,407 pounds of materials a day by three men and two electric hoists in its foundry is reported by a large machinery manufacturer. A single



molding machine gives an output of 22,000 pounds of good castings a day. In turning out this tonnage, patterns, flasks, molds, ladles and castings must be lifted, moved and lowered, frequently with hair-line precision,



as in lowering the cope on the drag. Two three-ton hoists, each carried by the simplest form of traveling crane, are the entire material handling equipment of this foundry.

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Nothing to Touch But the Hangers When Installing Hyatt Bearings



HYATT Line Shaft Roller Bearings combine so many desirable advantages that you cannot afford to overlook them when in the market for transmission bearings.

They are completely split for easy installation —and built to fit any make of hanger. They may be applied in a few minutes—while the shaft is turning, if emergencies occur.

It is not necessary to dismantle clutches, pulleys, drive gears or other shaft fittings. Just remove the old bearing and put on a Hyatt.

Positive power saving—in some cases as much as 50 per cent—is assured. Cost of lubricant and maintenance is likewise reduced—not for a few short months—but for the rest of your life.

Hyatt Line Shaft Roller Bearings have been lowering power transmission cost for more than 36 years. They are used with equal success in many parts of the world.

There is a Hyatt dealer in your vicinity. If not, we shall be glad to send a factory representative to consult on your transmission problem. Hyatt Roller Bearing Company, Newark, N. J.

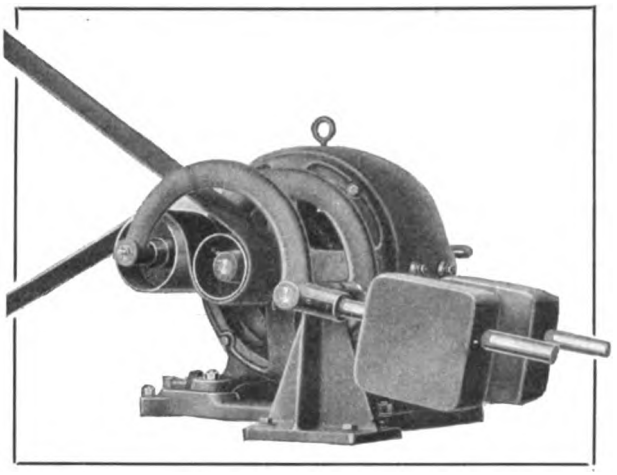
Dealers, Note

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Completely Split For Easy Installation

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ROLLER BEARINGS

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THE U. G. AUTOMATIC BELT CONTACTOR

Saving Space, Belts and Money

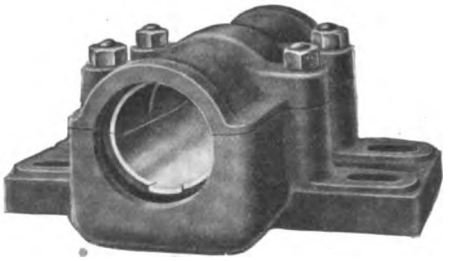
Here's a sturdy little power transmission unit that has great economical features. It saves Belts, Bearings, Floor Space, Motors, Power —and trouble.

It automatically wraps the belt around the pulley, increasing the arc of contact as load increases, thus giving more power.

The U. G. Automatic Belt Contactor is potent with possibilities of savings and increased production efficiency in your plant. We'd be glad to send you a circular describing this profit making appliance.

For 69 years T. B. Wood's Sons Company has been manufacturing a complete line of quality products for the mechanical transmission of power. Each and every one of them is of that durable, long wearing quality that makes for economy.

When you next consider power transmission appliances consult the Wood's Dealer.



T. B. WOOD'S SONS COMPANY

Makers of Power Transmission Machinery since 1857

Chambersburg, Penn.

New England Branch, Cambridge, Mass.

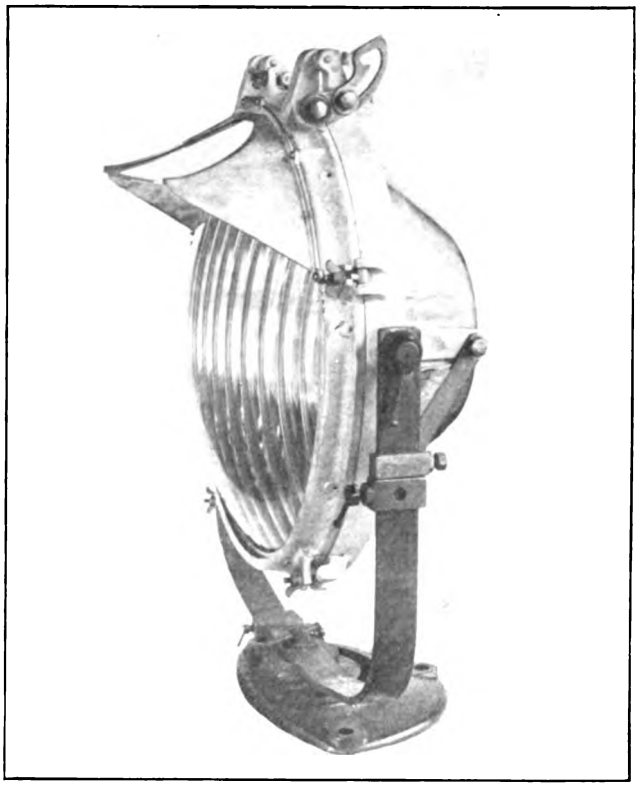
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Flexible Couplings, Motor Pulleys, Speed Reducers, Cast Iron Pulleys and Hangers, U. G. Automatic Belt Contactor for Short Center Drives.

A New Floodlight Projector

AN important departure from conventional floodlight projector design is claimed for the Pyle-National type No. 2375 projector. Ventilation has been entirely dispensed with and the cast aluminum alloy case has an absolutely tight closure, with machined surfaces at the door joint and a soft lead packing ring. The principal causes of depreciation in reflective values, and of lamp failures are thereby said to be eliminated, since dust, gases, moisture, and insects are entirely excluded from the interior of the unit.

Ventilation is dispensed with in this new design, for



the sufficient radiating surface, it is claimed, assures perfectly safe interior temperatures for the glass reflector and lamp when using 1,000 and 1,500 watt lamps.

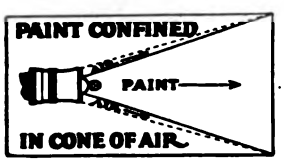
The case is of cast aluminum alloy, with a drawn aluminum back, and fittings and small parts are of aluminum or bronze. The mounting base and trunnions are provided with locking devices so that adjustment of the unit is not disturbed by the maintainer. Focussing is from the outside of the case. Pyle-National "Nonglare" or crystal glass reflectors 23" in diameter are used, and these, as well as the rectangular divergence lenses which are optional on this unit, are exclusive developments of the Pyle-National Company.

THE steel and iron industry is fortifying its strength by an evident inclination to keep a price that serves well to balance output and demand. The composite price of pig iron during recent months has not varied more than a dollar a ton, and the output has been in response to orders received. Consequently, there has been little or no speculation, with profit earned by economical and efficient operation. This policy dovetails well with the hand-to-mouth buying of consumers.—*La Salle Extension University.*

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Vortex Painting Method

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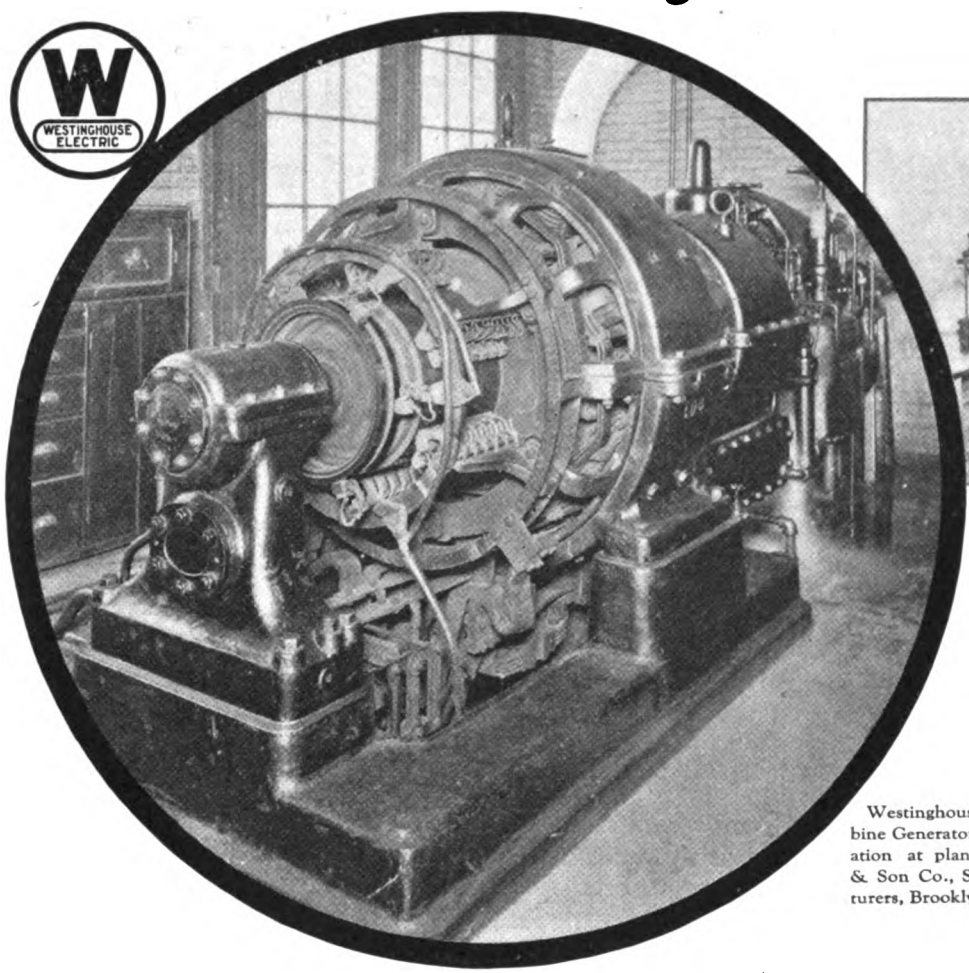
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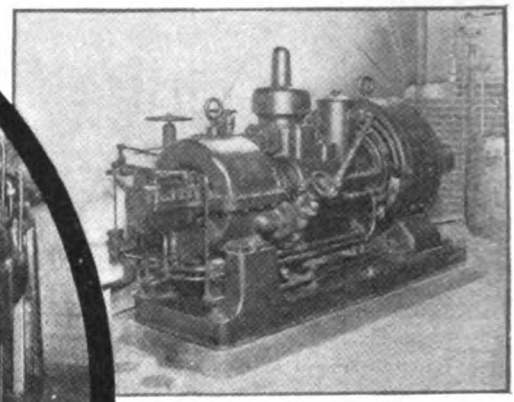
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Behind the Bars— for *Good* Behavior





The same type of turbine generator —seen from the turbine end.

Westinghouse Geared Turbine Generator Unit in operation at plant of Kirkman & Son Co., Soap Manufacturers, Brooklyn, N. Y.

GO behind the bars—and flakes—of Kirkman's soaps and you'll find this Westinghouse geared turbine generator serving a hard sentence.

It's "in" for good behavior—and has a record that any power user can well look into.

The unit is 500 kw, and has been operating since 1922. Current from the generator drives machines for making soap. The exhaust steam heats large rolls for making flakes, and for other purposes.

Behind soap bars—or any other product—Westinghouse turbines keep down costs and uphold quality.

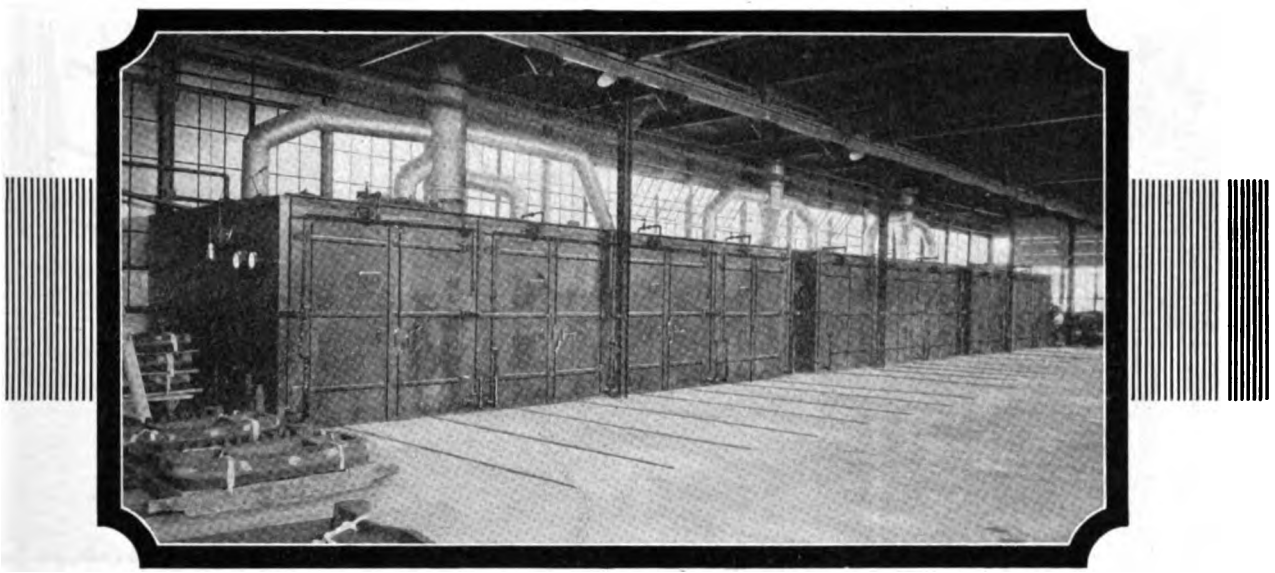
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IN THE FOUNDRY

An earned reputation for thorough dependability and low cost operation has given Young Brothers Ovens first place in the core and moulding departments of the modern foundry.

Here are a few of the increasing list of foundries using Young Brothers Oven.

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McCaskey System in use at the Wheeling Steel Corporation.

Now We Have a Constant Check on 1500~2000 Jobs in Process

YOU know how difficult it is to keep track of 150 or 200 jobs at a time. What would you do if you had from 1500 to 2000 different jobs going through the plant at the same time? Could you tell instantly the status of each job? You could if you used the McCaskey System. But let the Wheeling Steel Corporation, Wheeling, West Virginia, tell you their experience:

"Several years ago the Whitaker-Glessner Co. instituted at its Portsmouth Works a labor distribution system to give a record of each separate job—showing department where done, department served, job number, numbers of workmen, hours, rate, and extended time.

"The blind file used soon became too cumbersome, and 7 years ago they started installing McCaskey Registers for filing this information. Five years ago, when the Wheeling Steel Corporation took over the Whitaker-Glessner Co., we continued to employ McCaskey Registers. By means of carbon backs, 3 copies of the slips are made.

"The department originating or performing the job writes the McCaskey slip, retaining one copy. The cost department gets the original for its monthly recapitulation; the second copy goes to the department served. This system gives each foreman a definite check on all work done in his department.

"Posting the slips to the McCaskey Register by job numbers keeps the record of each job in process constantly in sight. No digging through file drawers is necessary. In our Portsmouth McCaskey Registers we keep a record of 1500-2000 jobs in process. Our Steubenville mills have about the same number; the other plants accommodate less.

"McCaskey Registers also keep our store charges —showing movements of all store supplies. This has reduced waste, because supplies are now issued only when actually needed.

"Altogether, 71 McCaskey Registers in our various plants keep our labor distribution and store charges systems working efficiently."

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A New Remarkable Book

that will show you how to cut to a minimum losses you now suffer from fire and accidents—

LANGE'S HANDBOOK *of* Safety and Accident Prevention

THROUGH a reading of this book you can in a large measure eliminate the tremendous waste that takes place in your factory every year through preventable accidents or preventable fires or both—a waste that necessarily eats greatly into any factory's profits. Fred G. Lange, for several years Assistant Director of Safety of the Youngstown Sheet & Tube Company and formerly Director of Safety for the Industrial Commission of Ohio, and a member of the National Safety Code Committee, has written this—the first complete presentation of the Safety First and Accident Prevention Movement. In a clear, concise, authoritative, and practical manner he describes every possible step you can take to bring down and keep down your accident and fire cost. This is easily one of the most important volumes INDUSTRIAL MANAGEMENT has ever published. Consider, if you will, the unquestionable fact that the prevention of just one accident or one fire will easily repay the cost of the book many times over. Then order your copy today and immediately make use of the far-reaching benefits it is bound to bring to your plant.

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Every **Construction Superintendent and Foreman.**

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120 West 32nd Street, New York City.

Please send me postpaid Lange's Handbook of Safety and Accident Prevention. I shall either return it to you within 10 days or remit the full price, $5.00.

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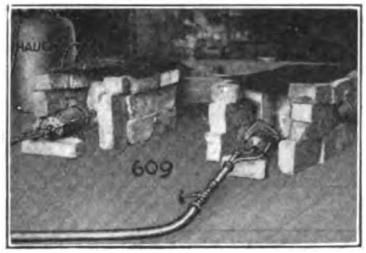
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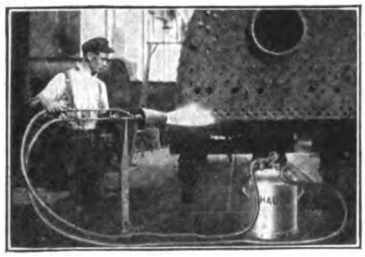
For PREHEATING in connection with welding use Hauck Kerosene Torches, and reduce the fuel cost by 50%. The steady, mild heat insures perfect welds.



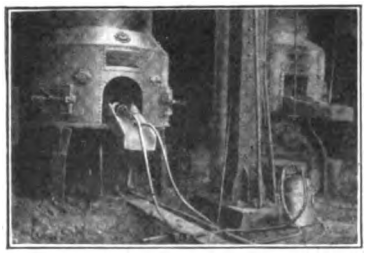
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Mail us bulletin which describes Hauck Oil Burner for

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Saving the Power Loss Through Faulty Transmission

By William Staniar

IT is true that there is a tremendous waste in the generation of power through faulty furnace and boiler design, bad water, inefficient stoking and improper combustion, but why add another large amount to this through the improper transmission and application of the power finally available. Slipping belts, fastener breakdowns, high ratios, improper motor capacities, poor shafting alignment, wrong type of bearings and a host of other mechanical transmission power consumers exact a heavy toll from the coal pile and pocketbook every hour of the working day.

The road from the fuel to the production machine can be made a smooth highway, but in too many plants, it is jammed by the traffic of antiquated methods of transmitting power, prejudice and carelessness.

In a recent newspaper editorial we read, "The annual report of the Secretary of Commerce holds a message not only to the business men of the nation, but to every citizen. It is the story of a miracle that has affected and is affecting all of us. Wages have advanced, costs have decreased. How is that? The answer is the elimination of waste in industry, in agriculture and in manifold phases of our national life."

The elimination of waste in industry is an asset to worker, farmer, consumer and manufacturer, because it saves material substances which cost money and labor to produce. Studies and investigations for the conservation of materials generally disregard the fertile field for economies presented by power generation and power application, therefore, based on the known fact that today the real prosperity of the nation is dependent to a great extent on the horsepower generated and mechanically applied, a plea is made by the engineering world for economy in its use.

For the past 86 years power belting has been vital to the production efficiency of industry and throughout these years this medium has practically stood supreme. The last few years, however, have brought inroads on this supremacy, due to the fact, no doubt, that modern industrial engineers and power users have come to the realization that one method cannot be a cure-all for all mechanical transmission problems. Still, at the present time the transmission and distribution of power by belting is extensive and is by far in the majority. It is still the final source of power application in thousands of industrial plants throughout the country and it still continues to be grossly neglected and misused.

The writer brought out, in a previous article, the fact that because the average belt is comparatively inexpensive, its importance is often overlooked. As an illustration, a high-priced gear generator was proven to be dependent on a $40.00 belt for its earning capacity, which is a positive fact with all belt driven machines and apparatus, because in the last analysis the belt is the final power connection. Without the connecting link, the boiler, turbine, generator and motor are worthless in industrial production operations.

In a recent issue of the "Scientific American" a pictorial graphic chart was shown, illustrating what becomes of the energy contained in a ton of coal. It was a splendid demonstration, but it did not go far enough.

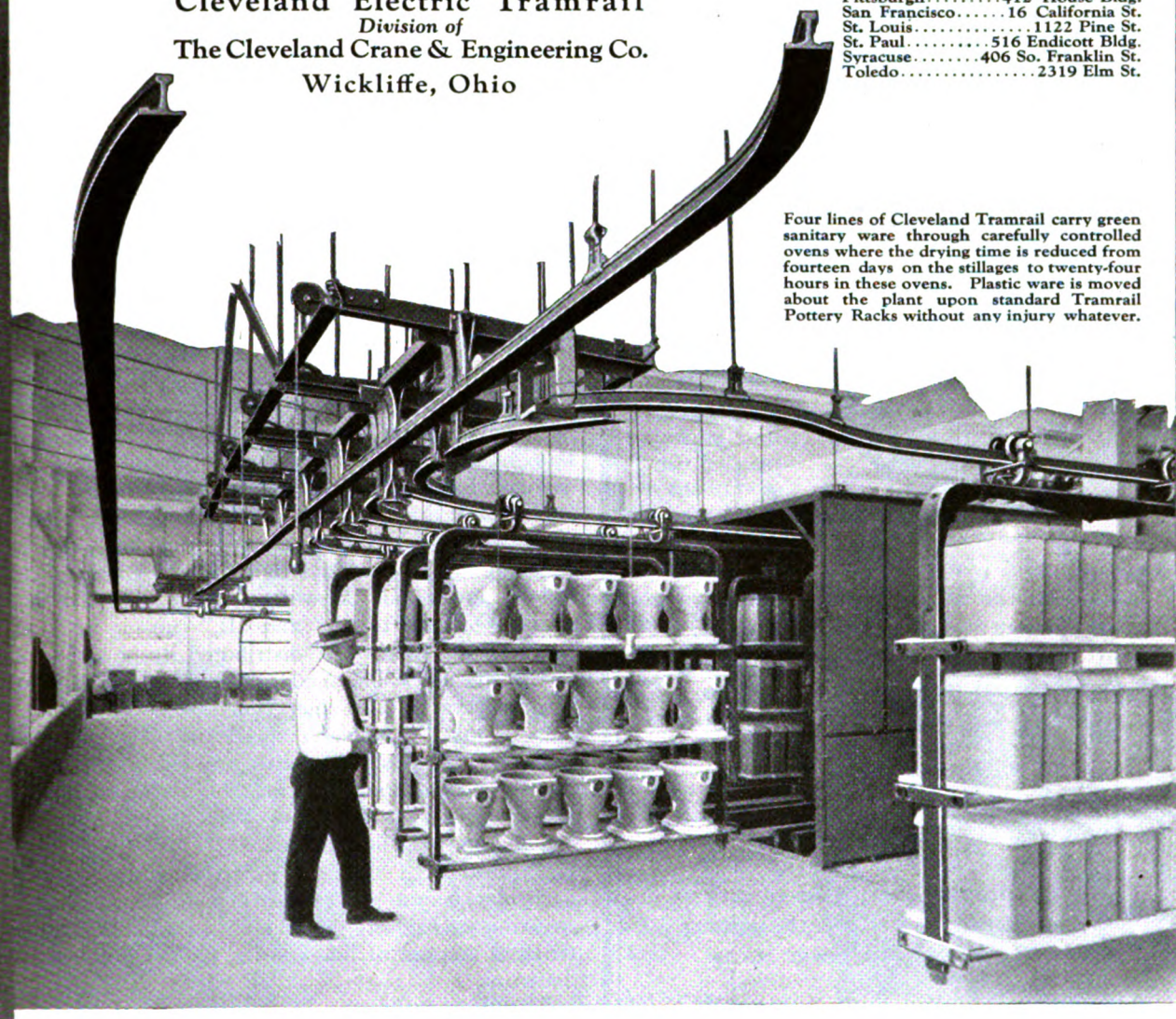
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THE Lee patented continuous casting method for making sanitary ware at the new Thomas Maddock's Sons Plant was made possible by the smooth operation of the Cleveland Tramrail System. Castings are not shaken down or cracked while being moved from one process to another.

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Milwaukee	B'way and Michigan St.
New York	30 Church St.
Philadelphia	2401 Chestnut St.
Pittsburgh	412 House Bldg.
San Francisco	16 California St.
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Four lines of Cleveland Tramrail carry green sanitary ware through carefully controlled ovens where the drying time is reduced from fourteen days on the stillages to twenty-four hours in these ovens. Plastic ware is moved about the plant upon standard Tramrail Pottery Racks without any injury whatever.

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has just the same perfect mechanical balance as the other drill chucks in the JACOBS' family. . . Each fundamental however is refined to a greater degree.

The SUPER CHUCK is unusually accurate, in fact it sets a new standard of accuracy. . . . It grips with tremendous power, yet the ball bearing construction makes it very easy to operate and allows the jaws to open or close with fewer turns.

This marvelous tool is built for durability, built to withstand severe duty, built to outlast any drill chuck in the world and is being adopted as standard equipment where ever it is being considered.

The Jacobs Manufacturing Co.
HARTFORD, CONN.
The World's Largest Producers of "Drill Chucks"

It showed 0.9 horsepower delivered to the motor per pound of coal burned, but there was no figure on the belt showing the *per cent. horsepower delivered to the machine* per pound of coal burned; the belt being pictured as the final power deliverer. It simply proves that the vital importance of the belt is always overlooked, and can anything be more obviously necessary? To what avail is all the rest of the generative apparatus shown if the belts slip 15 to 20% or failure occurs. If they slip, production slows down and if they break, production stops, therefore the 0.9 horsepower delivered to the motor from boiler, turbine and generator is worth only as much as the connection mediums will transmit to the final power consumer. The links of this power chain cannot be segregated—one must be as strong as the other because they are inter-dependent.

Many old concerns have remodelled their power plants, but have failed to realize that in many respects their greatest loss lies in the methods employed for distributing and applying the power generated and conveyed to the motor.

The layout of power distribution and application in an old plant, recently inspected, daily was creating a mechanical loss of 10 to 30% on the coal pile. A shaft running at 166 r.p.m. was a short head driven by a thick, non-flexible belt from a 50-hp. motor at 1,160 r.p.m., thus creating a ratio of 7 to 1 between driver and driven. It is obvious that 10 to 15% slip is possible here, due to a stiff belt operating on a high speed small pulley with reduced contact. The line shaft, belt connected to shaft "A," operated at a similar speed. Shaft "B" could have been driven direct from the motor, but at the time it was thought a simpler matter to install as described instead of removing a few obstacles, so a short center wide belt was employed to drive shaft "B" from "A." Small diameter pulleys were used, thus creating low velocity and necessitating a wide and tight belt to transmit the required power; all of which caused excessive bearing pressure on shafts "A" and "B," causing friction and power loss. Shaft "B" distributed its power to a battery of machines, and to a large grinding machine through a countershaft. The chief function of the countershaft was to make possible a speed of 996 r.p.m. on the grinder. The position of this counter in relation to the grinder necessitated a vertical high tension belting installation, causing excessive bearing pressure on both counter and machine and excessive slip due to the vertical position of the belt. Further inspection of this particular layout proved bearings to be of cheap construction, and poorly lubricated. In addition to this, the shafting was out of line and the pulleys not suitable for the work.

It is evident that the misapplications indicated resolve themselves into two direct tangible losses—one on the fuel to the extent of 10 to 30% and in some extreme cases as high as 50%, and the other on production to, no doubt, the same degree. Similar cases of power application abuse are prevalent throughout the country, some not so glaring, some worse, but nevertheless the general waste of power from the prime mover to production is in many cases in excess of the losses due to generation and should be given attention, because loss is waste and preventable waste is expensive and unpardonable.

That wasteful applications such as the one described can be eliminated is proven by what was done. By the removal of a few obstructions, the 50-hp. motor was

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The Peck Pivoted Bucket Carrier is used for handling coal, ashes, cement, sand and other materials. Transports materials horizontally, vertically, or at an angle.



Link-Belt Conveyors of various types are used in large and small manufacturing plants. There may be a suggestion here for you. Consult Link-Belt engineers.



Link-Belt furnishes complete belt conveyor installations for handling raw or finished, light or heavy materials—at any desired speed.

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For the transmission of power from prime mover to machines, Link-Belt Silent Chain, and other types of Link-Belt chain drives, are widely used. For handling raw and finished materials of every kind, Link-Belt conveyors, elevators, cranes, electric hoists, and practically every other type of mechanical handling equipment, are effectively employed.

To find out how you can produce more economically with Link-Belt elevating, conveying and power transmission equipment, address nearest Link-Belt office.

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Unusually rugged, fast, and economical to operate, Link-Belt "Built for Service" Gasoline Crawler Cranes provide quick, cheap handling. Various attachments furnished. Write for Book 895.



Link-Belt Silent Chain is the ideal drive, because it is a strong, long-lived, positive, yet flexible means of transmitting power. Drives from ½ to 10 H. P. in stock at a distributor near you.



Power transmission equipment, rugged and well constructed for continuous operation, bearings, gears, hangers, pulleys, sprockets, grease cups, safety collars, etc.



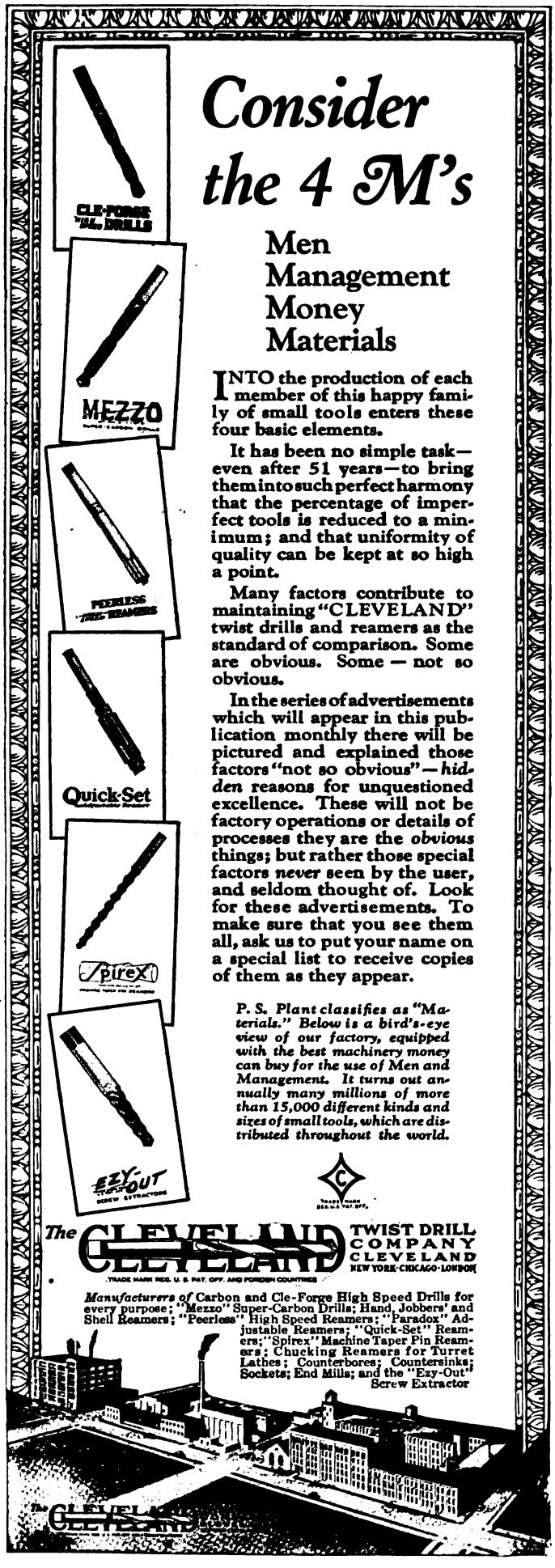
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2439

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Elevating, Conveying and Power Transmission Machinery

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suspended from the ceiling and the line shaft silent-chain connected to it; but instead of the line being operated at 166 r.p.m. the speed was increased to 332 r.p.m. so as to accommodate the required speed of 996 r.p.m. on the grinder. The head shaft, the counter-shaft, the 7 to 1 reduction from motor to head, the short-center high tension belt and the vertical belt to grinder were all done away with by this one change. The direct influence on the coal pile and production is now positive instead of negative. This slight attention and alteration saved at least 8 to 26% on power, production and maintenance on one 50-hp. installation. The possibility of improvement as demonstrated by this illustration is not unusual. It can be accomplished at most all plants of the country where old methods are employed, if the management will sanction the initial cost of the change. They should, because in mechanical installations, of moderate power capacity the return on the investment is immediate and lasting not only to themselves, but also to the natural resources of the country.

Power wasting transmission installations are not always confined to old plants. Many modern establishments can exhibit glaring examples, but in the majority of these cases it is not through the lack of knowledge or consideration of modern methods and equipment. It is because the transmission of mechanical power has been forgotten up to the last moment. Great care has been given by the designers to type, style and size of buildings and all materials entering into their construction; great skill has been displayed in the arrangement of apparatus, the finest kind of heating and ventilating equipment has been specified, then finally when it is all set and ready to operate, it is suddenly realized that the actual production apparatus must be driven and driven mechanically. What is the result? Motors, shafting, belting, speed reducers, etc., must be squeezed into small spaces and impracticable methods employed because it must be operated and any way is the best regardless of the power, maintenance and production losses.

Another hazard to proper transmission in modern industry is the utilization of old buildings for new processes, particularly if the buildings be of brick and steel construction. Short belt centres and high ratios are extremely prevalent in cases of this kind owing to the fact that after the apparatus is installed in the space available, there is absolutely no room for anything but faulty transmission, therefore, even if the designer realizes the economy and importance of good mechanical transmission he is compelled to resort to impracticable methods because the management disregards the monetary losses created by bad transmission.

Personal prejudices and peculiar mental attitudes by plant operating men toward transmission mediums, and particularly belting, will often seriously lower power transmitting efficiency. Unwarranted belting prejudice is more frequently found among the men actually handling and installing the belting of the plant than among superintendents and engineers, because plant men have not the time to study various makes and brands of a certain type and take it for granted that because one brand of the type tried has failed, all the rest will act accordingly. This results in an absolute prejudice to this entire type of belting and the plant is the loser, because, no doubt, there are many places where the outlawed type would be beneficial. This type of man is

(*Continued on page 100*)

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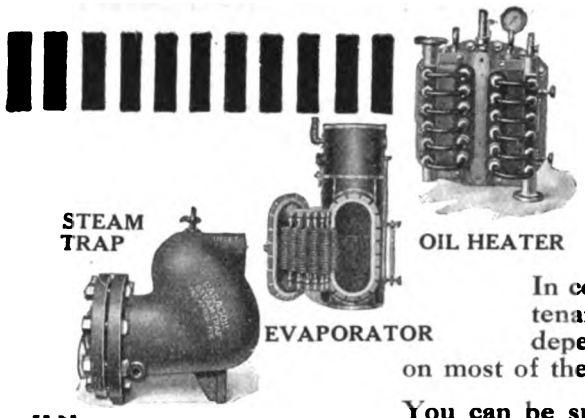
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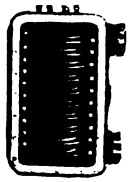
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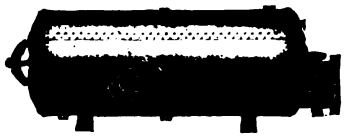
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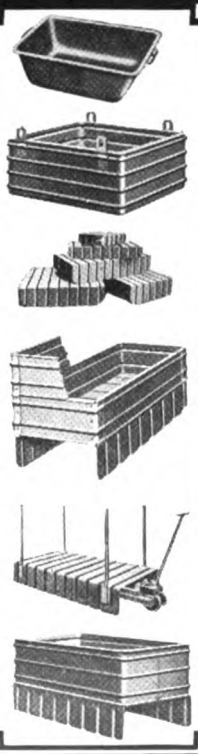
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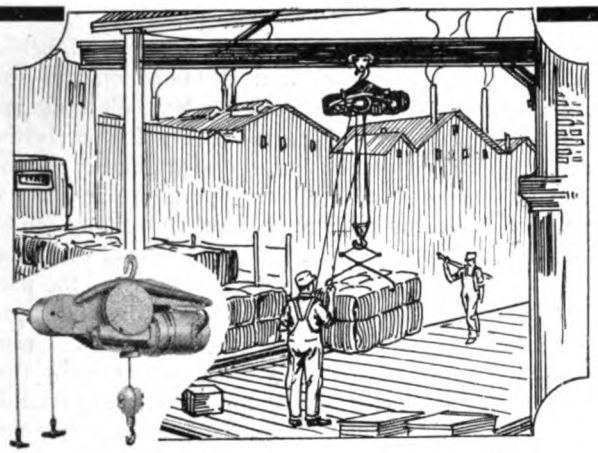
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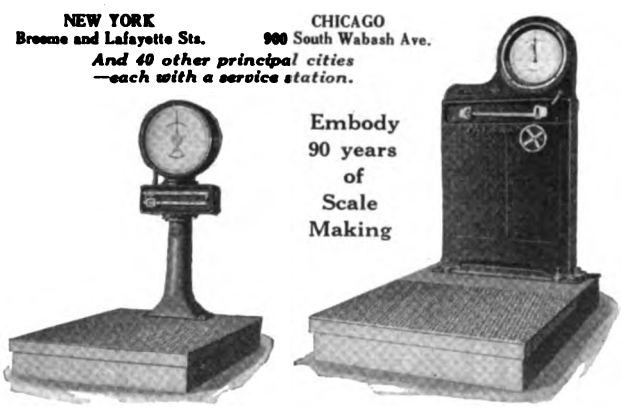
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OF the Valley Motors installed in the Grand Laundry, Saint Louis, 15 have been put to a special and difficult application on individual vertical drives operating the extractors.

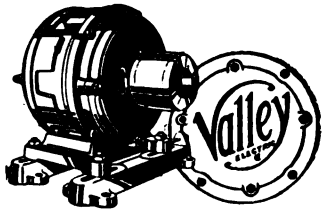
The starting load of these extractors is 5½ h. p., and it takes them 58 seconds to get up the speed. The motors operate at more than 200% overload for this period of time.

Since the motors were installed (about two years ago) not one has ever been changed or replaced, nor has the Grand Laundry incurred any expense of any sort on them. In fact, the only attention the motors have received has been lubrication service on one Saturday afternoon about every three months.

This is another demonstration of the fact that the delivery of continuous power under exacting operating conditions, is all in the day's work for Valley Ball Bearing Motors.

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Motor Division
VALLEY ELECTRIC CO., ST. LOUIS, U. S. A.
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Valley Electric

(Continued from page 96)

difficult to convert because his lack of general belting knowledge naturally makes him stubborn on this subject and to him one failure of a rubber belt condemns the entire rubber belting family, and one leather belting disaster generally banishes the entire leather belting offering of the country. He becomes set on one brand or type and uses it for all installations coming under his jurisdiction, no matter what the atmospheric conditions or mechanical arrangement. Thus the door of the plant becomes closed to the opportunities being offered by progressive transmission and belting manufacturers. Transmission mediums are constantly being improved by their manufacturers to keep pace with advancing industrial demand, therefore, personal prejudice should not interfere with the utilization of improvements.

In regard to peculiar mental attitudes of plant men toward belting, the writer recalls an incident where a master mechanic of a certain plant specified and used a 10-ply belt on small diameter pulleys because he figured that when three or four plies wore off it could be used on a lower powered drive. This to his mind was economy and of course he assumed that the plies would wear out in a uniform manner. In this particular incident power, production or maintenance were not considered—it was simply a peculiar mental conception of economy.

The advantages of standardization of apparatus, methods and material in industry are most obvious, therefore this standardization should include belting and mechanical transmission appurtenances, because it eliminates personal prejudice, making the best of its kind available for the installation. It reduces the cost of carrying a large belting stock, because it minimizes types and sizes; it reduces losses caused by the ignorance of new plant men, because selection is not left to guess; it reduces accounting costs because there are fewer types and sizes to keep track of and it reduces to a great extent belting and transmission complications between engineering and operating departments.

INDUSTRIAL activity, which on the whole has been increasing ever since last July, when the period of spring and summer let-up came to an end, has regained its former momentum. Not only has employment steadily increased since July, but the average weekly earnings of those now employed have regained the same high level that prevailed early in 1925 and just before the slump in 1924, according to monthly studies of wages, hours and employment by the National Industrial Conference Board, 247 Park Avenue, New York. The return to this comparatively high level of earnings of the workers, together with steadily increasing employment, the Conference Board's wage study declares, indicates that at this level the elements of production, wages and other costs and prices are well balanced.

Employment in November showed an increase of 1.8 per cent. over October, and a total increase of nearly 6 per cent. since July, 1925, according to the last monthly study of the Board, covering 25 different industries employing a total of about 700,000 wage earners. With the November gain, employment now for the first time is practically the same as it was before the 1924 depression set in.

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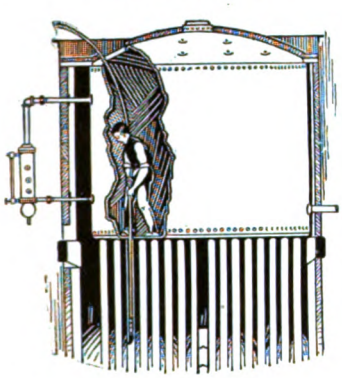
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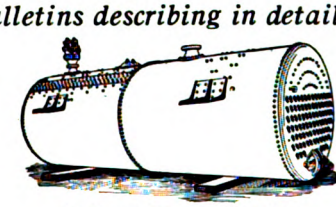
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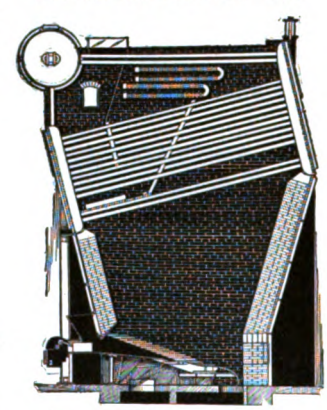
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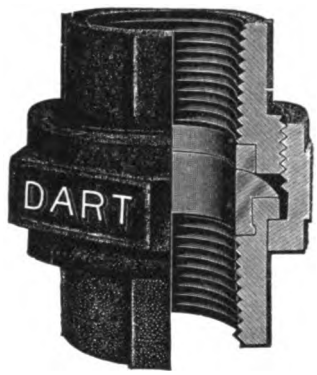
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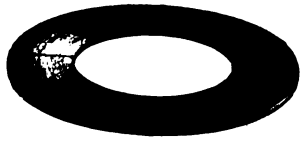


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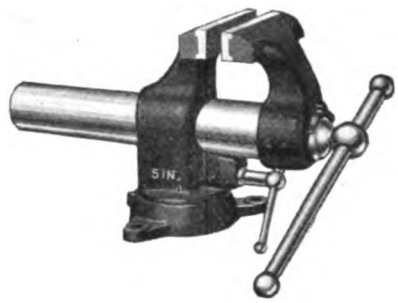
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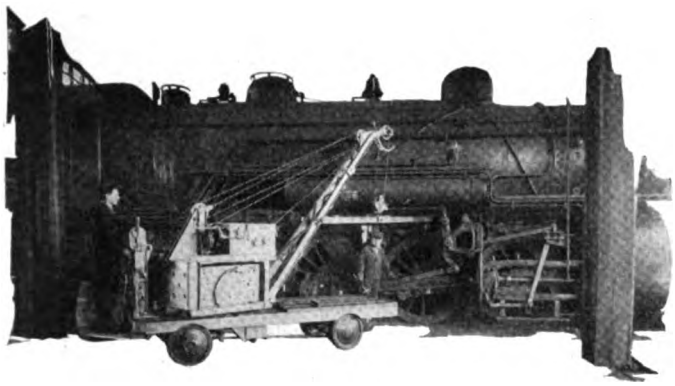
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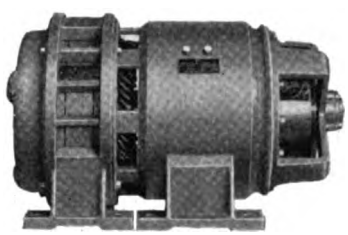
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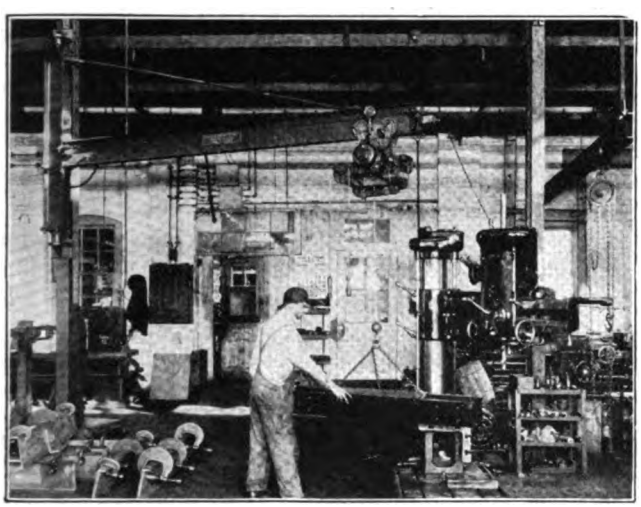
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Manufacturers' Bulletins and Catalogs

Helpful new literature for the man who selects and directs industrial equipment

Single Pass Boiler

The Edge Moor Single Pass Boiler is illustrated and described in a 25-page booklet which has been issued by the Edge Moor Iron Co., of Edge Moor, Del.

Magnetic Clutches

A 16-page booklet which illustrates and describes C-H Magnetic Clutches has been issued by the Cutler-Hammer Mfg. Co., of Milwaukee, Wis.

Coal Handling Equipment

An illustrated folder describing the coal handling, weighing and storing equipment at the new power plant of the Purdue University at Lafayette, Ind., has been issued by Freeman-Riff Co., of Terre Haute, Ind.

Liquid Baths for the Heat Treatment of Steel

are described in a booklet containing 158 pages which has been prepared by the Houghton Research Staff of E. F. Houghton & Co., Philadelphia, Pa.

Low Pressure Recording Gauge

An illustrated folder which describes the Foxboro Low Pressure Recording Gauge has been issued by The Foxboro Co., Inc., Foxboro, Mass.

Roller Bearings

The Dimension and Load Bulletin, No. 1559, containing illustrations and description of the types of Hyatt Roller Bearings, has been issued by the Hyatt Roller Bearing Co., of Newark, N. J.

Industrial Painting

Bulletin No. 103, giving specifications and standards for painting exterior and interior metal, hot surfaces, exterior and interior wood and concrete buildings, etc., has been issued by the Goheen Corp., of Newark, N. J. Another pamphlet issued is on "Rockote," a concrete floor hardener.

Heat Transfer Equipment

An illustrated bulletin has been issued by the Griscom-Russell Co., 90 West St., New York, which describes condensers, heat exchangers, gas and water coolers, etc.

Texrope Drive

Bulletin No. 1228, containing 16 pages, which illustrates and describes the "Allis" Texrope Drive, has been issued by the Allis-Chalmers Mfg. Co., of Milwaukee, Wis.

Fire Brick Cement

Several pieces of descriptive literature on Adamant Fire Brick Cement have been issued by the Botfield Refractories Co., Philadelphia, Pa.

Materials Handling

Circular 7378 on Materials Handling, containing 32 pages of illustrations and description of electrically driven machinery has been issued by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. "The Engineering Achievements of the Westinghouse Electric & Mfg. Company for the Year 1925" have been written by H. W. Cope, Assistant Director of Engineering, and also issued by the company in book form.

Electric Tramrail

An illustrated booklet which describes the Cleveland Electric Tramrail has been issued by the Cleveland Electric Tramrail Co., of Wickliffe, Ohio.

Electro-Magnetic Steel Hardening Furnaces

A 24-page booklet illustrating and describing Wild-Barfield Electric Furnaces has been issued by Automatic and Electric Furnaces, Limited, of 173-175 Farringdon Road, London, E. C., England.

Reagent Chemicals

Catalog No. 85, listing some 950 Baker & Adamson reagent chemicals, has been issued by the General Chemical Co., 40 Rector St., New York.

Aluminum Paint

is the subject of a treatise on the physical properties of aluminum paint and its uses in industry which has been written by Junius D. Edwards, assistant director of research of the Aluminum Company of America, Pittsburgh, Pa.

Instruments and Pyrometers

A 56-page illustrated booklet which describes Tycos Pyrometers has been issued by the Taylor Instrument Companies, of Rochester, N. Y. This is known as Catalog Part 4000.

High Speed Tapping Attachment

The Ettco High Speed Tapping Attachment is described and illustrated in a folder which has been issued by the Eastern Tube and Tool Co., of 594 Johnson Ave., Brooklyn, N. Y.

Speed Reducing Gears and Light Transmission Machinery

are described in catalog No. 22, which has been issued by Winfield H. Smith, of Springville, N. Y. This booklet contains illustrations of gears, pillow blocks, arbor presses, hangers, pulleys, etc.

Caterpillar Tractors

A 16-page illustrated booklet describing the 5-ton Caterpillar Tractor, has been issued by the Caterpillar Tractor Co., of San Leandro, Calif.

"Modern Speed Reduction"

is the title of a 36-page booklet, which illustrates and describes Boston Speed Reduction Units, and which has been issued by the Boston Gear Works Sales Co., of Norfolk Downs, Mass.

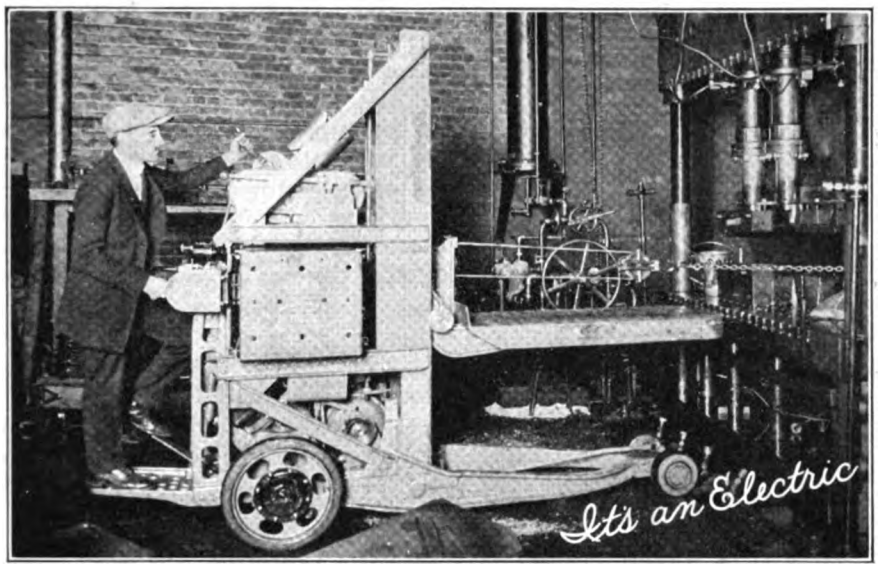
Fire Brick

A small booklet illustrating and describing the Olive Hill (Kentucky) and Wynn (Pennsylvania) fire brick has been issued by the General Refractories Co., Philadelphia, Pa.

Pumps

An illustrated folder entitled "De Laval Pumps at Tulsa, Okla.," has been issued by the De Laval Steam Turbine Co., of Trenton, N. J. Another booklet issued is that which describes and illustrates Superior Speed Reducers for every service. A convenient chart to calculate quantities connected with the expansion of steam is being distributed by this company. The Mollier diagram is printed on a stiff sheet of Bristol board, attached to which is a scale which can be broken off and

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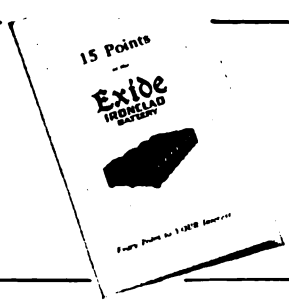
The electric industrial truck is a most economical means of material handling. How economical, however, depends a great deal upon whether you equip your trucks and tractors with the storage battery described upon this page.

How to deliver more material in quicker time, at less cost

THERE is one thing you can do to speed up your plant's material handling service and keep down its cost. Namely, put in your electric industrial trucks and tractors a storage battery that will drive those machines at a good fast speed all day long—whether on the level or up grade. Let it be a battery, furthermore, that lasts for years, doesn't cost too much in the beginning, and is built ruggedly enough not to get out of order. You can get such a battery by specifying the Exide-Ironclad. If you want proof, ask any of the several hundred prominent companies who have put Exide-Ironclad Batteries in their industrial trucks and tractors. The names of a few of these companies are listed below.

A few well-known companies out of several hundred that use Exide-Ironclad Batteries in their electric industrial trucks and tractors:

Fisher Body Company, Detroit, Mich.
Dodge Bros., Inc., Detroit, Mich.
Cleveland Automatic Machine Co., Cleveland, O.
Buick Motor Company, Detroit, Mich.
Cadillac Motor Company, Detroit, Mich.
Delco-Light Co., Dayton, Ohio.
The National Cash Register Co., Dayton, O.
Crane Company, Chicago, Ill.
Eagle-Picher Lead Co., Joplin, Mo.
American Motor Body Co., Phila., Pa.
U.S. Playing Card Co., Cincinnati, O.
Remington Arms Co., Bridgeport, Conn.
J. G. Brill Company, Phila., Pa.
B. F. Goodrich Company, Akron, O.
Trumbull Steel Co., Warren, O.
Minnesota Steel Company, Duluth, Minn.



Write for this booklet of interesting facts and valuable information about storage batteries. It is sent you without charge.

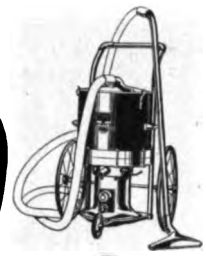
Exide IRONCLAD BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

Exide Batteries of Canada, Limited, 153 Dufferin Street, Toronto

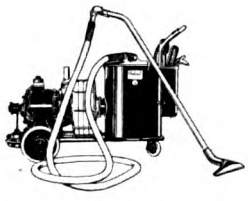
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read these 10 facts



then fill in and send the coupon

1. The "INVINCIBLE" Industrial Vacuum Cleaner will remove that troublesome dirt which is a hindrance to your production. It will pick up all kinds of dust and dirt, glass, metal filings, and other abrasive material, without injuring the vacuum unit in any way at all.
2. The "INVINCIBLE" is extremely portable. It can be used all over the shop—thru narrow aisles and in otherwise inaccessible places.
3. One of the great advantages of this type of vacuum cleaner is the fact that there is no installation expense entailed by users.
4. It is of unusually rugged construction, and is designed and built to withstand rough plant handling and to give constant service.
5. This machine has years of service built into it. Some of our installations being in constant use for 19 years.
6. It has the combined advantages of both a vacuum cleaner and a blower.
7. The type of floor in no way affects the usefulness of the "INVINCIBLE." It works equally well on concrete, rough wood, and tile floors.
8. It holds as well as picks up all kinds of dirt.
9. Its usefulness is not confined to the cleaning of floors. It works with equal effectiveness on walls, ceilings, overhead pipes, lighting fixtures and machinery. Its usefulness in cleaning walls before painting has often resulted in a saving equal to the value of the machine.
10. In every factory and plant which has installed this equipment, many additional uses have been found for it. Our service men will be glad to suggest additional uses in the light of our broad experiences with the more general applications of these machines all over the country.



INVINCIBLE VACUUM CLEANER MFG. CO.
Dover, Ohio

Fill in the attached coupon and we will be glad to send you full descriptive data on a vacuum cleaner built especially for industrial plant use which embodies all of the above qualities—the "INVINCIBLE."

Name.....

Street No.....

City..... *State*.....

Kind of business.....

Floor Space.....

used directly for measuring heat available, spouting velocity, etc.

Industrial Control Catalog

An Industrial Control Catalog, No. GEA-257, containing in its 160 pages information on representative lines of industrial control manufactured by the company and including material on the care and operation of control devices; wiring diagrams of some standard controllers, and other accessories; reference tables, etc., has been issued by the General Electric Co., of Schenectady, N. Y.

Steam Accumulator

A 30-page illustrated booklet describing the Ruths Steam Accumulator has been issued by the Ruths Accumulator Co., Inc., of 292 Madison Ave., New York. Another booklet issued is that containing a paper read by A. J. T. Taylor before the Institution of Engineers and Shipbuilders in Scotland last October.

Worm Gearing

Bulletin No. 105, containing 15 pages, which illustrates and describes Cleveland Worm Gearing, has been issued by the Cleveland Worm and Gear Co., Cleveland, Ohio.

Air Compressors

Bulletin No. 126, illustrating and describing Pennsylvania Duplex Single Stage and Two Stage Cross Compound Air Compressors, has been issued by the Pennsylvania Pump and Compressor Co., of Easton, Pa.

Screw Machines

Catalog No. 24G, containing 140 pages of illustrations and description of Brown & Sharpe Screw Machines—plain, wire feed and automatic types—also attachments and tools, has been issued by the Brown & Sharpe Mfg. Co., of Providence, R. I.

Clam Shell and Orange Peel Buckets

Bulletins Nos. 652 and 656 illustrate and describe Hayward Class "G" and Class "H" Clam Shell Buckets and Hayward Three-Sided and Rope Reeved Orange Peel Buckets, respectively. Pamphlet 624 illustrates and describes Hayward Clam Shell Snow Buckets. This literature has been issued by The Hayward Co., 50 Church St., New York, N. Y.

Power Shovels

Bulletin No. 39, containing 15 pages of illustrations and description of ½-, ¾- and 1-yard Orton Power Shovels, has been issued by the Orton & Steinbrenner Co., Chicago, Ill.

Monel Metal

An illustrated booklet containing information on Monel Metal Wire Rope, Netting, Wire and Strip Products, Wire Cloth, etc., has been issued by the International Nickel Co., 67 Wall St., New York.

Petroleum Refining

A booklet of 25 pages containing a brief description of organized engineering and construction service as applied to the petroleum industry, has been issued by the J. G. White Engineering Corp., of 43 Exchange Place, New York.

Audible and Visible Signals

Catalog No. 104-29-B, containing illustrations and description of Cory Audible and Visible Signals featuring Turbine Order Systems, and also Cory-Record Ohmmeters, has been issued by Chas. Cory & Son, Inc., 183 Varick St., New York.

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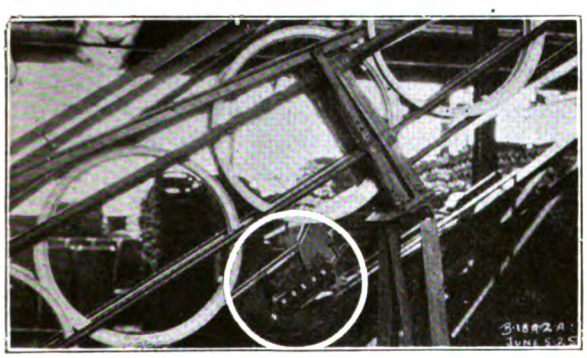
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VICTOR SAW WORKS, Inc.
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Counting metal tire rims at the Firestone Tire and Rubber Company used to require a man's full time and wages; Productimeters are now doing it with dependable accuracy and at a fraction of the time and cost.

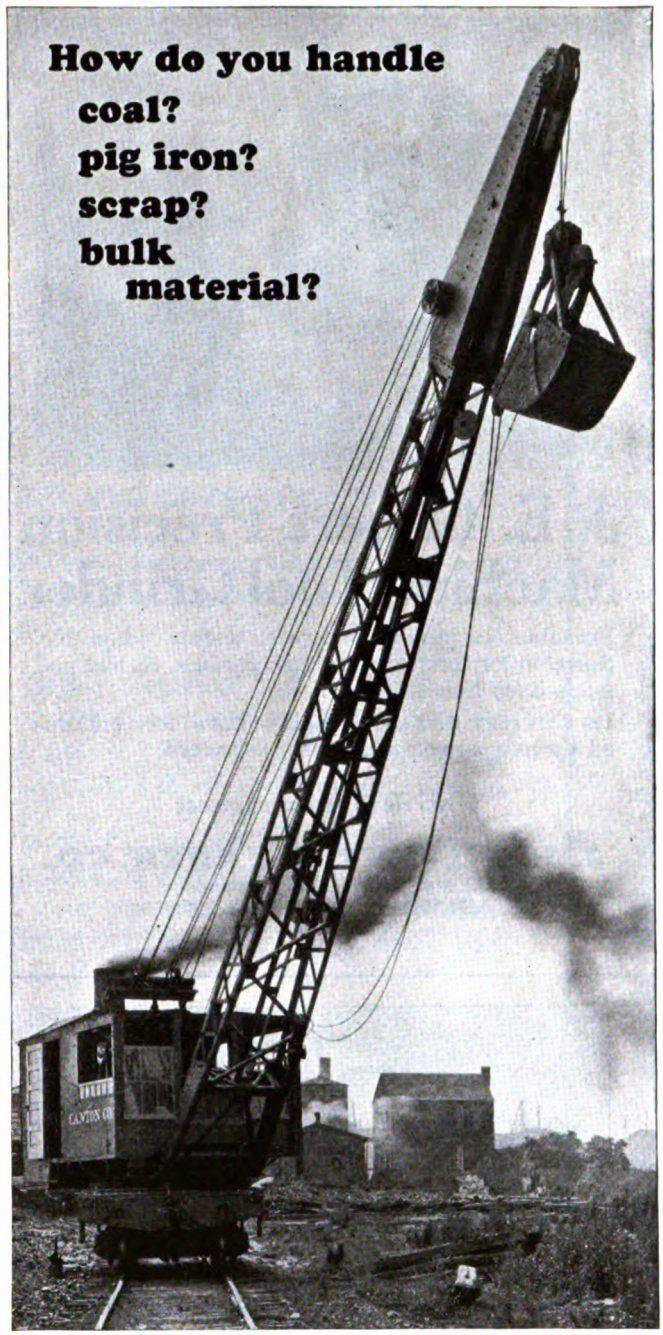
Productimeters accurately tally any and every article—bundle, bale, box, barrel, or tiny unit, on any form of conveyor, carrier or production machine.

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This locomotive crane is adaptable for many kinds of service. Equipped with a grab bucket it handles coal, ashes and other bulk material. With a lifting magnet, it handles pig iron, structural shapes and scrap. With a ball and hook or a fall block, it is used for erecting steel or for any heavy lifting job.

The No. 4 shown here is rated at 20-tons. It has the tractive effort to switch several loaded cars.

Send name and address for bulletins on this crane.

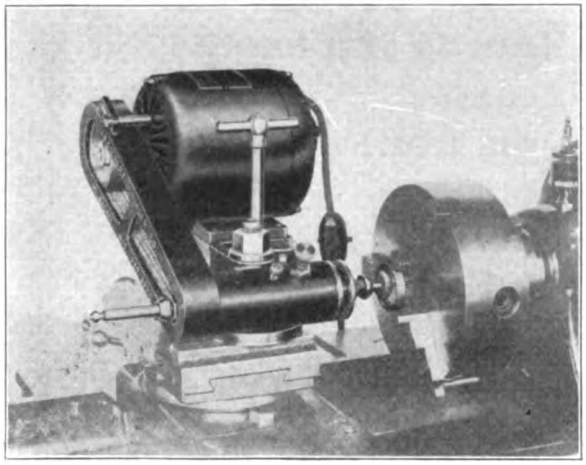
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Drilling 1,600 Holes a Day with an Air Drill

THE illustration below shows part of the work on a job which required the drilling of 19,000 holes, each 3/16" diameter, in half-inch boiler plate.

The air tool used on this work is one which is claimed to work on a unique principle requiring neither crank-



shaft, connecting rod nor toggle. The principle of operation, say the manufacturers, eliminates vibration and its attendant evils—fatigue of the operator, chattermarks of the tool, or breakage of drills.

The operator, on this particular job, averaged two hundred holes per hour during an eight-hour day, which speaks well for both himself and the air drill.

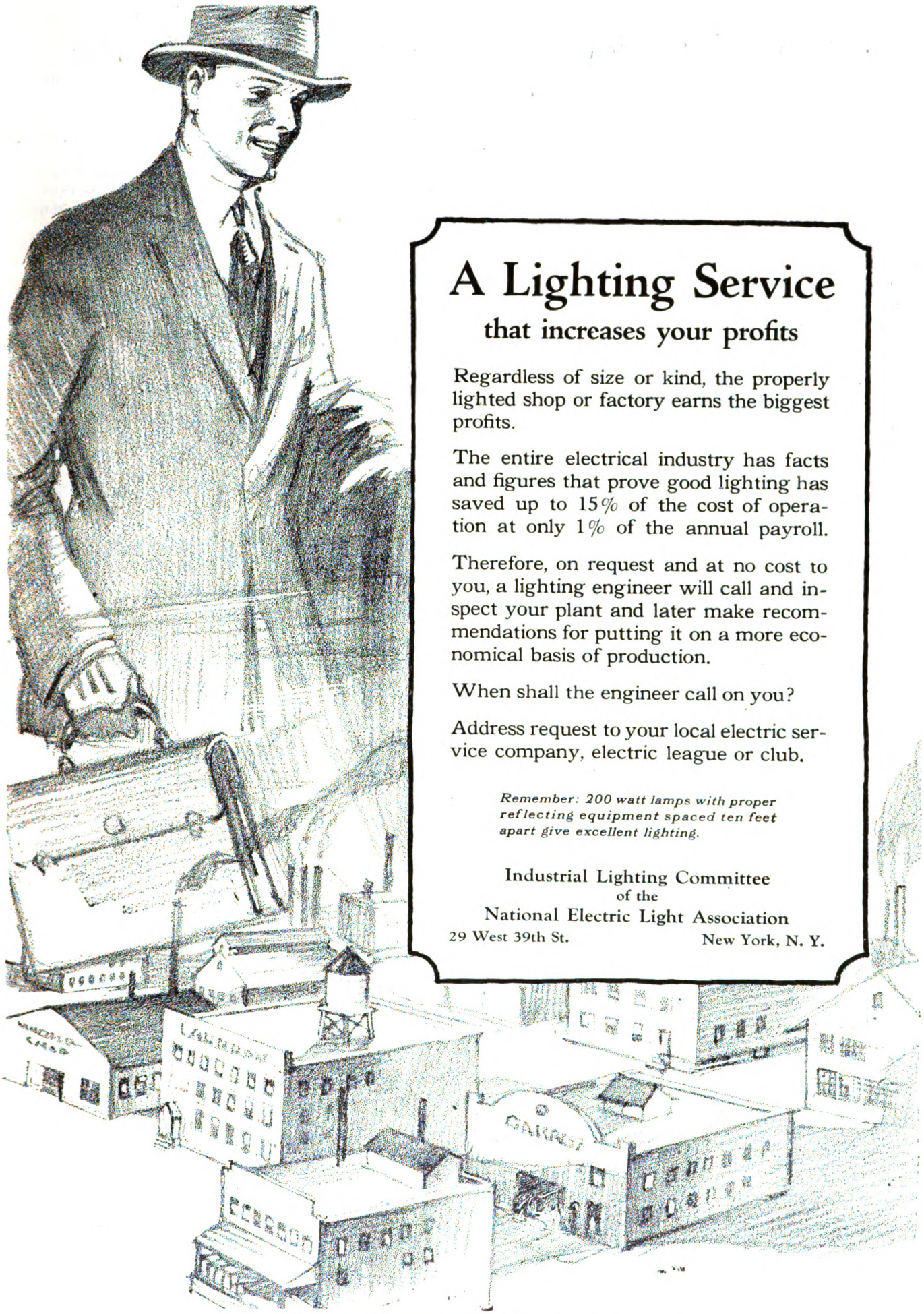
FIFTY million dollars annually is entered on the debit side of the economic ledger of the United States through the disregard of simple rules in wrapping and packing merchandise for domestic shipping, according to a report on paper wrapped packages by the advisory board of the Department of Commerce on domestic packing made public today.

In general, the board finds that no special technique is required to insure a package against damage in transit. Strong, tough paper that will not crack when folded, that can withstand contact with other containers in the shipment without being torn, and the use of securely knotted twine of a strength commensurate with the weight of the package is sufficient for all ordinary purposes.

This is the first of a series of publications on better packing being prepared by the Department of Commerce in coöperation with the container industries, shippers, and transportation agencies in an effort to reduce waste in domestic trade.

The complete report contains instructions for wrapping packages with paper for parcel post and express shipment. Copies may be had upon application to the Superintendent of Documents, Government Printing Office, Washington, D. C., or any district office of the Bureau of Foreign and Domestic Commerce. The price is 5 cents. Lots of 1,000 are sold for $20. The price is $10 for each subsequent 1,000 mailed out with the original order.

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that increases your profits

Regardless of size or kind, the properly lighted shop or factory earns the biggest profits.

The entire electrical industry has facts and figures that prove good lighting has saved up to 15% of the cost of operation at only 1% of the annual payroll.

Therefore, on request and at no cost to you, a lighting engineer will call and inspect your plant and later make recommendations for putting it on a more economical basis of production.

When shall the engineer call on you?

Address request to your local electric service company, electric league or club.

Remember: 200 watt lamps with proper reflecting equipment spaced ten feet apart give excellent lighting.

Industrial Lighting Committee
of the
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29 West 39th St. New York, N. Y.

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Readers' Guide to Profitable Equipment

Practical Helps for Mill and Factory Managers

An Automatic Conveyor that Costs Less than One Dollar per week, is shown on page 112, by the Chicago Automatic Conveyor Co.

The Productimeter Catalog Describes Counting Machines which aid in speeding up production. For a copy see page 107. Durant Manufacturing Co.

Information on Electric Hoists for All Industrial Departments. Roeper Crane & Hoist Works, Inc. See page 103.

Pyott Red Face Pulleys, Gears, Sprockets, Flywheels, and Sheaves are illustrated and described on page 58. Pyott Foundry Co.

Small Turbines and Turbine-Generator Sets are illustrated on page 88. Westinghouse Electric & Mfg. Co.

High Speed Forged Type Drills with the oversize shank are described on page 42. Morse Twist Drill Co.

Literature on Economical Oil Burners for every industrial purpose is offered by the Hauck Mfg. Co. See page 92.

Catalog 57A Describes the Features of the Parker Vise. See Page 84. The Charles Parker Co.

Catalog Describing Steam Specialties used in a great many large industrial plants is offered on page 98. Davis Engineering Corp.

The Inside Story of the Jacobs Chuck is illustrated on page 94. Jacobs Manufacturing Co.

A Solution to Industrial Lighting Problems solved by the Reelite. See page 83. Appleton Electric Co.

The New Steam Trap that Has Eliminated Five Steam Trap Weaknesses is shown on page 78. See 90 day free test offer. Armstrong Machine Works.

Catalog 21 Describes Some Valuable Suggestions for Steel Lockers. See page 34. Durand Steel Locker Co.

The "Merrick Catalog" shows how bulk materials can be weighed while conveyor handled. The Merrick Scale Co., page 2.

A Bulletin on Special Purpose Trucks for Industrial Use. Handles Skids 15 feet long, 6,000 lbs. capacity is shown on page 79. The Lakewood Engineering Co.

A Catalog Which Gives the Solution to an Important Ventilating Problem is offered by the Truscon Steel Co. See page 3.

A 62-Page Catalog Describing the Various Types of Scales, that indicate weights, while material is on the move, is offered by The American Kron Scale Co. See page 76.

"Hitting the High Spots" is the title of a book which shows ways to cut grinding costs. For a copy see page 81. Wisconsin Electric Co.

C-100 is a Descriptive Booklet Offered by the Edwin L. Wiegand Company and describes heating strips for every industrial purpose. See page 49.

The "Quickfix" Booklet gives the solution to an important problem in the repair of factory floors. See page 40. The Master Builders Company.

Information on Lighting Fixtures, adjustable for any operation, is given in the catalog offered by the American Fixture Company. See page 115.

A New Development in Factory Seating. See page 99. Do/More Chair Co.

Illustrations Describing the Economical Handling of Materials are shown on page 62. The Jeffrey Manufacturing Co.

An Electric Motor for the Hard Jobs. See page 77. Howell Electric Motors Co.

An Improved Oven for Cores is featured by Young Brothers Company on page 89.

The Quick Installation Feature of the Split Lineshaft Roller Bearing is illustrated on page 85. Hyatt Roller Bearing Co.

A Booklet Describing the New Ruboid Wheel that gives more resiliency to industrial trucks is offered by the Bassick Company. See page 35.

An Apron Conveyor that Puts Delivery Dates Forward is described on page 71 by the Chain Belt Company.

Literature on the Industrial Gasoline Locomotive can be obtained from The Fate-Root-Heath Company. See page 69.

Five Very Interesting Bulletins on Boiler Room Economies are offered by The Wickes Boiler Co. See page 101.

Coatings that Cut Down Upkeep on Roofs, Floors and Walls. Choice of samples offered by L. Sonneborn Sons, Inc. See page 53.

A Lift Truck Platform that Results in 50% Speedier Handling is described on page 74. Barrett-Cravens Company.

High Speed Drills for high speed production. See page 96. The Cleveland Twist Drill Co.

"15 Points of Exide-Ironclad" is the title of a booklet on Storage Battery information. See page 105. The Electric Storage Battery Co., Philadelphia.

Interchangeability of Parts Is a New Idea in Motor Manufacturing by the Master Electric Co. See page 80.

The Advantages of Timken Tapered Roller Bearings on Belt Conveyors is shown on page 5.

Grinding Machines for Internal, External, Surface, Thread and Extra-deep-hole Grinding. J. E. Gilbert Grinder Company. Page 108.

Catalog No. 860 Illustrates and Describes Applications of Fans and Blowers for every kind of work. See page 48. Buffalo Forge Company.

An Economical Method of Handling Scrap is shown on page 107 by the McMyler Interstate Co.

Brooms Expressly Built for Industrial Use are described on page 43.

Sheet Metal Stamping. The service offered by The Breese Bros. Co. See page 58.

A Paint Made Expressly for Galvanized Iron is described on Inside Back Cover by Goheen Corp.

Descriptive Bulletins on Industrial Paints can be had by writing to the Nitrose Company. See page 115.

Catalog No. 10 Describes the Dial Thermometer, easily readable at a distance of 20 feet. The Motometer Co. Page 50.

Sample Blades are Offered by Victor Saw Works. See page 107.

Catalog and Price Lists on Steam Unions that prevent loss of steam, can be obtained from the E. M. Dart Mfg. Company. See page 102.

Details of the Ettco Keyless Drill Chuck can be seen on page 51. Eastern Tube and Tool Company, Inc.

An Illustrated Booklet, "More Light" on the use of factory paint is offered by the U. S. Gutta Percha Paint Co. See page 9.

Catalog on Boiler Feed Water Regulators. See page 34. Chaplin-Fulton Co.

A Free Trial Offer on Five Gallons of Skybryte and a Skybryte Brush. For coupon see page 52. The Skybryte Company.

A 30-Day Test Is Offered on an Industrial Fire Fighter. See page 70. The Oil Conservation Engineering Co.

Fire-Proof Oily Waste Cans are illustrated and described on page 30. The Witt Cornice Company.

Descriptive Circulars Illustrating Steel Fabricated Buildings for every industrial requirement can be obtained from the Matin Steel Products Co. See page 34.

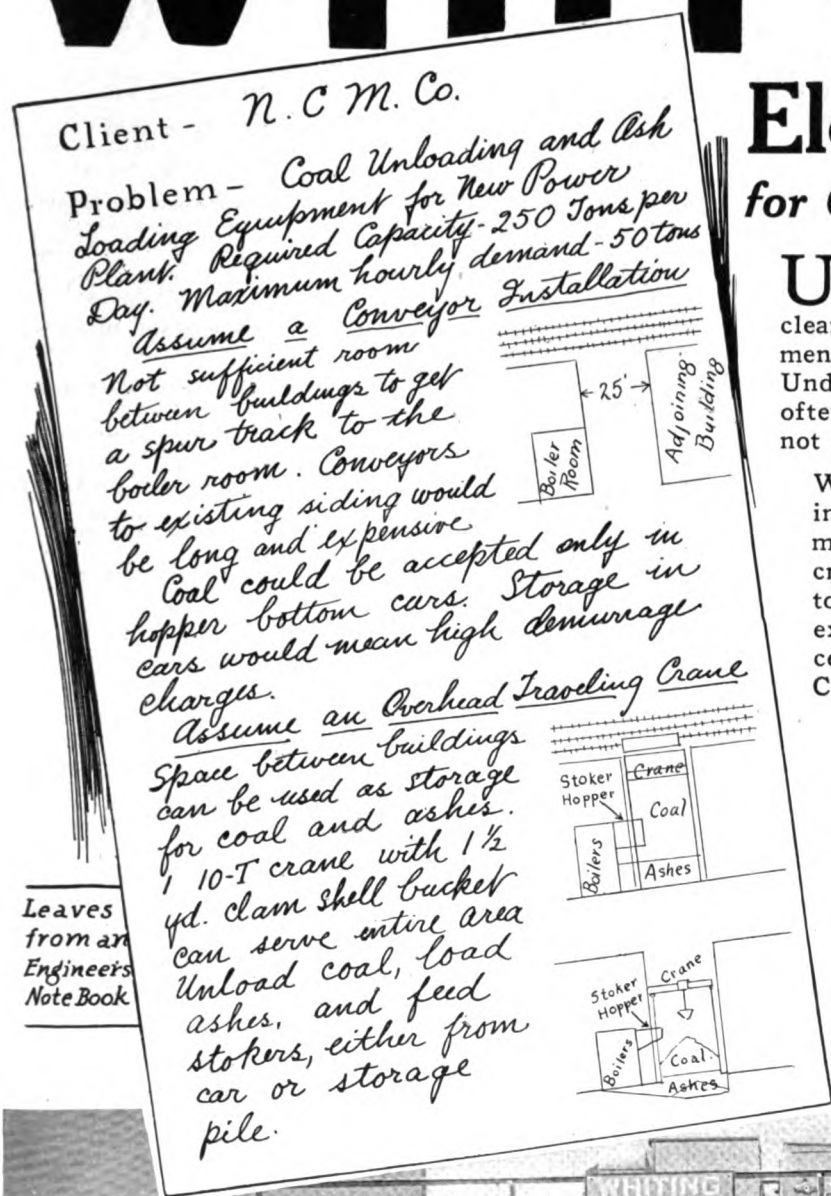
Sliding Door Problems for Industrial Plants. See page 25. Richards-Wilcox Mfg. Co.

A Belt Lacer, extremely tough, durable, and pliant is shown on pages 72-73, by the Clipper Belt Lacer Company.

Catalog Number 50 Illustrates and Describes the Complete Line of Everedy Electric Hoists, Reading Multiple Gear

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WHITING



Electric Cranes
for Coal and Ash Handling

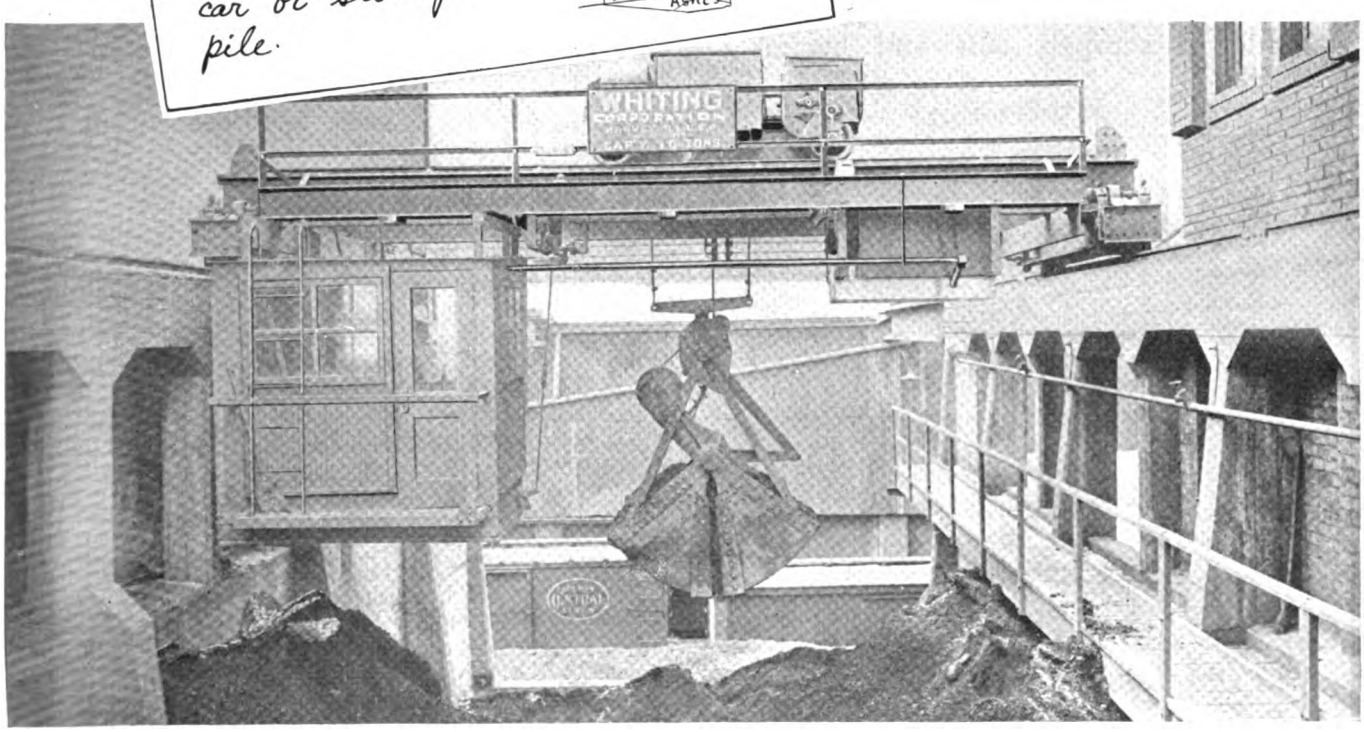
UNDER existing conditions at some power plants an electric crane is clearly superior to any other type of equipment for unloading coal and loading ashes. Under other conditions a careful study will often disclose advantages of a crane that were not appreciated at first thought.

We always welcome a competent engineering analysis in the selection of such material handling equipment. Whether a crane is bought or not, the results are sure to be more satisfactory, and we know from experience that the choice in a large percentage of cases will fall on a Whiting Crane.

This is only one of the many applications for which Whiting Cranes are daily demonstrating their advantages. The Whiting line of cranes is complete—for any size, capacity, or service.

Catalog 200 on request.

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Harvey, Illinois (Chicago Suburb)



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Price $490.00

An adjustable wheelframe, ball bearing, three-phase motor including conductor cord plugs and receptacle or 3 H.P. gasoline engine with clutch.

No Belts to Wear out

Lasts 10 Years and More

It does seem low, but that is just what a Chicago Automatic will actually cost you in round figures.

The price is $490.00. It will last at least 10 years; that is only $49.00 per year or less than $1.00 per week.

Can any other method or equipment bring down your handling cost to such a low cost?

Why not send for one to-day, or let one of our engineers help solve your problem? No obligation, of course.

Made in scraper, belt and bucket types.



Chicago Automatic Conveyor Co.
982 Old Colony Bldg., Chicago, Ill.

Chain Blocks, Cranes and Trolleys. Write to Reading Chain & Block Corp. See page 99.

A Description of the Air Hoist is given on page 80 by Northern Engineering Works.

A Copy of "The Hames of Horsepower" is a description of economical transmission equipment. See page 66. The American Pulley Co.

The Losses Resulting From Friction are very interestingly described on page 4 by the Skayef Ball Bearing Co.

The Hallowell Pressed Steel Bench Leg should interest every industrial executive. See page 97. Standard Pressed Steel Co.

Seventeen Degrees of Black and Three Pencils for Copying are manufactured by the American Lead Pencil Company, makers of Venus Pencils. See page 116.

An Exceptionally Good File is manufactured by the Simonds Saw & Steel Co. For description see page 68.

A Vise and Machine Hammer for the Hard Work are shown on page 68. Prentiss Vise Co.

Booklet No. R-67 Describes the Sarco Temperature Regulator which is sold on 30 days' free trial. See page 82. Sarco-Company, Inc.

Illustrated Folder and Prices on steel platforms, boxes, etc., is offered by The Powell Pressed Steel Co. See page 98.

Fabroil Pinions and Textolite Gears are now used in a wide range of industrial applications. For a description of these see page 120. General Electric Company.

A 68 Page Booklet entitled "Book of Illustrated Economy" shows savings in handling costs in every industry. For a copy see Back Cover. Shepard Electric Crane & Hoist Co.

A Motor Service to Manufacturers of Industrial Equipment is offered by the Star Electric Motor Co. See page 63.

Bulletin No. CE719 Describes a Steel Belt Lacing that is quickly joined. See page 51. The Bristol Co.

Descriptive Bulletin on Electric Motors for Industrial Use is offered by the Diehl Mfg. Co. See page 51.

A Wide Range of Transmission and Handling Equipment is described on page 95. Link Belt Co.

A Successful Breakdown Test of an Electric Hoist is shown on page 116. The Euclid Crane & Hoist Co.

Standardized Shop Furniture that Spells Economical Production. See page 7. The New Britain Machine Co.

Information on Stopping the Losses Resulting From Human and Mechanical Errors in the measurement of material is offered by The Toledo Scale Co. See page 64.

Model 20B is a Ball Bearing Electric Hoist recently brought out by the Yale & Towne Manufacturing Company. For information see page 41.

The Latest System in Watchclocks. Literature describing this system is offered by Detex Watchclock Corp. See page 103.

Consultation Service on Forced Draft, Ventilation, Air Conditioning and Heating. See page 119. American Blower Co.

A Photograph of the U-RE-LITE Circuit Breaker is shown on page 8. The Cutter Co.

Industrial Trucks Competing with Oriental Labor. See page 101. Baker-Raulang Co.

A Lighting Service that Has Saved Operating Costs as high as 15%. See page 109. National Electric Light Asso.

"Quality Facts About Belting" contains 50 pages of belting economy. See page 67. Chas. A. Schieren Co.

A Paper Pulley for Every Industrial Service, ready to use, is described on page 6. The Rockwood Mfg. Co.

Free Bulletins on Air Filtration System are offered on page 33. Reed Air Filter Company.

Catalog 43 Issued by the Medart Company affords a simple method of concentrating transmission machinery purchases. See page 38.

Locker Catalog No. A-13 and Shelving Catalog S-7 contain information on steel shelving and steel lockers. See page 79. Fred Medart Mfg. Co.

An Application of the Cleveland Tramrail System is shown on page 93. Cleveland Crane & Engr. Co.

Lubrication as a Means to Reduce Production Costs is explained in a book entitled "Lubricators for Industrial Ma-

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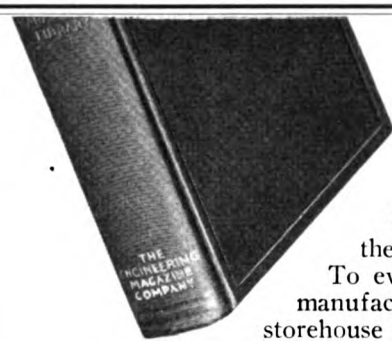
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AT OUR EXPENSE

An Up-to-Date and Practical Book Devoted Solely to Gaging

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I. Interchangeable Manufacture.
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III. Standard and Reference Gages.
IV. Work Gages.
V. Inspection Gages.
VI. Gaging of Screw Threads.
VII. Inspection and Gaging of Gears.
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HERE is a book that fills a long felt need on the part of the factory manager, superintendent, engineer, machine shop foreman, inspector, and tool designer. It covers thoroughly and in logical order every important point in gaging practice, from the simplest to the most complex operation. To every man interested in this all-important manufacturing process, this book will prove a storehouse of practical and profitable ideas and suggestions.

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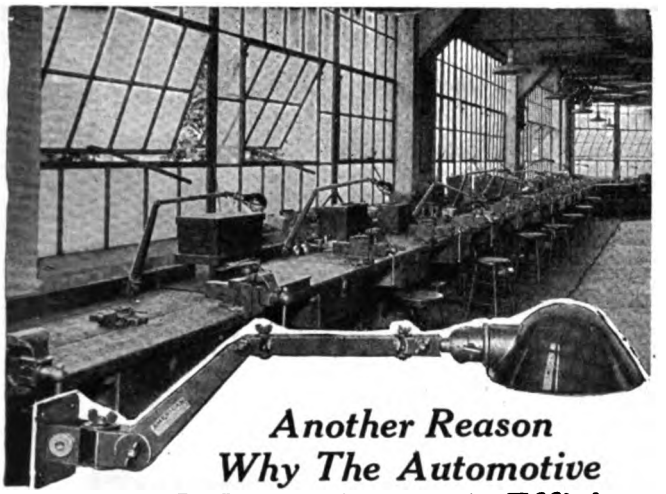
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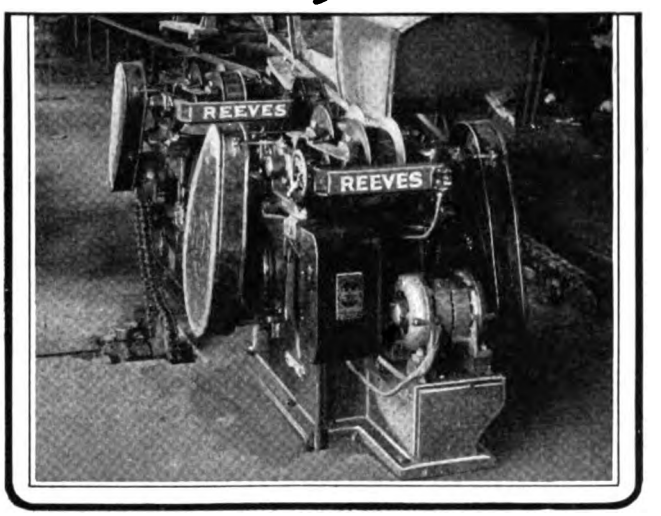
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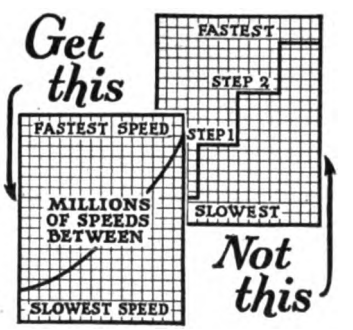
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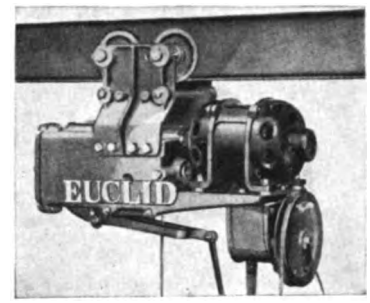
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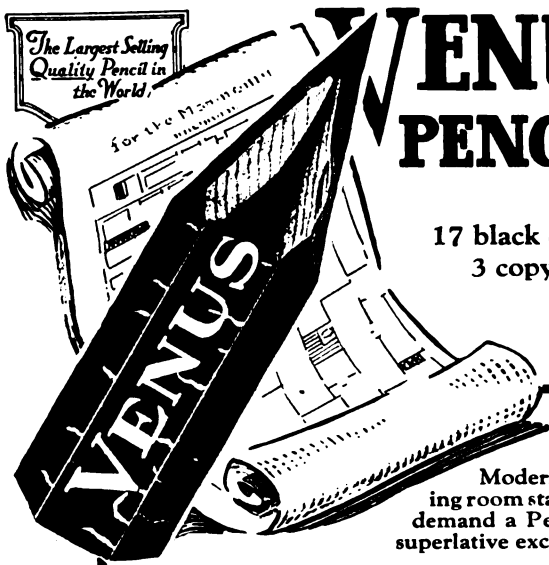
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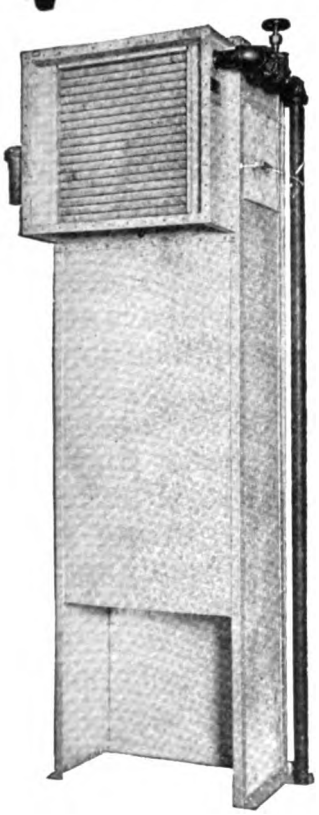
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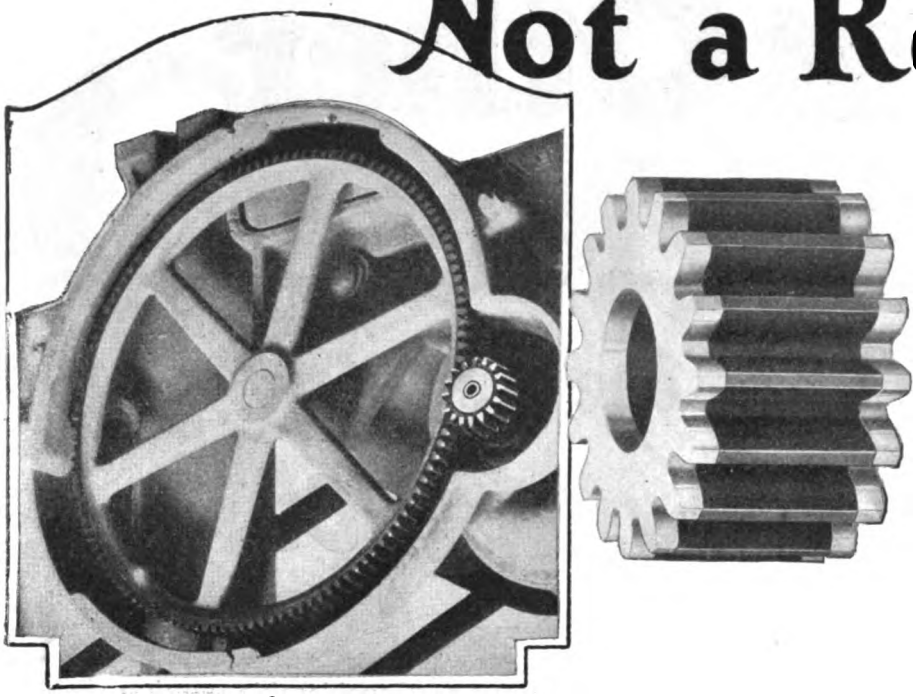
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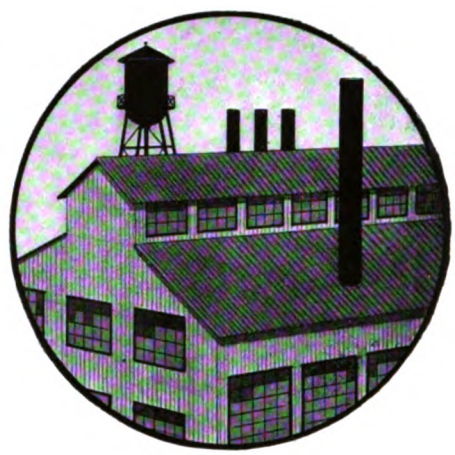
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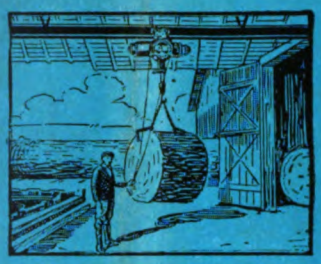
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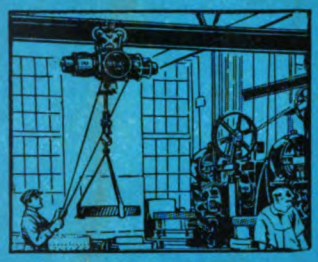
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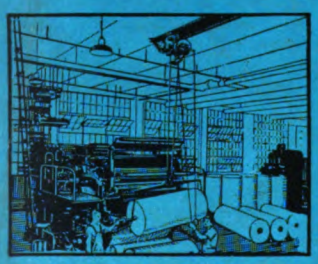
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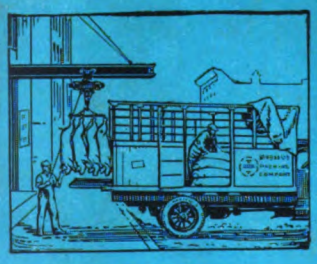
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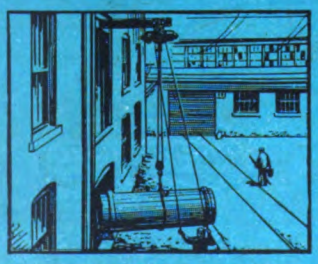
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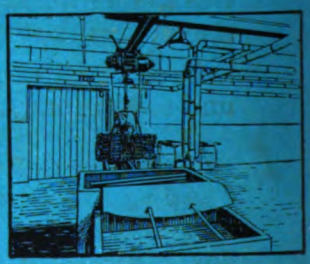
MILLING



ICE MAKING



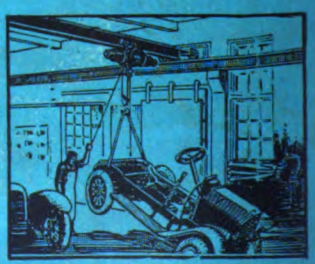
STONE WORK



FOOD PRODUCTS



ASH REMOVAL



GARAGE

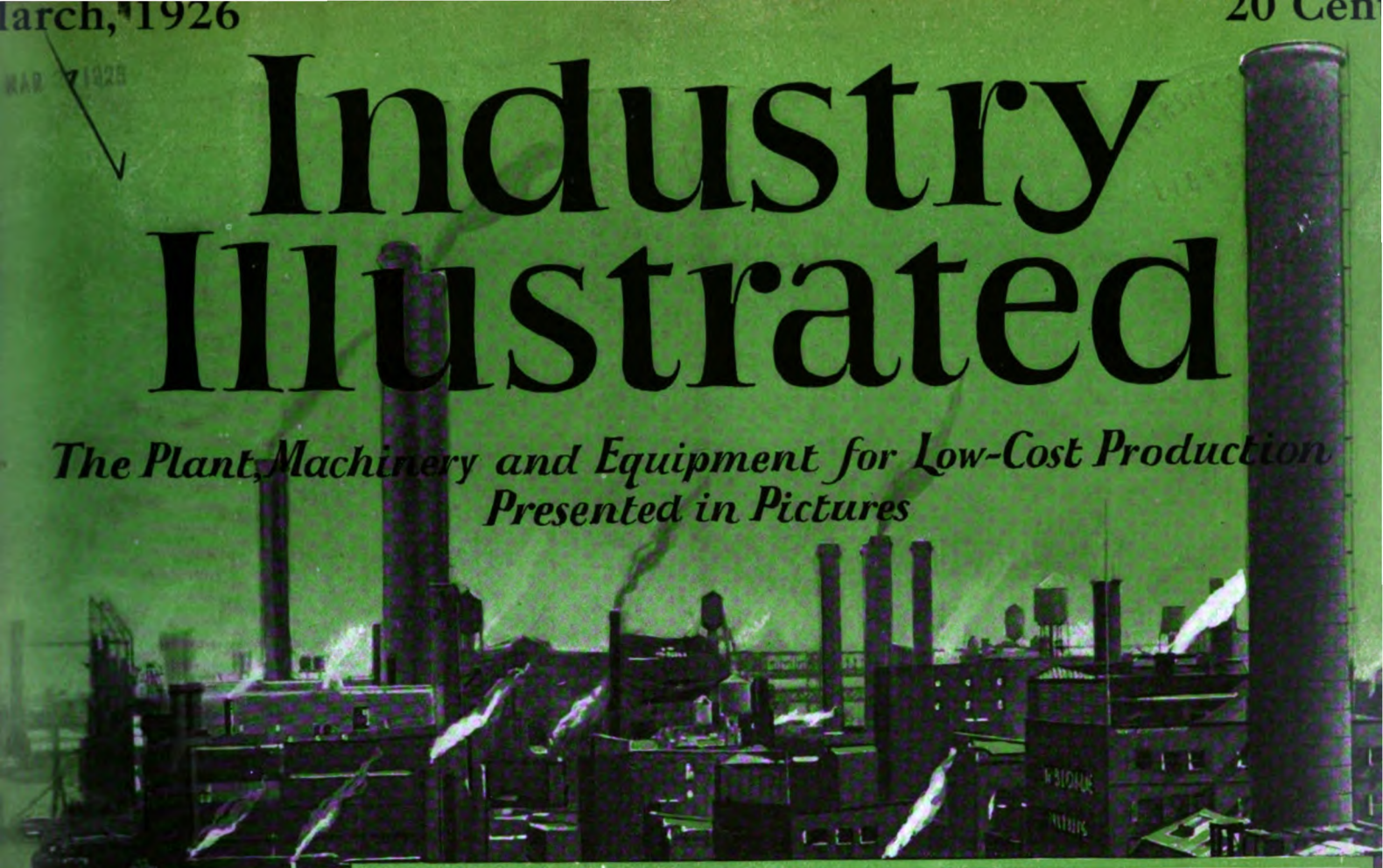
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larch, 1926 20 Cen

MAR 7 1926

Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures



B. & A. R. R.

Good Housekeeping in the Factory

It may cost from ten to a hundred dollars to repair a worn floor — but what does it cost, in lost time and truck maintenance, to leave it unrepaired? It costs money to rearrange machinery; it costs money to provide efficient storage racks and receptacles; sprinkler systems, for fire protection, cost money to install. Yet all these things — and many others — save more money than they cost.

Turn to page 18 for some suggestions on this all important subject of good housekeeping in the modern plant.

Complete Table of Contents, page 17

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A GOOD MECHANIC IS KNOWN BY THE WRENCHES IN HIS KIT —

Master Mechanics everywhere are using Bonney *C. V. Chrome Vanadium Wrenches

*C. V. is a Bonney trademark registered in the U. S. Patent Office

BONNEY
"ONLY THE BEST"



Set No. 25
Contains six *"CV" Engineer's type 15 degree angle wrenches with 12 different openings from 3/8" to 1". Price, east of Mississippi $6.85 without Leatherette Roll. $7.85 with Roll. Canadian and Western prices slightly higher.

Bonney *C. V. Chrome Vanadium Wrenches are twice as strong as ordinary carbon steel wrenches and are easily identified by the dull nickel finish of the handle and the highly polished heads. Look for orange Bonney trademark in handle and the words "Chrome Vanadium" on the handle.

You can secure from your jobber. Write for detailed information.

Bonney Forge & Tool Works
Allentown, Pa.

Makers of Special Service Wrenches of Chrome Vanadium, Carbon Steel Drop Forged Wrenches, Stillson Wrenches, Vises and Drop Forgings and the Bonney Rim Tool.

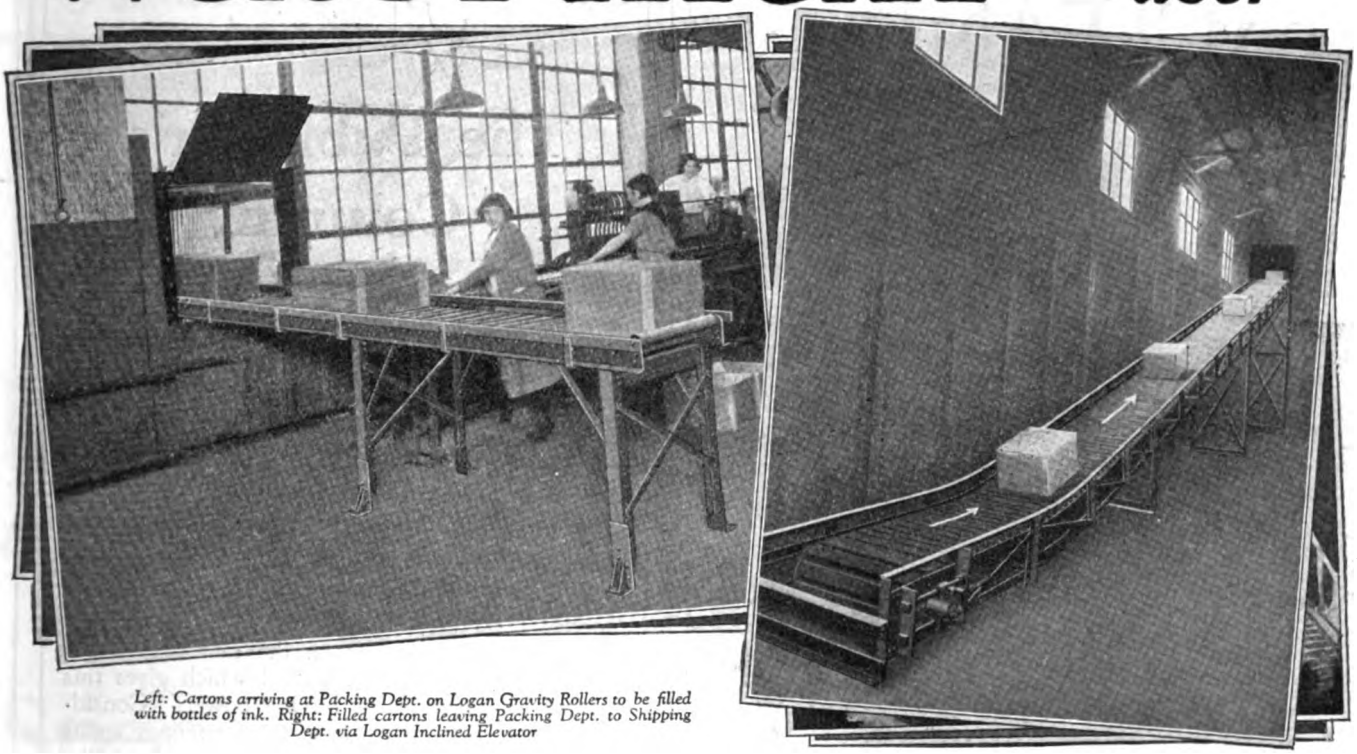
BONNEY Chrome-"CV"-Vanadium WRENCHES

REG. U.S. PAT. OFF.

(Patents Pending)

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Waterman - another user



Left: Cartons arriving at Packing Dept. on Logan Gravity Rollers to be filled with bottles of ink. Right: Filled cartons leaving Packing Dept. to Shipping Dept. via Logan Inclined Elevator

WATERMAN! To millions of people and for many years that name has meant just one thing—dependable fountain pens. And the fact that today you can find in every city in the country a Waterman Ideal to suit your penmanship and purse is a reflection of good methods in manufacture and merchandising. In meeting the continued demand for this nationally advertised product and in maintaining prices at a consistent level, Logan Conveyors are co-operating in a substantial way. Pens or paints, heavy castings or fragile filaments—Logan Conveyors can move them more swiftly, more safely and at a saving. Write our nearest office for further information.



Just as the pen is mightier than the sword, time- and labor-saving systems of Logan Conveyors give the manufacturer a more effective weapon against mounting costs than hordes of useless human hands.

Logan Co.

Formerly THE DOW CO., *Louisville, Ky.*

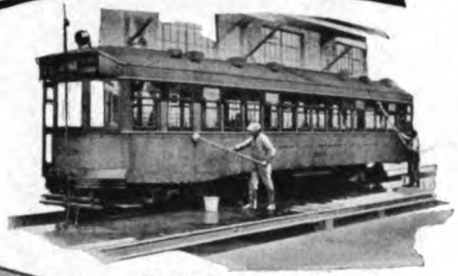
New York Office, 50 Church St.
Detroit Office, 8855 Woodward Ave.
Indianapolis Office, 425 Board of Trade Bldg.
Kansas City Office, 3130 Washington St.
Chicago Office, 343 S. Dearborn St.
Rochester Office, 116 Saint Paul St.
Los Angeles Office, 1102 Van Nuys Bldg.
Pittsburgh Office, 405 Fulton Bldg.
Representatives in other principal cities

Logan Conveyors

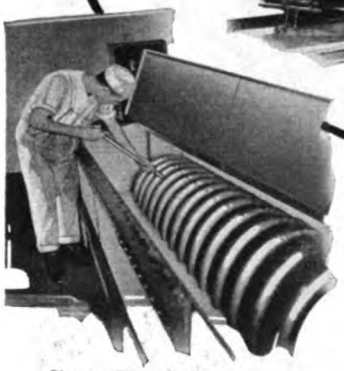
LOUISVILLE

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When you want ideas on CLEANING



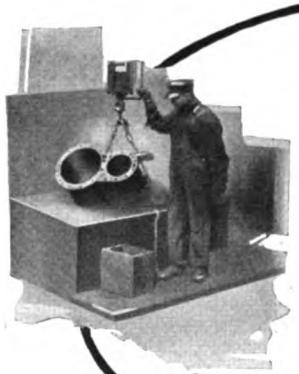
Cleaning Street Railway Cars



Cleaning Batch Pasteurizers in Dairies



Cleaning in Garages



Cleaning Locomotive Parts

. . . sound workable ideas that cut costs, turn out a better quality product and eliminate waste—ask us.

In street railways or dairies, locomotive shops or garages—whatever your business—let Oakite materials and methods point the way to better and more economical cleaning in your plant, as they have in more than 300 different lines of industry.

Inquiries are invited from concerns interested in lowering cleaning costs, and who desire to make comparative tests. Tests involve no other obligation, of course, than to provide the opportunity for demonstrating just what Oakite materials will do.

Oakite Service Men, cleaning specialists, are located at:

Albany, Allentown, Pa., *Atlanta, Ga., Baltimore, Boston, Bridgeport, *Brooklyn, Buffalo, Camden, Charlotte, N. C., *Chicago, *Cincinnati, *Cleveland, *Dallas, *Davenport, Dayton, *Denver, *Des Moines, *Detroit, Erie, Flint, Mich., Grand Rapids, Harrisburg, Hartford, *Indianapolis, *Kansas City, *Los Angeles, *Milwaukee, *Minneapolis, *Montreal, Newark, New Haven, *New York, *Oakland, Cal., Peoria, Philadelphia, Pittsburgh, Portland, Me., *Portland, Ore., Providence, Reading, Rochester, Rockford, Rock Island, *San Francisco, *Seattle, *St. Louis, Syracuse, Toledo, *Toronto, Utica, *Vancouver, B. C., Williamsport, Pa., Worcester.

**Stocks of Oakite Materials are carried in these cities.*

OAKITE

TRADE MARK REG U.S. PAT OFF

Industrial Cleaning Materials and Methods

OAKITE IS MANUFACTURED BY OAKLEY CHEMICAL CO
40A THAMES ST., NEW YORK, N.Y.



The Publisher's Column

Are You in Line With Prosperity?

THERE is but one way to make sure of reaping the rewards of prosperity. You must first make sure that you are in line with it.

Prosperity is based on the relationship between productivity and consuming ability. There is no argument on this point.

There is no argument on the fact that wages today in America are at a level which gives this country an unparalleled buying power. Considerably more than one half of all the money spent in this country comes from wages. It is also indisputable that during the past five years the average productivity of American wage earners has increased 35 per cent.

A good part of this increased productivity comes from the use of better machinery—of tools that enable men to increase their output. Thirty-five per cent. is a big increase!

Have you increased the productivity per man in your factory 35 per cent. during the past five years? If you have, you are in line with prosperity and will reap your reward.

If you have *not* it would be a good plan for you to study the possibilities of the improved machinery represented in the advertising pages of INDUSTRY ILLUSTRATED.

Industry Illustrated

Published Monthly by
THE ENGINEERING MAGAZINE CO.
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TRUSCON Boxes and Platforms save you time, space and money

Boxes and Platforms- Built *to* Your Specifications!

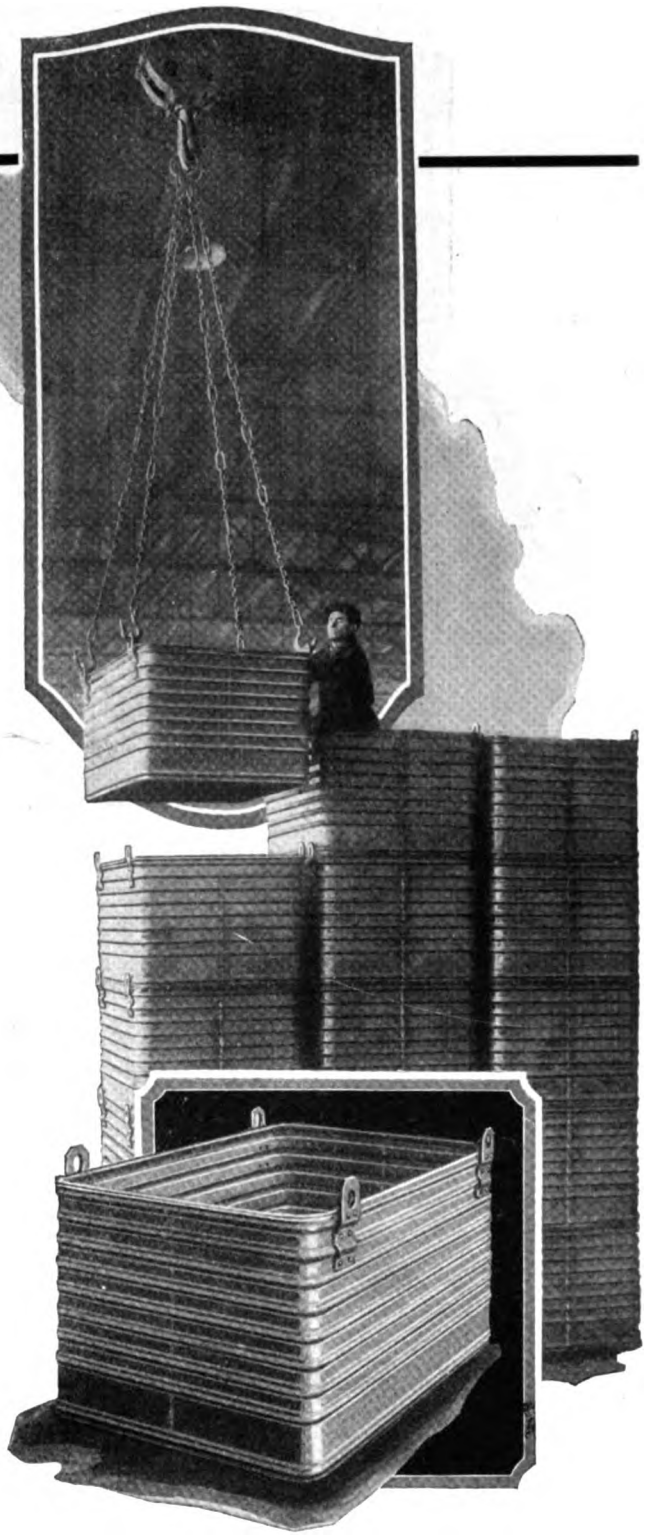
No matter how large or small your production problems Truscon Alloy Steel Boxes and Platforms will help solve them. Rigidly and solidly built for handling and storage uses they are practically indestructible and are adapted to any method of hand or mechanical conveying.

They can be stacked or piled—do away with wasteful piling and repiling and eliminate the necessity for excessive handling between stock and production line. It costs you nothing to employ Truscon's Expert assistance in solving your handling problems.

Return coupon for information

TRUSCON STEEL COMPANY Youngstown OHIO

Special Box and Platform Representatives in New York, Philadelphia, Chicago, Pittsburgh, Cleveland, Buffalo, Detroit, Boston, St. Louis, and Cincinnati.



Truscon Crane Handling Box 24" x 48" x 24"—capacity 3000 lbs.

*TRUSCON ALLOY STEEL BOXES AND PLATFORMS

***A complete line of Steel Buildings, Steel Windows, Metal Lath, Steel Joists, Steel Poles, Concrete Reinforcing for Buildings and Roads, Pressed Steel Specialties, Waterproofing & Technical Paints. Truscon maintains Engineering and Warehouse Organizations thruout the Country.**

TRUSCON STEEL COMPANY
YOUNGSTOWN, OHIO

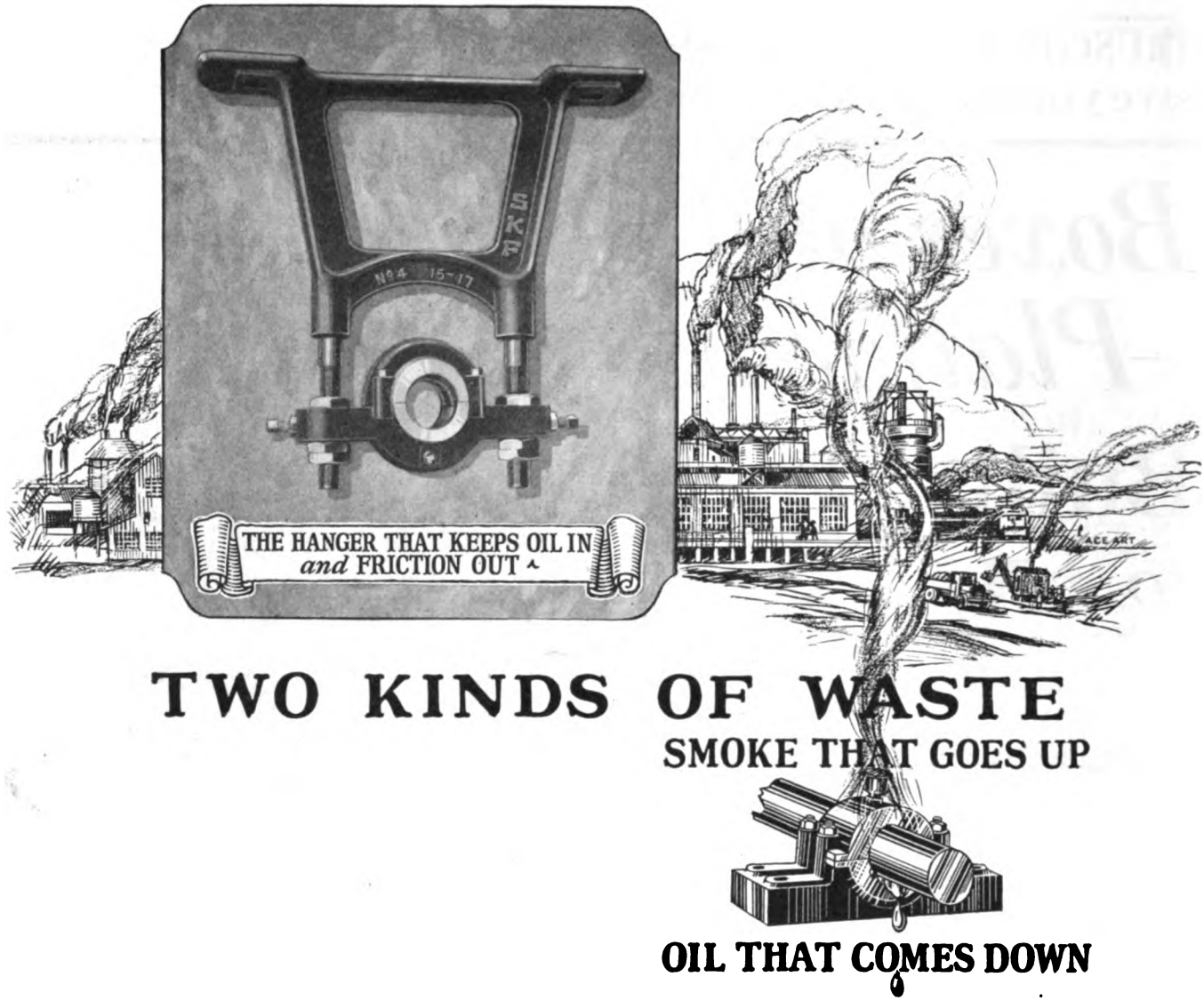
Send me complete information on your Alloy Steel Boxes and Platforms.

Name .....

Address .....

I.I. 3-26

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TWO KINDS OF WASTE

SMOKE THAT GOES UP

OIL THAT COMES DOWN

FRICTION plays a dual role in many plants where line shafting turns on plain bearings. For not only is there a waste in power, oil, lubricants and labor costs, but often there is the greater waste caused by oil that drips from overhead and damages valuable merchandise.

A Pennsylvania mill devoted to the weaving of heavy fabrics, facing these conditions, installed Skayef Self-Aligning Ball Bearing Hangers. The result was not only a reduction in maintenance costs to a point where the saving represented 49% of the cost of the Skayef installation, but the oil-tight Skayef bearings eliminated all oil spoilage in the plant.

Just another instance where a Skayef installation paid for itself in less than two years' time. Why not put YOUR hanger problems up to SKF?

The SKAYEF BALL BEARING COMPANY, 165 Broadway, New York

1535

BALL BEARING

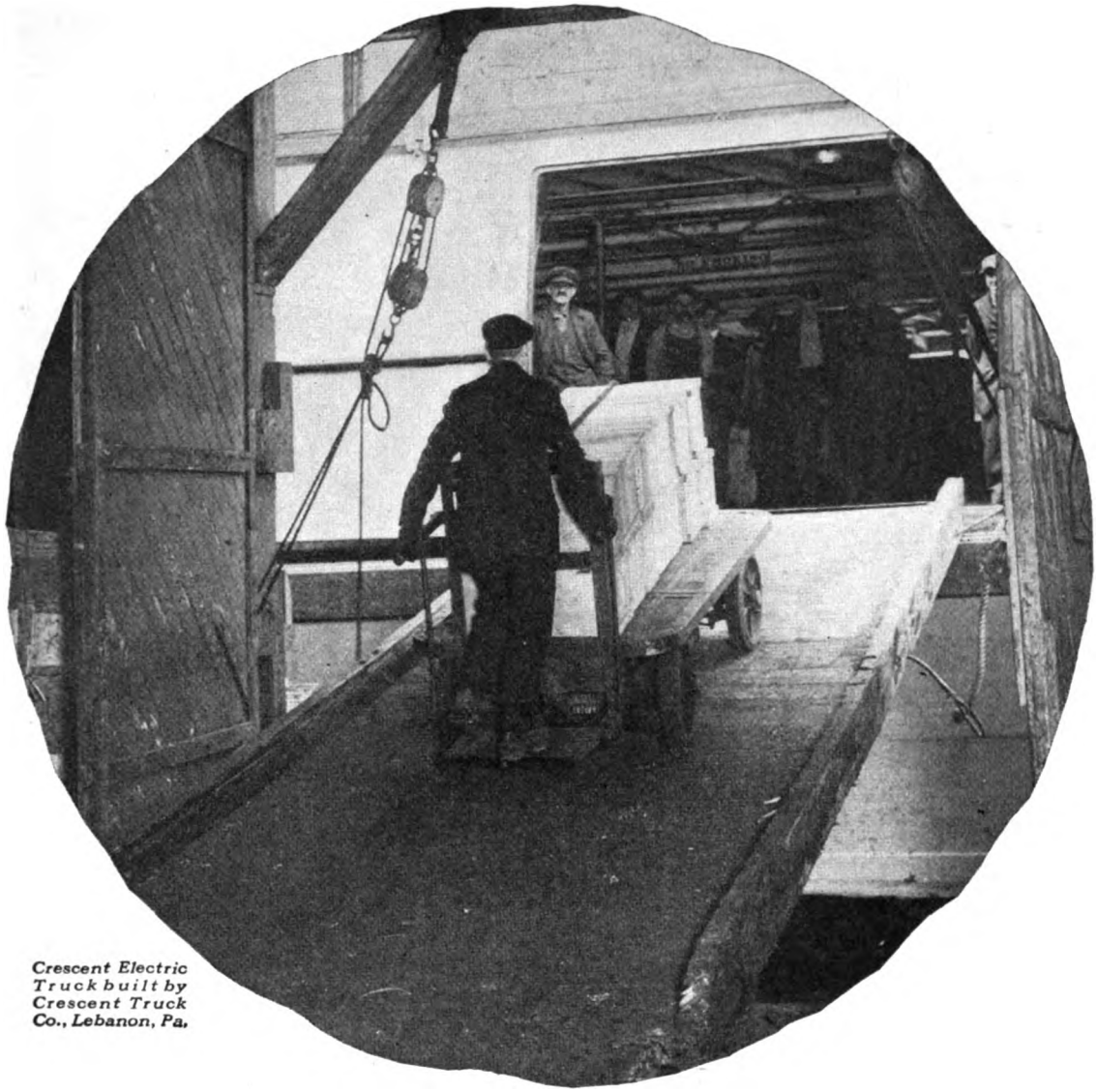
SKAYEF HANGERS

POST HANGERS, PILLOW BLOCKS AND TRANSMISSION APPLIANCES

SKF Puts the Right Bearing in the Right Place

For products not advertised in this issue write Industry Illustrated

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Crescent Electric Truck built by Crescent Truck Co., Lebanon, Pa.

Nimble as Goats

Up gangplank or runway, out in the yard, over the tracks, in, out, and around, nimble as a goat. Industrial trucks must do it, must take the shocks of starting, bumping, jerking, lurching.

Therefore Crescent trucks, like so many leading makes, are equipped with Timken Tapered Roller Bearings. Thus friction and current consumption are less. Wheel alignment and safety are maintained. Lubrication is vastly simplified.

Only Timken-equipped trucks give you greater Timken load capacity, Timken Dual Duty, and the endurance of the fine bearing steel which is compounded and made by Timken itself.

THE TIMKEN ROLLER BEARING CO., *CANTON, OHIO*

Technical information regarding bearing sizes and their mounting, can be secured from the Timken Roller Bearing Service & Sales Company's Branches located in the following cities: Atlanta, Baltimore, Boston, Buffalo, Chicago, Cleveland, Dallas, Denver, Detroit, Indianapolis, Kansas City, Los Angeles, Memphis, Milwaukee, Minneapolis, Newark, New York, Omaha, Philadelphia, Pittsburgh, Portland, Richmond, St. Louis, Salt Lake City, San Francisco, Seattle, Toronto, Winnipeg

TIMKEN *Tapered Roller* BEARINGS

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Before you decided to use electric trucks and tractors in your plant you spent much time considering which make to buy. It will also pay you to spend a little time checking up on the best storage battery to use in those machines, for the battery is the heart and lifeblood of any electric truck.



Speed up the handling of material and slow down the cost

WHEN the storage battery in your electric industrial trucks and tractors is an Exide-Ironclad you can handle more material in a day's time and do it at less cost. Here is why.

An Exide-Ironclad keeps your trucks moving at a fast speed all day long. As long as the battery's voltage remains high the truck will step right along. And the voltage of an Exide-Ironclad remains high right down to the end of the discharge period.

When faced with a steep ramp, an Exide-Ironclad-equipped truck never falters. The battery calls on its reserve power, delivers current a little faster than usual, and the truck breezes ahead. Rare indeed is it for an Exide-Ironclad to spend a day out of service for repairs, for this battery is just as ruggedly built as 38 years' experience has taught us to make it. On charge the Exide-Ironclad has an unusually high efficiency. Its first cost is reasonable and its life long.

Ask any of the numerous prominent manufacturers who have equipped their trucks with Exide-Ironclads and they will be glad to tell you of their experience.

The names of a few of them are printed on this page.



This booklet contains information about storage batteries that every operator of an electric truck should have. Send for a copy today—no charge.

Here are the names of just a few of the many prominent companies that have speeded up deliveries and cut the cost of this service by using Exide-Ironclad Batteries.

Fisher Body Co., Detroit, Mich.
Dodge Bros., Inc., Detroit, Mich.
Cleveland Automatic Machine Co., Cleveland, O.
Buick Motor Co., Detroit, Mich.
Cadillac Motor Co., Detroit, Mich.
Delco-Light Co., Dayton, Ohio
The National Cash Register Co., Dayton, O.
Crane Company, Chicago, Ill.
Eagle-Picher Lead Co., Joplin, Mo.
American Motor Body Co., Philadelphia, Pa.
U. S. Playing Card Co., Cincinnati, O.
Remington Arms Co., Bridgeport, Conn.
J. G. Brill Company, Philadelphia, Pa.
Edw. G. Budd Mfg. Co., Philadelphia, Pa.
Trumbull Steel Co., Warren, O.
Minnesota Steel Company, Duluth, Minn.

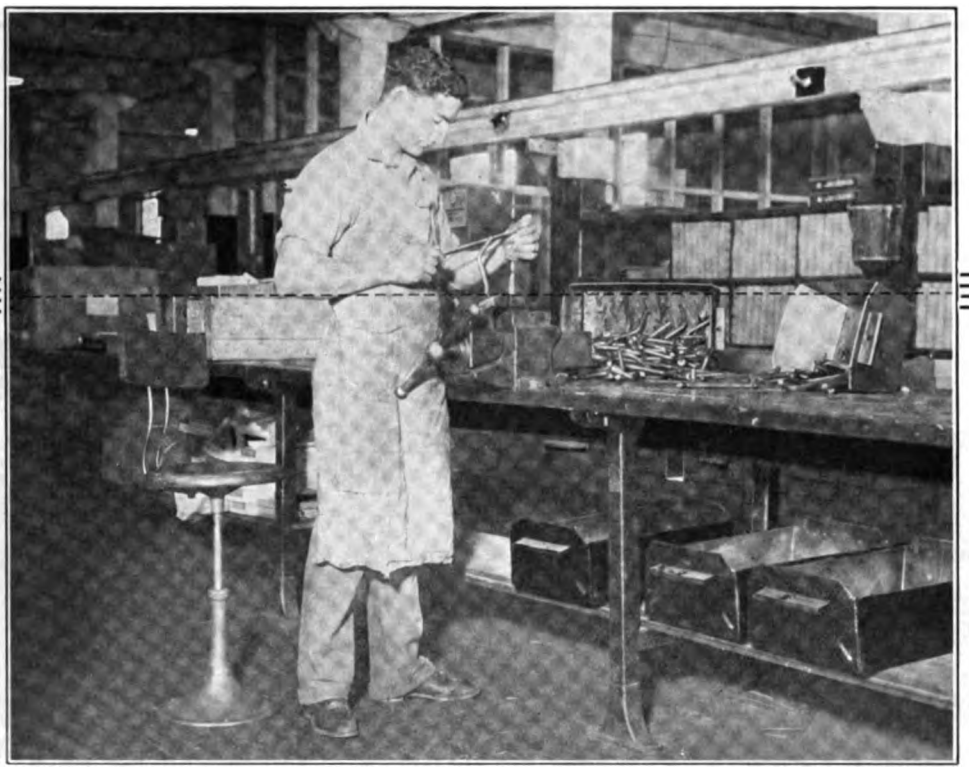
Exide
IRONCLAD
BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

Exide Batteries of Canada, Limited, 153 Dufferin Street, Toronto

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Does Your Shop Furniture Give Maximum Working Convenience?

Take benching for instance—twenty-five years experience building pressed steel bench legs for all types of industries and for every conceivable use has convinced us, as well as many production superintendents, that the ideal height for the average bench is 34 inches. Benching built this height and in which there is no end sway or vibration and wobbling allows an operator to produce a maximum output with minimum fatigue.



Ideal widths have also been studied and arranged accordingly. Special conditions sometimes call for special benching.

New Britain Pressed Steel Bench Legs are designed and built, as a result of this long experience, to give maximum working convenience. They are built in three weights and for single and double benching. Every part of their construction is the result of concerted study to produce, not just bench legs, but better, more serviceable benching. Over a period of time, you too will find them superior and most economical.

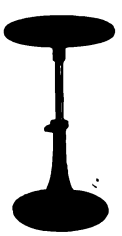
Our catalog contains valuable information on better benching and the proper method of building it, including type of legs and lumber to use, proper method of placing bolts, and other vital factors. Write for it now!

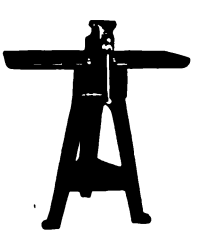
THE NEW BRITAIN MACHINE COMPANY

"Shop Furniture Originators" NEW BRITAIN NB HOME BETTER New Britain, Conn., U. S. A.

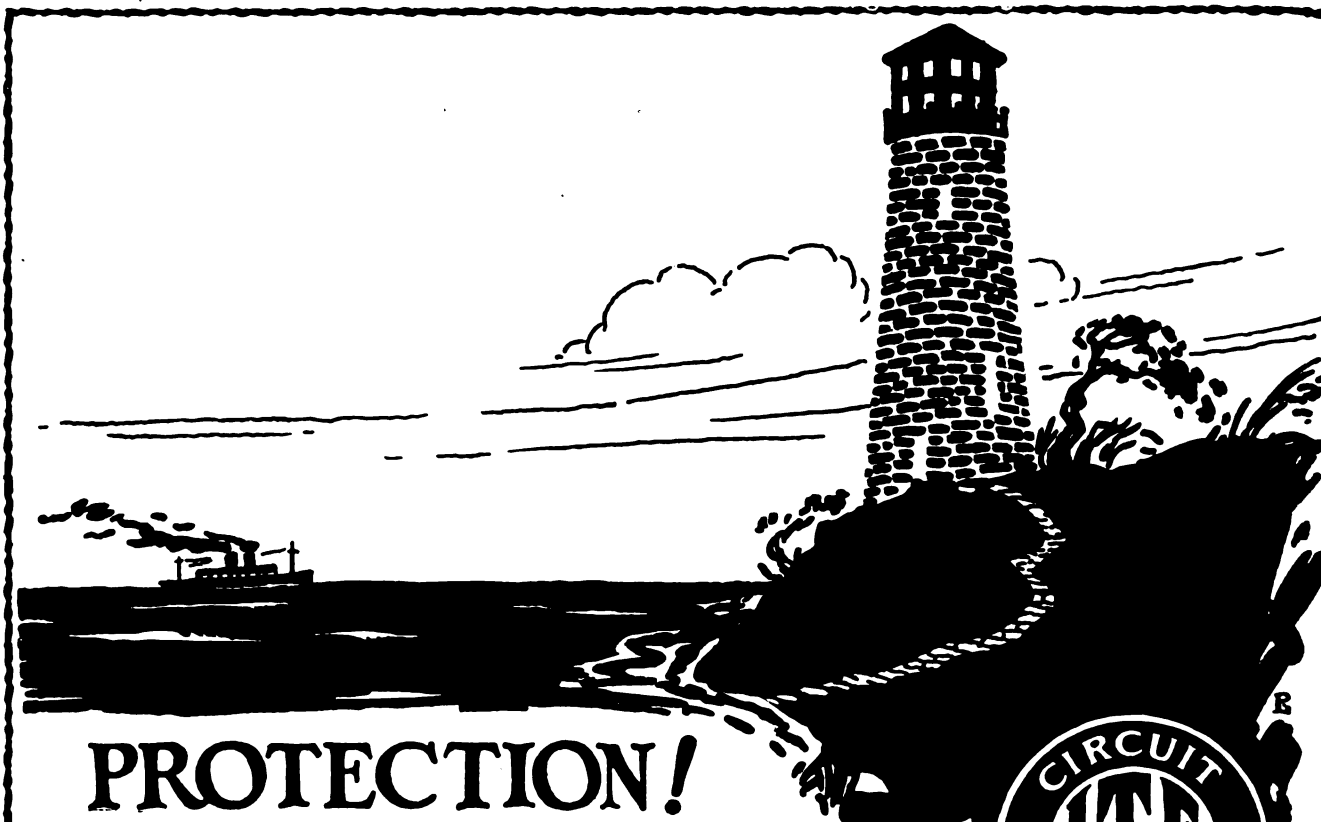








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PROTECTION!

THERE are substitutes for almost everything, but there is no substitute for I-T-E Circuit Breakers.

I-T-E Circuit Breakers are so widely used throughout the industries because they give *just such* protection to electrical equipment. You will find them on the switchboards in a multitude of power plants—in steel mills—in machine shops—in great modern hotels—in department stores—on battleships—everywhere on land or sea where absolute safety against electric short-circuits and overloads is demanded.

There is nothing like I-T-E Protection. It is reliable—it is positive—it is complete. If your Circuit Breakers have the I-T-E trademark on them you know they will perform the duty they are intended to perform—every day—every year—without fail—and with practically no upkeep.

(Figures on request)

THE CUTTER COMPANY
PHILADELPHIA
501 North 19th Street

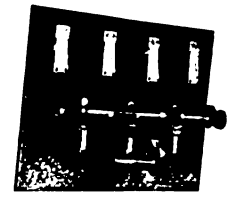
CIRCUIT I-T-E BREAKERS



Just a Minute—

Think of what it means to be able to design and build a 5000 Ampere Four Pole, Four Coil Auto Dalite (time limit and non-closable) I-T-E Circuit Breaker.

The smaller breaker shown is a duplicate of the larger, with the exception that it is of 5 amperes capacity instead of 5000—both CUTTER.



CUTTER

U-RE-LITE I-T-E CIRCUIT BREAKERS

10

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Where interiors are painted with this



Washing removes the dirt but not the paint—

TRY to wash ordinary white paint. Does the dirt come off? Does the paint stay on?

You can wash Barreled Sunlight clean any number of times without the least injury to its lustrous white surface.

This is because Barreled Sunlight is so satin-smooth that dirt can find no foothold —and so durable that repeated washings will not wear it away.

Made by the exclusive Rice Process, Barreled Sunlight is guaranteed to remain white longer than any gloss paint or enamel, domestic or foreign, applied under the same conditions—also, not to flake or scale if properly applied. It is economical in application, too, flowing on freely with brush or spray at the *lowest cost per square foot of surface covered.*

These are the practical reasons why thousands of industrial plants prefer Barreled Sunlight to any other paint for their ceilings and walls.

Sold in 55- and 30-gallon churn-equipped steel drums, and in cans from ½ pint to 5 gallons. Where more than one coat is required, use Barreled Sunlight Undercoat first.

The coupon will bring you an illustrated booklet and a painted sample of Barreled Sunlight.

U. S. GUTTA PERCHA PAINT CO.
Factory and Main Offices
5 Dudley Street, Providence, R. I.
New York—350 Madison Ave. Chicago—659 Washington Blvd.
San Francisco—156 Eddy Street
Distributors in all principal cities

Barreled
Reg. U. S. Pat. Off.
Sunlight

U. S. GUTTA PERCHA PAINT CO.,
5 Dudley Street, Providence, R. I.

Please send us your booklet "More Light", and a painted sample of Barreled Sunlight.

Name.....

Street.....

City..... State.....

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Big Reduction

OSBORN WIRE SCRATCH BRUSHES

Prices Greatly Reduced
Lowest Prices Since 1918

We are glad to announce substantial reductions on all numbers of the Nationally advertised trade-marked line of Osborn Scratch Brushes.

As the largest manufacturers of Scratch Brushes, we now make available Osborn Wire Scratch Brushes that surpass in quality, workmanship and value any other branded or unbranded line on the market—at prices heretofore unthought of even in our own organization.

Osborn Wire Scratch Brushes, known for their long wear and high quality, are sold by foremost mill supply houses and hardware houses everywhere. Come along with Osborn.

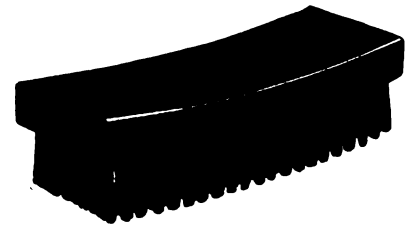
Write or wire for new prices.

THE OSBORN MANUFACTURING COMPANY
INCORPORATED
5401 Hamilton Avenue Cleveland, Ohio

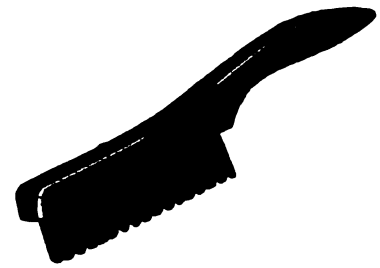
Osborn Brushes

OSBORN

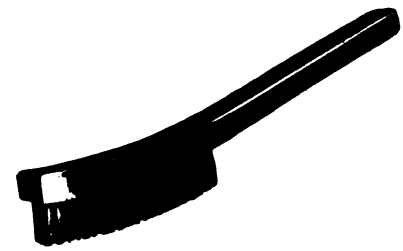
Every genuine Osborn Wire Scratch Brush bears this mark.



1779—Wire Scratch Brush. Made with curved back. For removing paint, varnish and rust.



1781—Standard Shoe Handle Wire Brush for household, auto or factory use.



1777—Steel Wire Scratch Brush. A narrow brush for general use.



1780—Wire Scratch Brush. Straight back brush with extra long wires for general use.

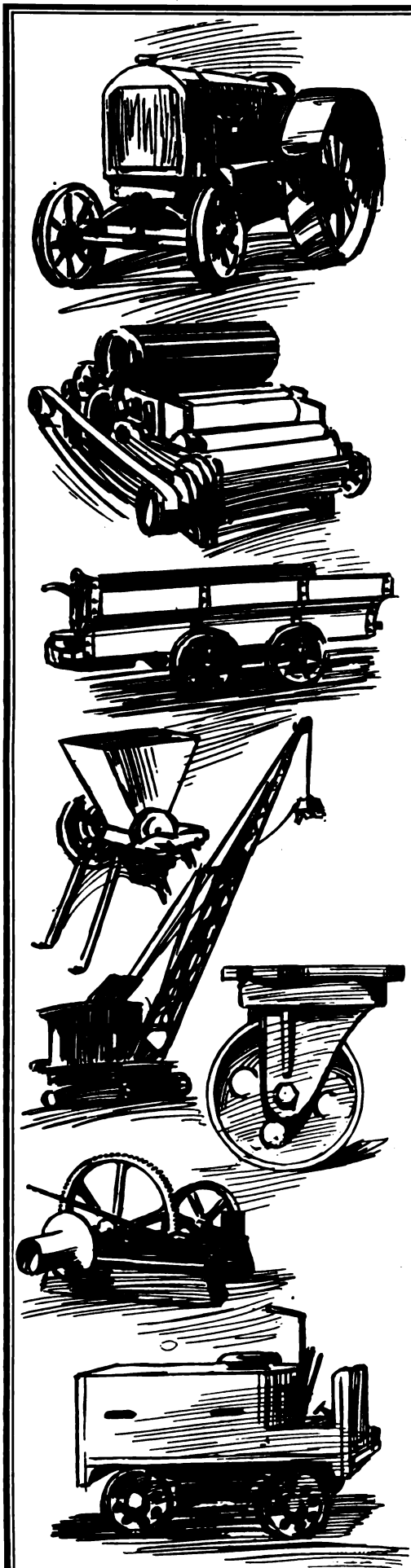


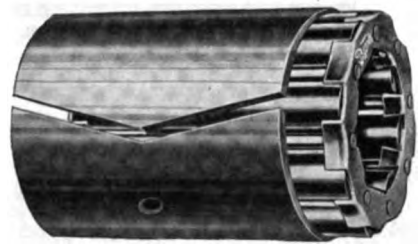
Assortment "K"—Containing an assortment of 12 fast selling wire scratch brushes in attractive counter box.

A BETTER WEARING BRUSH FOR EVERY USE

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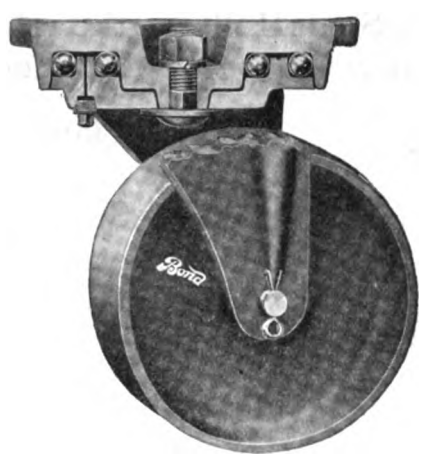
Bond

Commercial
ROLLER BEARINGS

Wherever you need a dependable, efficient Commercial Roller Bearing, the Bond Commercial Roller Bearing is the logical choice.

Designed by Bond engineers after an exhaustive study of industrial requirements, it has features found in no other bearing. The pressed steel Retainers, or cage ends, are tied, spaced and held rigidly in place by steel Stay Rods, alternating with hardened and ground solid steel Rollers. These Stay Rods are shouldered and electrically welded to the Retainers, keeping the Rollers evenly spaced and constantly parallel to the shaft axis.

Bond Commercial Roller Bearings are ideal for use in a wide variety of machines, as illustrated at the left. May we discuss with you the advisability of their use in your products? No obligation, of course.



BOND TRUCK CASTERS

"Casters with the Quality you have been looking for" — that means Bond Truck Casters. There is a type to meet every requirement of the industrial plant.

Bond Casters have features that place them in a class by themselves. Our illustrated catalog explains why—ask us for a copy.

A Complete Line of Power Transmitting Machinery for All Industrial Requirements

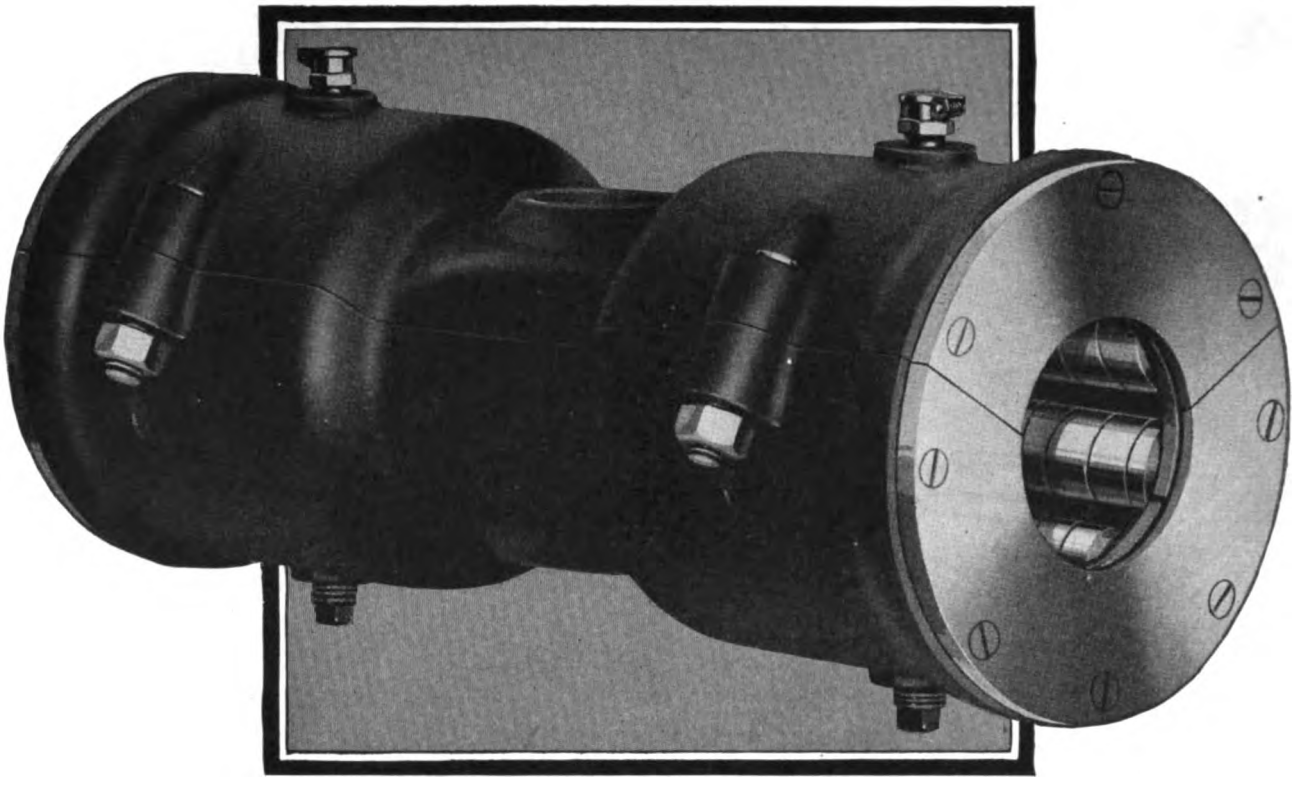
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No wonder it's meeting with such widespread demand

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Plant engineers have enthusiastically endorsed the *new* Hyatt Line Shaft Bearing. It leads the way to economical, carefree, dependable power transmission everywhere.

No wonder it's meeting with such widespread demand. *Hyatt Roller Bearing Company, Newark, N. J.*

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B. F. STURTEVANT COMPANY

HYDE PARK, BOSTON, MASS.

June 9, 1924.

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Completely banished oil drip!

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Ran 22 months with one filling!

"In fact Knorrs thoroughly lubricated the exhauster for twenty-two months with the original lubricant. The exhauster has been running nine hours a day, six days a week, at 900 R. P. M."

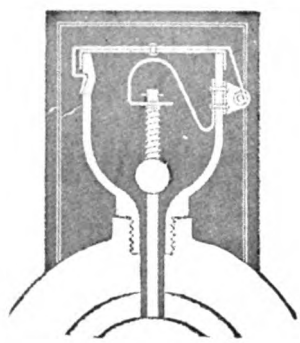
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J. F. Lyons.
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It's a low-cost "sure fire" lubricator that will add prestige to new machines —easily installed on old machines.

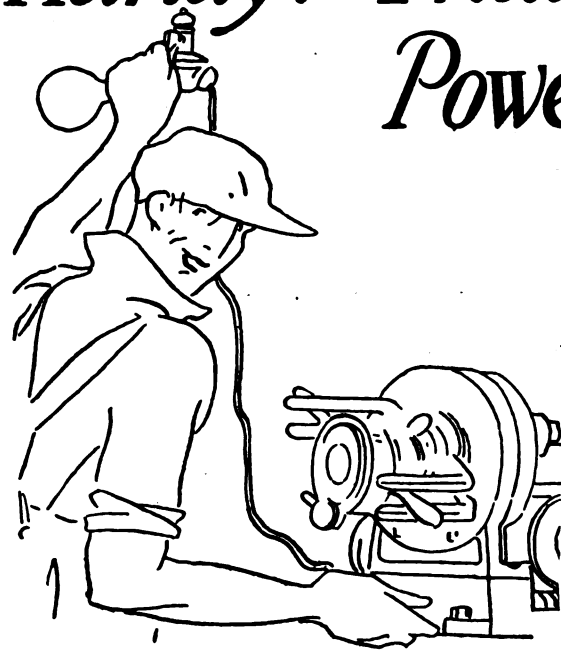
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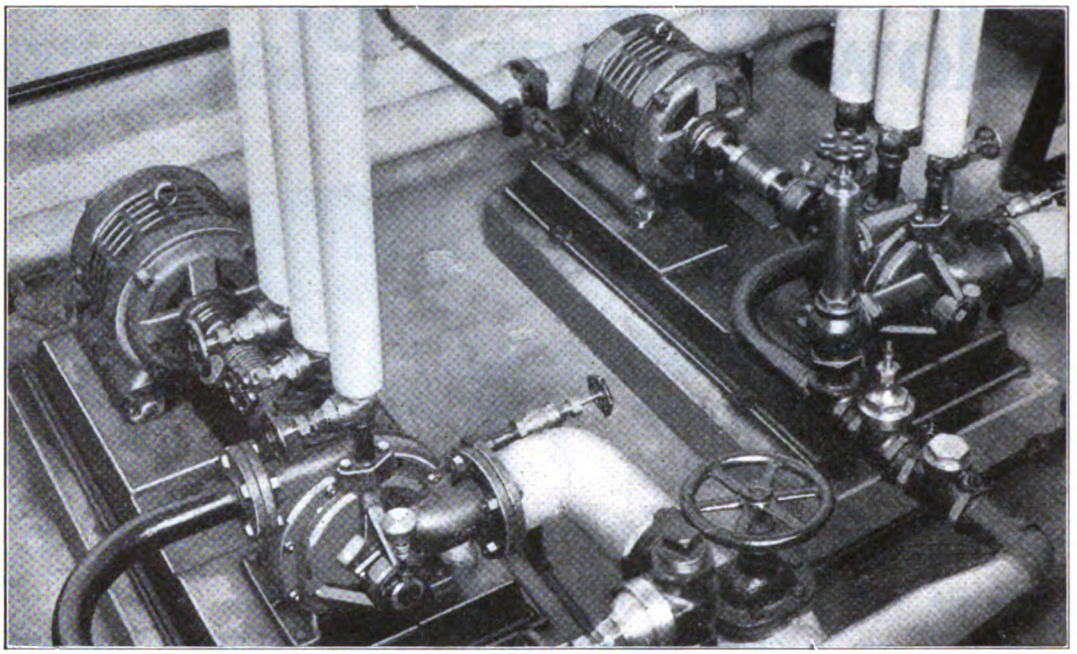
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—"if Hytors weren't satisfactory I wouldn't have ordered three more"

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MARCH 1926

Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures

JOHN H. VAN DEVENTER, *EDITOR*

W. THOMSON LEES
Associate Editor

ADOLF SCHILDKRAUT
Art Director

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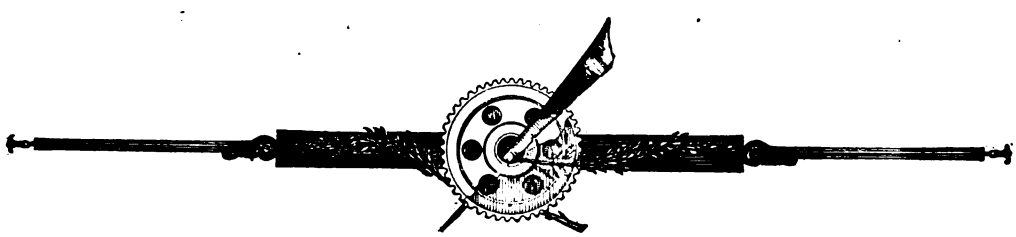
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Good Housekeeping in the Factory

Examine Your Plant in the Light of This Practice

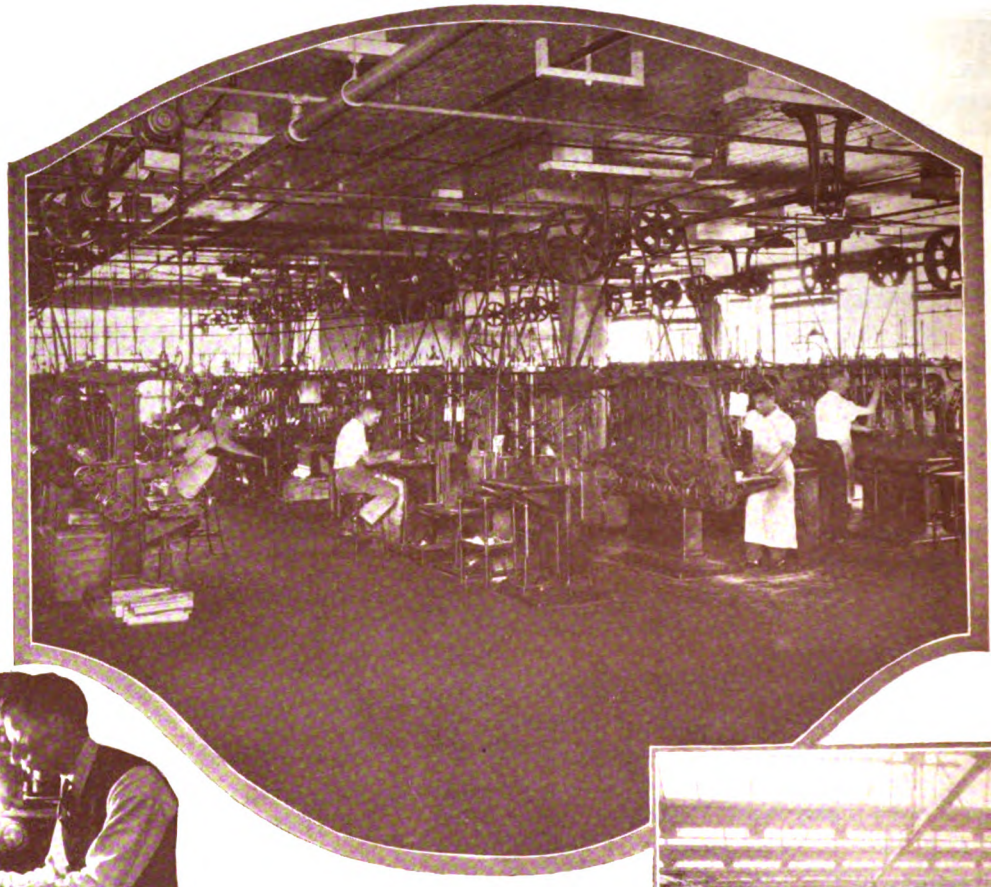


Fig. 1. Contrast this orderly placing of machines with the helter-skelter placing of tools that you have observed in some shop departments. The effect on the man employed is the same as that on the visitor. An orderly arrangement says "this place means business."

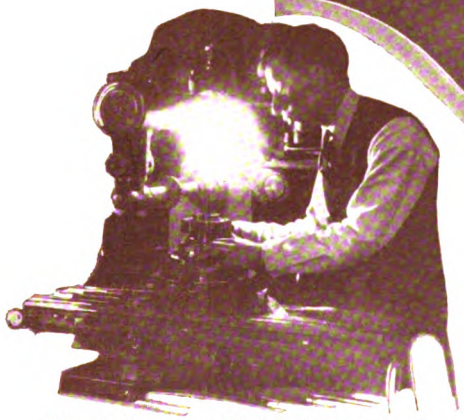


Fig. 2. Proper artificial lighting is an indication of good management and its absence certainly shows bad factory housekeeping. When you find men groping about in a shop, or blinded by glare because of poor light, you may be sure that the management has a serious blind spot. It cannot see an obvious loss of profits.



Fig. 3. Clean, clear aisles, kept free from stock as well as from rubbish, comprise one of the surest signs of good factory housekeeping. Cluttered passageways and good management do not go together.

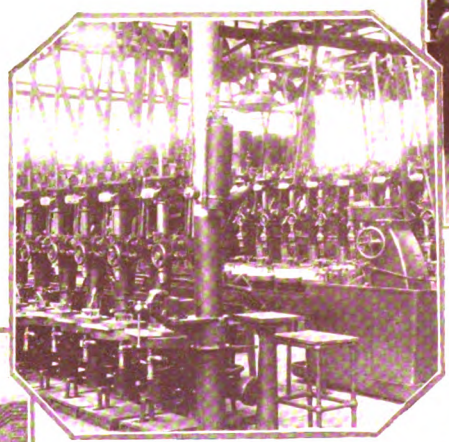


Fig. 4. Modern shop housekeeping demands that the work shall be kept on the move. Therefore there must be no unnecessary accumulation of stock parts at the various machines. Today, tools are placed much closer together than in days gone by. This conserves floor space.

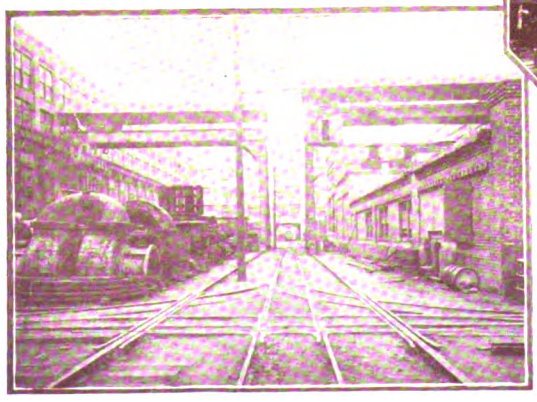


Fig. 5. Even the plant yard has had to undergo a reform in connection with modern industrial housekeeping. It used to be the general dumping grounds. Now it is considered a part of the production facilities. Contrast this neat plant yard, typical of practice today, with what you remember to have seen twenty years ago.

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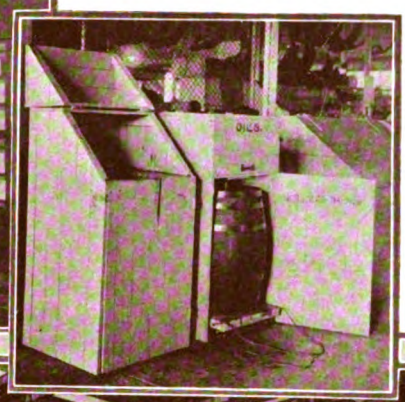


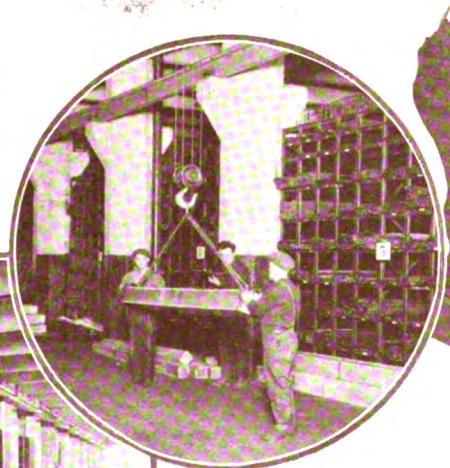
Fig. 7. Oil is all right in its place, but its place is restricted to where it will do good. In many plants you will find it "all over the shop," which is not only wasteful, but mussy. Central oil storage with auxiliary stations or traveling wagons if necessary check oil consumption and aid neatness.

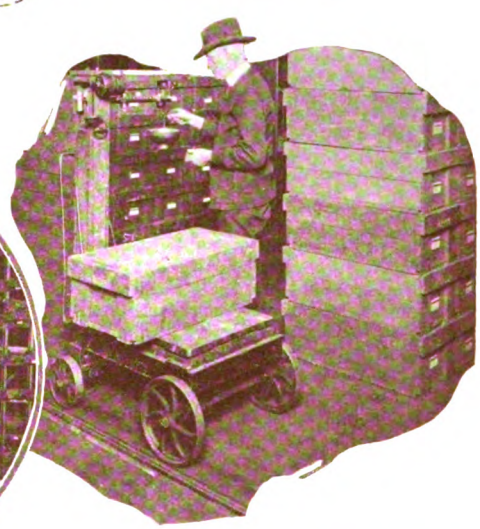


Fig. 6. Wall racks for work ahead orders take a great deal of work off of the foreman's shoulders and put it on routine, where it belongs. Good housekeeping in the factory involves the systematic "dispatching" of work through the department with minimum attention from the boss.

Fig. 8. The steel barrel and box have helped to solve the problem, among other things, of neat and economical storage of castings, forgings and stampings of moderate size, for which tote boxes may not be suitable.

Fig. 9. At the right—Even raw materials must be neatly stored today if the good housekeeping verdict is to be rendered. These bars, for example, are placed in racks which separate the sizes, make handling easy, and keep them off the ground. Shortages are seen at a glance.





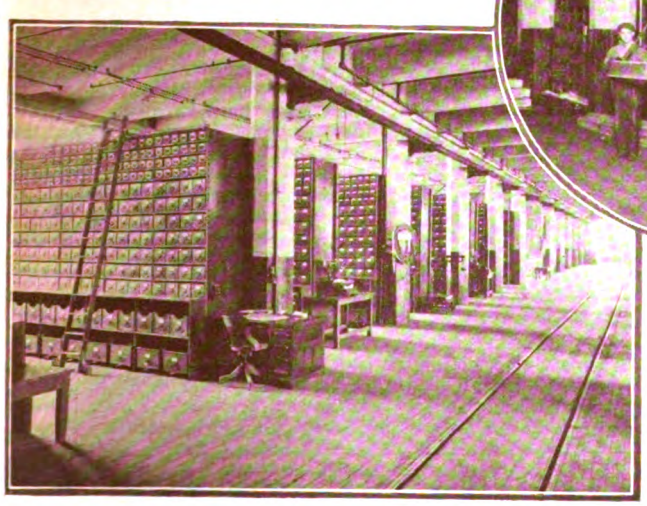


Fig. 11. Less idle stock in process, per unit of production is the aim today, to reduce material investment. Thus the big stock rooms where many thousands of dollars worth of stock parts could rest in peace and be forgotten, have gone out of fashion. But costly materials and easily damaged parts are still segregated, usually under lock and key.

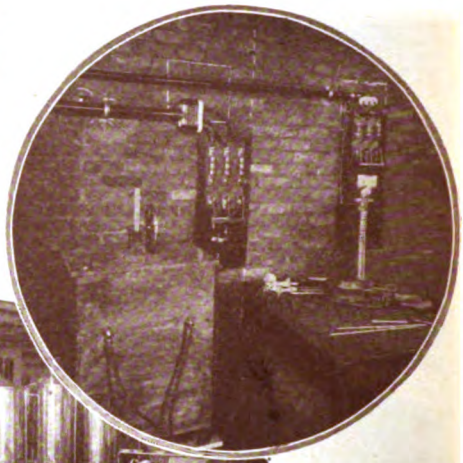
Fig. 10. Tote boxes for small parts in process help shop housekeeping by keeping together the parts that belong together. Also they aid in inventory, in transportation and in tracing stock. They have helped a lot to transform shop housekeeping during the past ten years.

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Fig. 12. When there is a bit of space in the factory yard, and particularly in the front yard, that is not actually required for storage or other purposes, a little gardening with grass and flowers goes a long way toward making an exceptionally attractive plant. Good men seek good environment, and this sort of expense is therefore not altogether nonproductive.

Fig. 13. Neat electric wiring, both for power and other purposes, is an indication of good factory housekeeping. The proper placing of switches and controllers is an art in itself and not a matter of guesswork. Little things of this kind reveal the quality and quantity of brains possessed by those in charge.



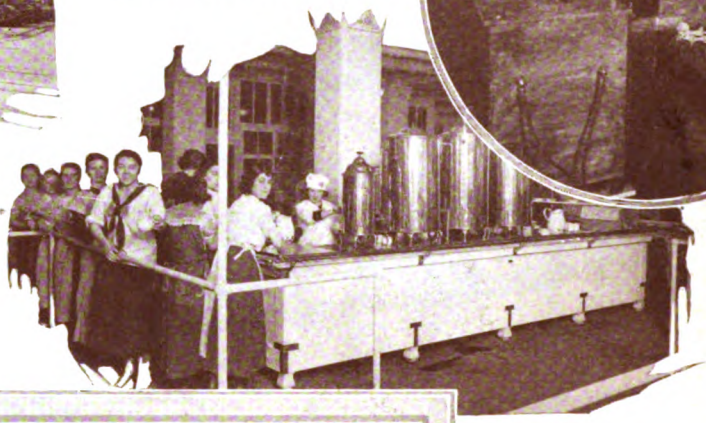




Fig. 14. At noon, the housekeeping activities in the industrial plant hinge upon feeding the inner man. Whether he feeds himself from a cold lunch bucket and throws his refuse under the bench, or eats a hot meal in a pleasant lunch room, depends upon the housekeeping ideals of the management.



Fig. 15. No one cares to live in a cold house in winter. No one cares to work in a cold shop. So an adequate heating system is a very important part of good housekeeping. The day has passed when workmen are required to warm their hands over a salamander fire between operations.

Fig. 16. Sanitary drinking fountains, of course, are the rule with good shop housekeeping. The old tin cup may be all right on the farm, but it is all wrong in the factory. And these shop drinking places are situated so as to require the least total walking distance for those they serve.

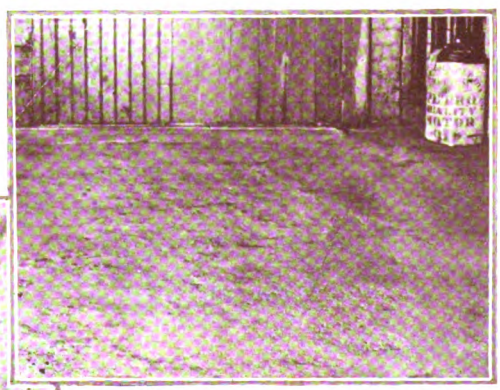




Fig. 18. Fire protection and prevention are part of good factory housekeeping. They guarantee uninterrupted production. Today it is the exception when one finds a really worth while plant that is not equipped with a sprinkler system. "I have a thousand firemen on duty night and day" said one manager, pointing to his sprinkler heads.

Fig. 17. Smooth, level floors, kept in first class condition, are a mark of good management. Whether of wood, concrete, composition or other material, floors must be kept smooth and level for the sake both of safety and transportation. Rutted and broken floors add daily charges to your bill for moving materials.

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About as Big as They Make Them

This Lathe Is One Hundred and Twenty Feet Long

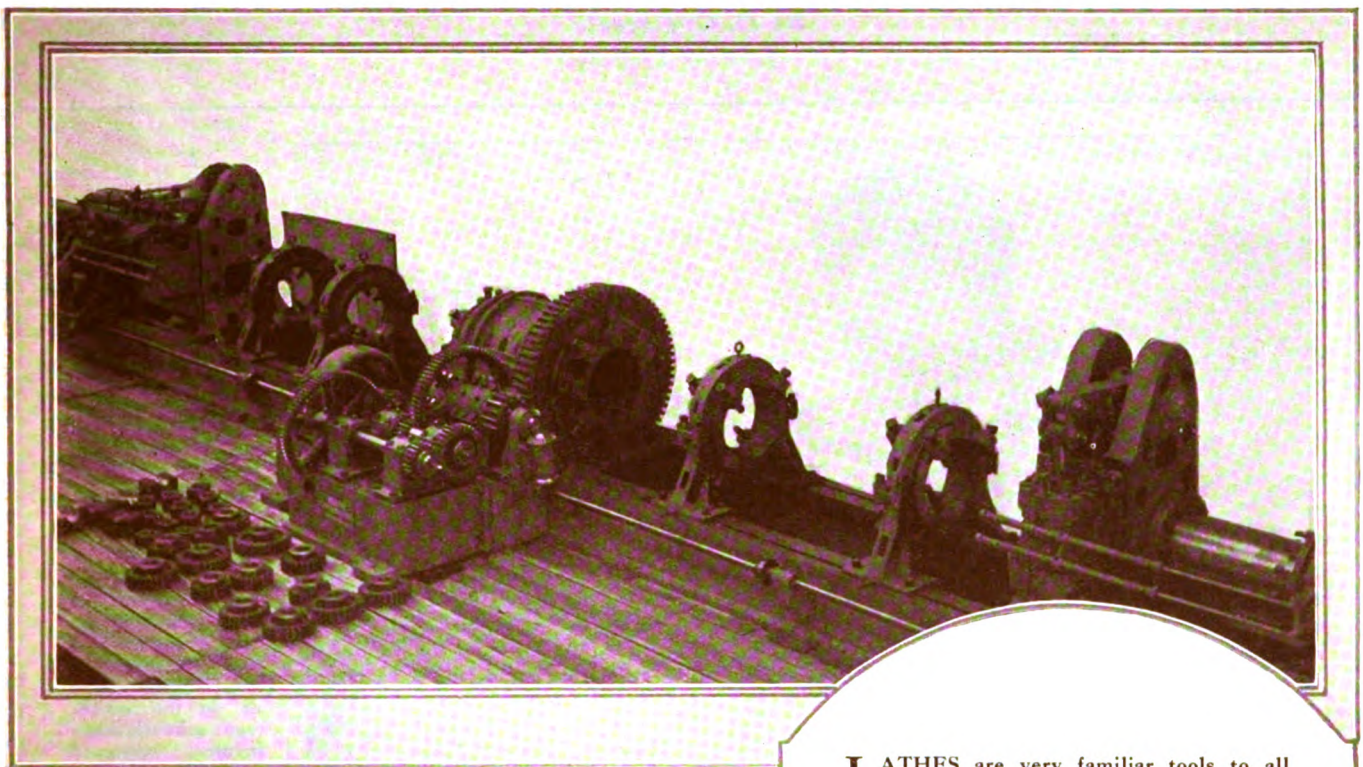


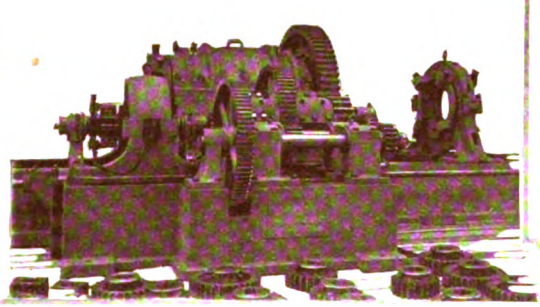
Fig. 1. Very few readers of INDUSTRY ILLUSTRATED have ever seen a lathe as big as this one. It is used to bore out the central core in propeller shaft sections for ocean liners and warships. The bed is one hundred and twenty feet long.

LATHES are very familiar tools to all of the readers of INDUSTRY ILLUSTRATED. Little and big, they are found in every machine shop. But here is a rather rare species of lathe that is not so common. It is used for boring out the central core hole in propeller shafts for the largest ships.

As is well understood in mechanical science, the central portion of a shaft used for torsion is practically so much waste metal. Hence in marine practice, to conserve weight, propeller shafts are made hollow. Huge forgings, from 30 to 50 feet in length, and perhaps three feet in diameter must be bored through their entire length. This is the sort of giant lathe on which this task is performed.

The holes bored through these shafts are sometimes two feet in diameter. It takes from six months to a year to build one of these monsters, but after it is once made, it usually stays put for some time.

Fig. 2. The shaft is held by means of capstan screws in this revolving steady rest which is driven by electric motors. The spindle hole through the body of the steady rest is nearly four feet in diameter.



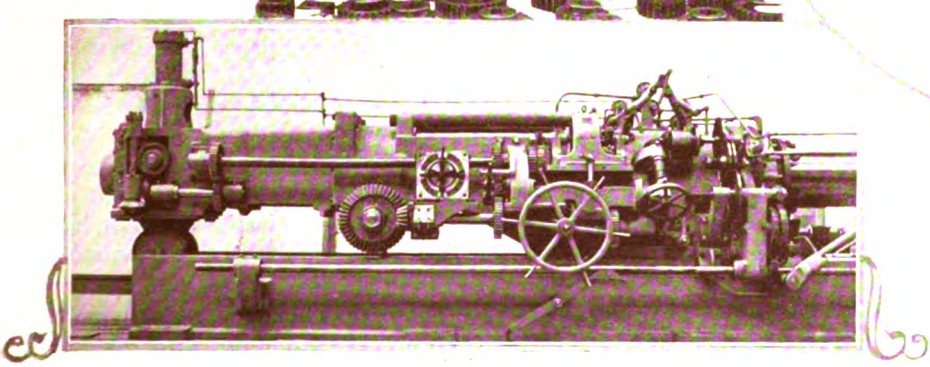


Fig. 3. The boring bars operate from both ends at once, and are fed hydraulically by means of huge tailstocks. The main castings of these tailstocks weigh over fifteen tons. Electric control regulates the hydraulic feed.

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They Handle a Half Million Invoices Annually

So the Ford Motor Company Designed a Uniform Invoice

By C. C. Cheadle
Ford Motor Company



The single uniform invoice held in the hand of the clerk at the left, covers as many billed items as do the seventeen miscellaneous invoices scattered over his desk.

SOMETHING like 500,000 invoices reach the Ford Motor Company annually; they come from all over the world, cover hundreds of distinctly different items, and—hardly any two of them are similar as to typographical arrangement. In the past, it has been necessary to treat each invoice as an individual proposition; particular information has been sought out with great effort, while frequently a dozen or more separate invoices have been handled in connection with a single billing. The time and energy expended in handling invoices grew—as the business of the company grew—to tremendous proportions. Finally, it was decided that this expenditure must be reduced, and a thorough and systematic study of the situation was begun under the direction of the purchasing department, to which all invoices go for checking and preservation.

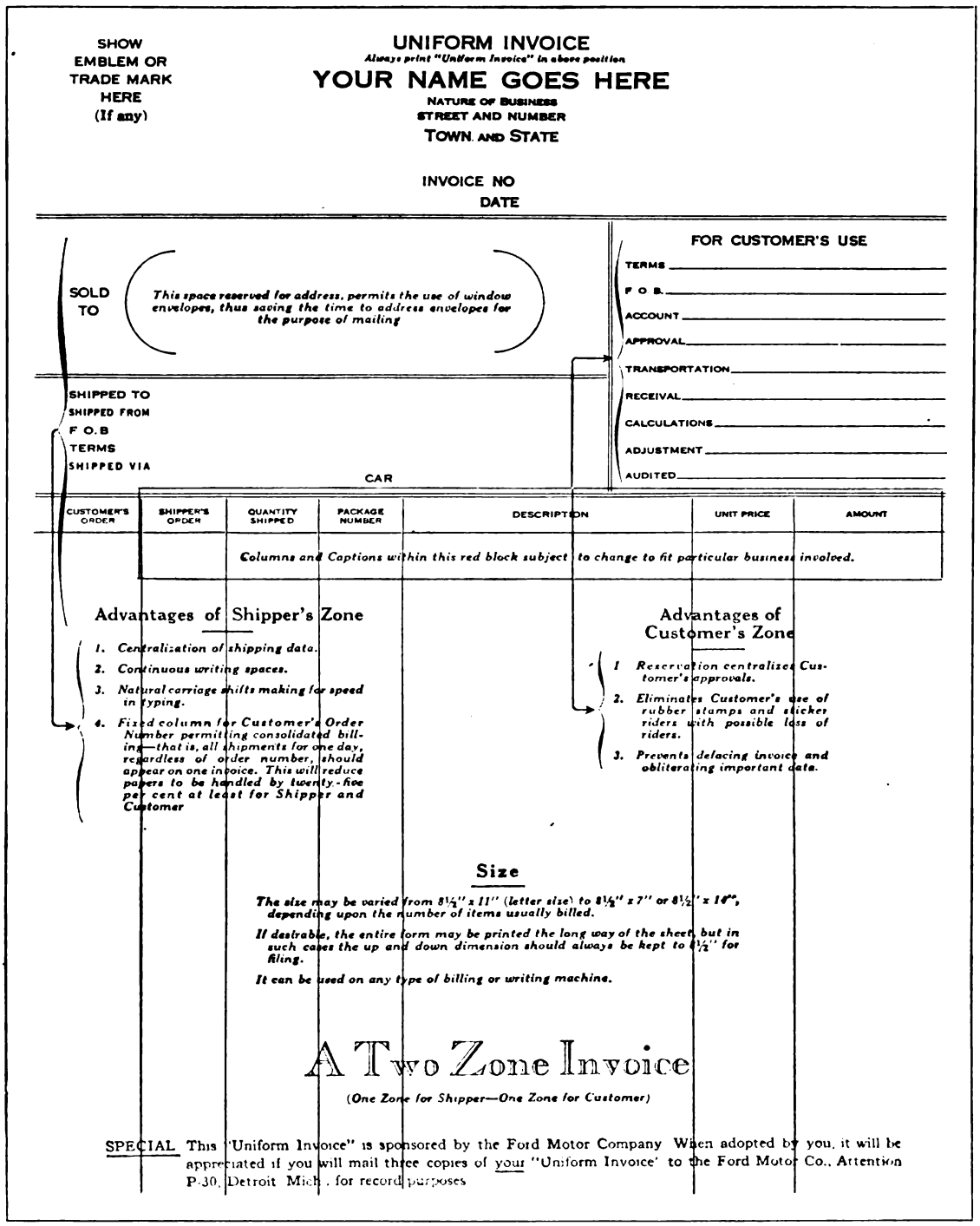
As a result of this investigation, begun more than two years ago, the uniform invoice was designed and is being offered to the commercial world. The Ford Motor Company believes that general use of this invoice would save millions of dollars annually for American business; that it would simplify the handling of invoices to a point where accuracy would result with much less supervision and checking; and that it would speed up commercial transactions immeasurably.

The accompanying reproduction of the uniform invoice shows the general idea around which it has been designed. Multiple or consolidated billing and simplicity of arrangement were the major objects to be attained.

Some concerns think that to adopt such a form would require a change of systems. This is not true. The plan is simply one of typographical arrangement of the basic elements required for every type of invoice, whether it be toothpicks or elephants you are selling. What you wish to convey to your customer is the fact that a shipment was made from a certain point to another point; that it was sold upon an agreed f. o. b. point with cash discount and payment terms and via routing designated; and that the charge has been made against certain purchase order or orders. Upon the regularity of appearance of these captions depends the value of the uniform invoice.

The plan has been successfully carried out in fanfold, multifold and pad forms, through hectograph and other duplicating systems. Some organizations find it highly profitable to issue at the time of writing customer's invoice, a stock requisition, packing slip, charge copy for the disbursement records, shipping department instructions, and many other clearances. Some have even gone to the extent of including the bill of lading. The

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Standardization is the word in industry today. However, the principles of standardization have, for the most part, been applied to manufacturing procedure. Standardization of office work has seemed to suggest tiresome routine. But standardization of office work means greater efficiency, less confusion, and less strain on the workers.

uniform invoice in no way interferes with these methods.

Invoices may seem small things, but when one considers the fact that the Ford Motor Company handles approximately 500,000 a year, they cease to be negligible, and the handling of them assumes large proportions. One advantage of the uniform invoice is forcibly brought out through the consolidated billing feature alone, and which reduced the total of invoices received last year by approximately 150,000. The saving involved in this reduction is in itself very much worth while. One company alone that formerly used anywhere from 2,500 to 3,000 invoices per month in invoicing us, reduced this figure to approximately 500 by using the uniform invoice. It is estimated that this single reduction, considering all detail that is involved in checking, has been worth the value of nine clerks.

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Sunshine, Cleanliness and Good Will as Manufacturing Assets

One of a Series of Pictorial Visits to Noted Plants

By John H. Van Deventer

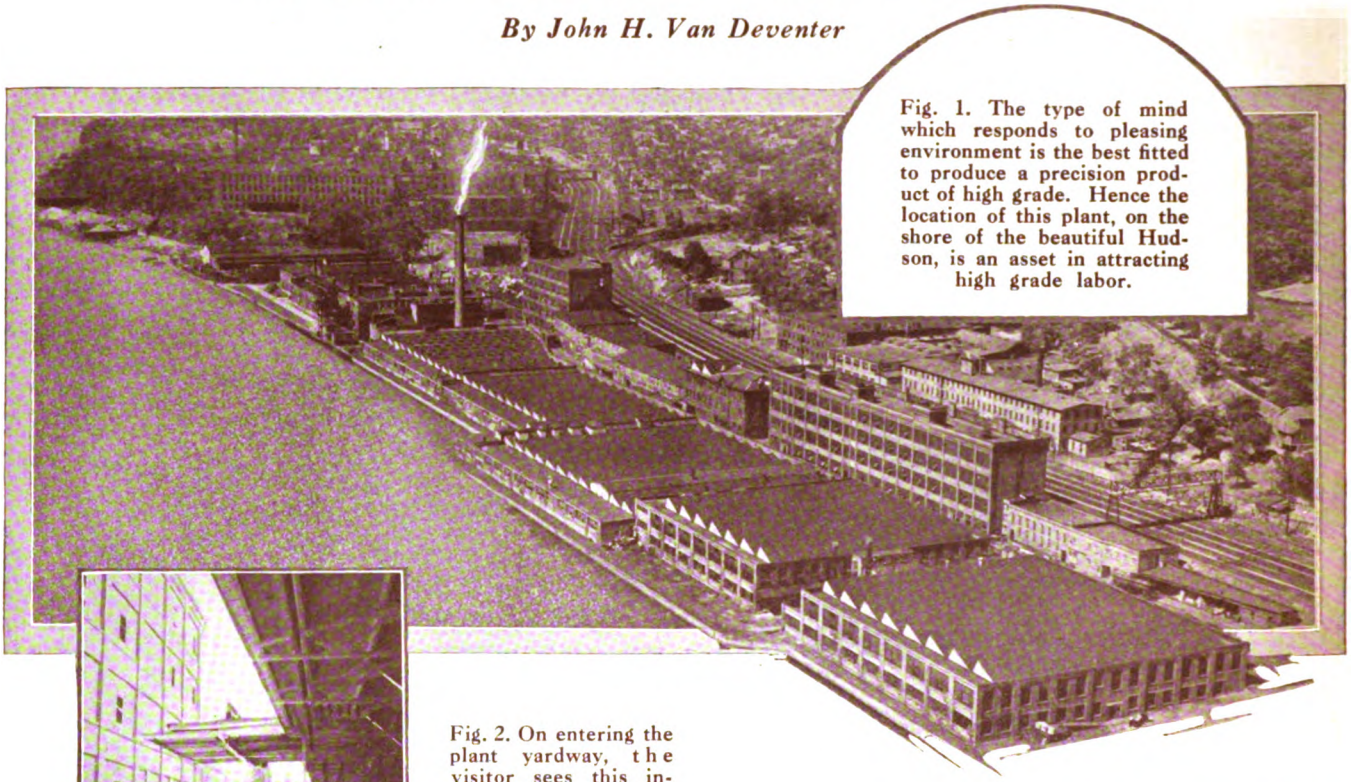


Fig. 1. The type of mind which responds to pleasing environment is the best fitted to produce a precision product of high grade. Hence the location of this plant, on the shore of the beautiful Hudson, is an asset in attracting high grade labor.



Fig. 2. On entering the plant yardway, the visitor sees this ingenious telescoping roof canopy. In rainy weather it extends out over the freight tracks, keeping the car loaders dry and comfortable.

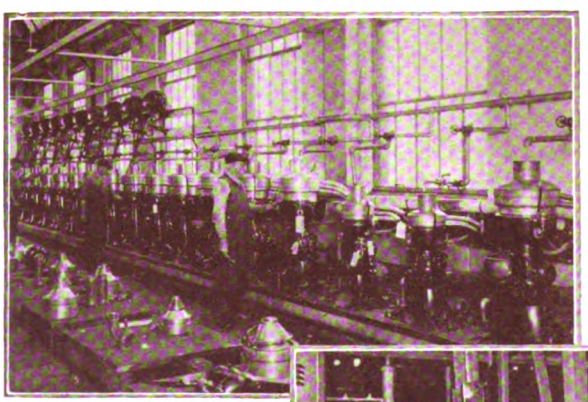


Fig. 3. It would be difficult to name a product that requires more accuracy in its manufacture than a high grade cream separator. The bowl must revolve many thousands of revolutions per minute with perfect balance. Accuracy in use must be maintained in spite of careless handling.

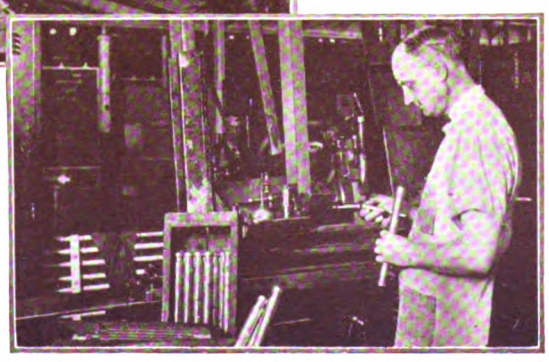


Fig. 8. At the right—This plant operates entirely on the metric system of measurement. These crank shafts are ground to a limit of one hundredth of a millimeter, which will give you an idea of the accuracy involved.

"VISIT as many worthwhile industrial plants as you can, if you want to be sure of keeping out of a rut." This was the advice given by a successful manufacturer to a young man who had just been promoted to a position of responsibility in his organization. And it is sound advice if one will follow it, for you cannot fail, in so doing, to find many fresh ideas and better ways of doing things.

Next best to a personal visit—which takes a great deal of time—is a pictorial visit which can be taken at your convenience, either at your desk or at home. It will be our pleasure to conduct you this month, through the works of the De Laval Separator Company, of Poughkeepsie, N. Y. Here you will find, in addition to the practical ideas that the photographs will reveal, if you study them, an object lesson in the use of sunshine, cleanliness and good will as real manufacturing assets.

The making of cream separators is a "ticklish" piece of work from the manufacturing standpoint, because of the enormous rotative speeds that are required of the apparatus. Hence accuracy is a primary requisite, and hence, in turn, the labor that is employed must be skilled and con-

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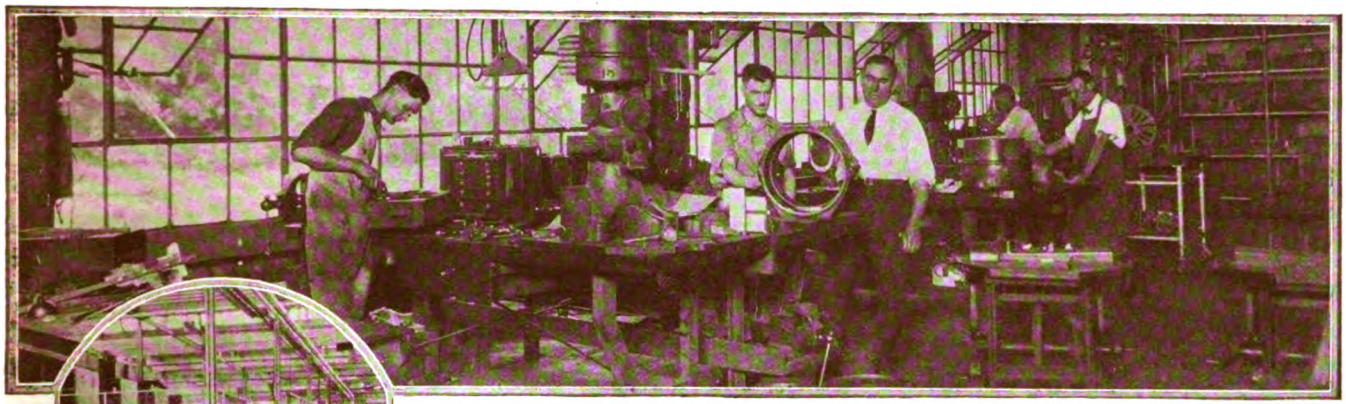


Fig. 5. The metal pattern department. Note the stationary and portable benches as well as the excellent lighting.





Fig. 6. Cleanliness is a watchword in the manufacturing departments of the DeLaval Separator Company. Floors are not merely swept, they are washed thoroughly and regularly. Cleanliness sets an example of care in making.

Fig. 7. Floor aisles are plainly marked with broad white lines. These aisles are part of the "transportation system" and are kept free from accumulation at all times.

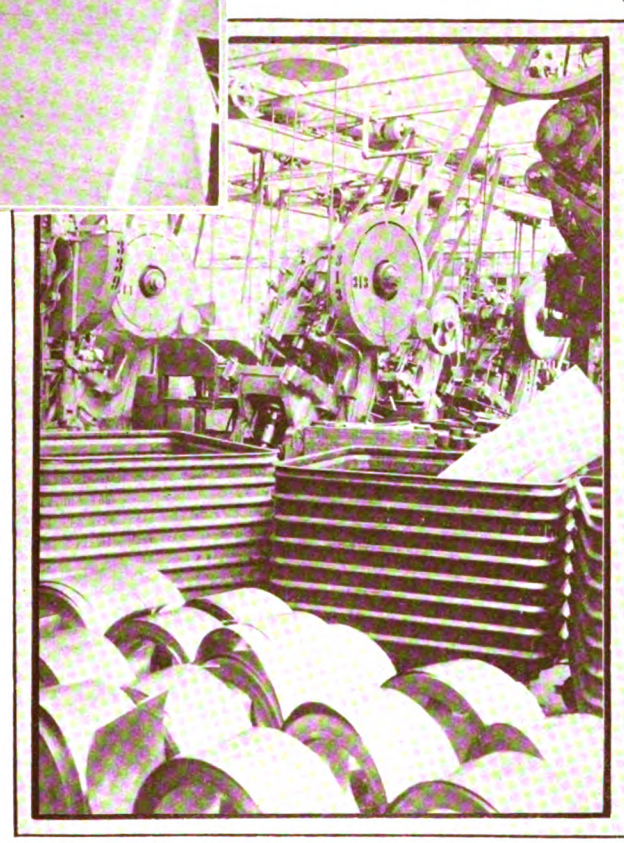


Fig. 8. In the stamping department, the presses are painted yellow. This increases the natural illumination of the room, and more light makes fewer accidents and better work.

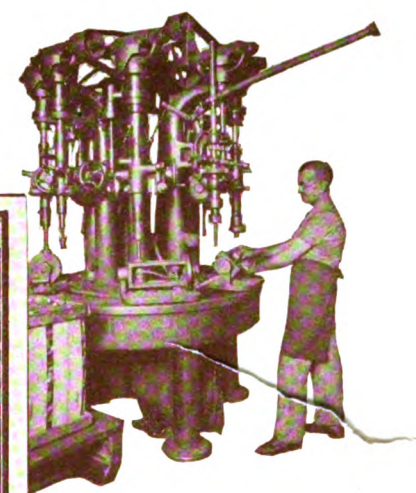


Fig. 9. Advantage is taken of the possibilities of multiple tooling wherever possible. Here the operator is boring crank arms on a station type machine.

tented. A discontented mind will not produce or maintain accuracy in work, any more than a diseased body can give a high output of physical labor.

The location and setting of this plant, directly on the shore of the beautiful Hudson, are such as to attract, instinctively, that class of labor which takes pleasure in pleasant surroundings. There is more in this than may appear at first thought, because the type of mind which responds to such environment is best suited to maintaining high ideals with regard to the product which it helps to make.

Carrying out this thought, you will find within the plant, an unusual insistence of cleanliness and neatness. The shop floors of manufacturing departments are not only swept, but scrubbed with soap and water. The thoughtless visitor might look upon this as an unnecessary expense, suitable perhaps in a plant making food products, but out of place in a machine shop. It is a policy, however, that has been found to pay in this plant, and many others "The product can be no better than the plant which makes it."

It is perceptible to the visitor that a large amount of goodwill has been developed within the plant. One may ask, "How can good will be perceptible to a visitor?" Easily enough if you know how to look for it. One of the products of good will in an industrial plant, are *smiles*. By observing the expressions of various employees when approached by their foremen or other factory executives, it is easy to detect the presence or absence of good will,

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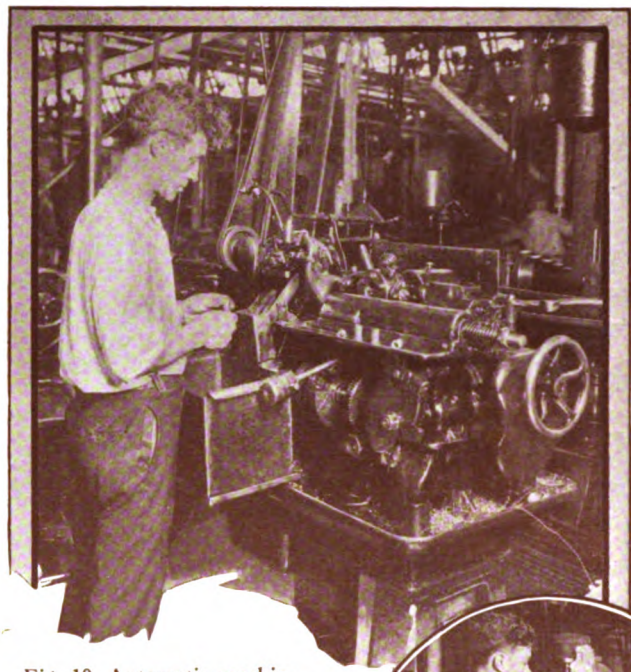


Fig. 10. Automatic machinery is employed wherever possible, of course. This automatic screw matchine is performing several operations required by a step nut.



Fig. 11. The toilet facilities at this plant are exceptionally clean and attractive. One can form a good opinion of the standards of management prevailing by an inspection of such places.

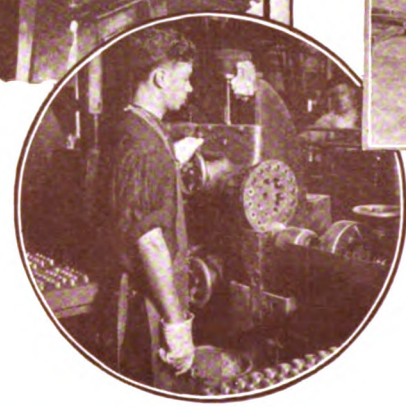




Fig. 12. In the annealing department, an ingenious attachment has been designed for loading and unloading the furnaces. It operates in conjunction with the overhead traveling crane.

Fig. 14. Heat treating is important in connection with making machinery of high rotative speed. Therefore we find these facilities well represented.



Fig. 13. An accurate and economical method of facing both ends of a bushing at the same time, and in fact, both ends of quite a number of them at once. Straddle milling is the secret.



Fig. 15. This is the sort of natural lighting that insures accurate work. And accuracy has to be the watchword in this die and tool department.

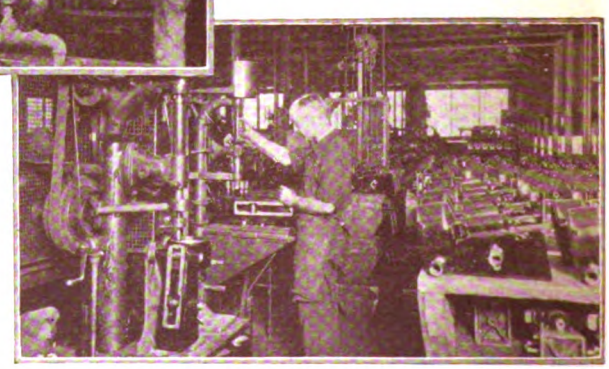


Fig. 16. By means of proper jigs, the ordinary drill press is converted into a machine of highest accuracy. The burden of precision is removed from the machine and the operator, and rests with the jig.

providing of course that you do not confine your observations to one or a few cases only. I do not know of ever having encountered more smiles per square foot or per hundred employees, or however else you might measure it, than in this plant. Certainly, that is an unmistakable indication of good will.

There are a number of good ideas for use in other plants to be had by a visit to this Poughkeepsie plant. However, this is a pictorial story, so you must look for them in the pictures.

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Lifting Industry's Burdens

Ingenious Applications of Electric Hoists

By F. C. Eibell

TO fully appreciate the wonderful growth in things electrical, and the application of electricity to industry, let us turn back the pages of time for a few years and see what the records show. Witness the fact that at the Centennial Exposition, held in Philadelphia in 1876, the entire electrical exhibit was contained in a space about 50 square feet. Seventeen years later, at the great Columbian Exposition, held in Chicago, the whole show was run by electric motors. This included an electrically operated elevated railroad that encircled the grounds within the enclosure, and a motor-driven moving sidewalk.

What had been scientific toys in 1876 were operating, industrial realities in 1893. But, even at that fairly recent date the knowledge of electrical engineering was so limited that what comprised a full college course in 1900 is only a high school course today. The scientific world has moved with rapid strides forward.

The improvement of the electric hoist has kept pace with the development of our knowledge of the application of electricity to industry. From the first crude contrivance—a spur geared block hooked up to a small motor—there has emerged a well designed, complete unit, built to meet the exacting demands of modern industry. Strength, compactness, safety, adaptability and speed are all combined in this electrical lifting and lowering device. Breakdowns are infrequent, even in hoists that are called on to go into operation 30,000 times a day. Overloads, although not recommended by the manufacturers, are often forced on these hoists. Today the electric

(*Continued on page* 29)



Fig. 1. Above. Rather an unusual job for an electric hoist. The contractor is using it to lift masonry blocks and columns

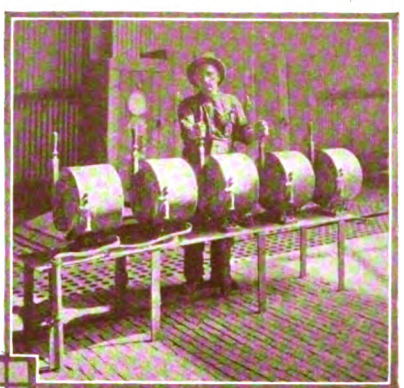


Fig. 2. Above. Remote control for five hoists that are located high up in the rafters of a heat treating plant, and which operate furnace doors

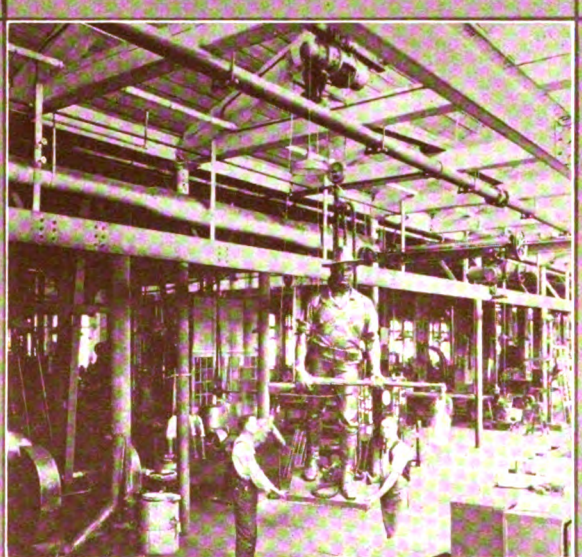


Fig. 4. Below. Ash handling in a power plant by means of monorail and electric hoist. Note the rigging for handling four cans at once.

Fig. 5. Below. A novel rigging for lifting rolls of paper into a printing process. Such loads are lifted at the rate of seventeen feet per minute.

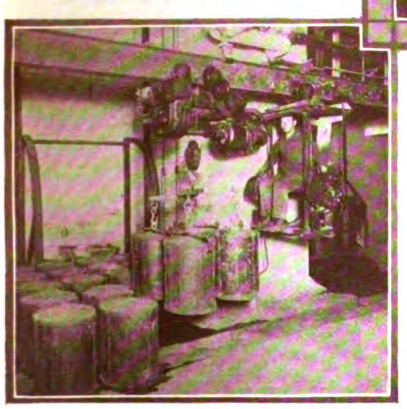
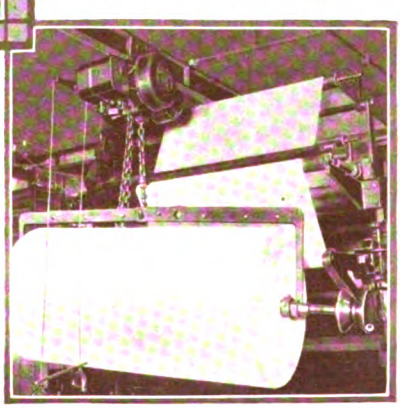


Fig. 3. Above. Not a giant in flesh and blood, but a statue in bronze, is the burden of the hoist shown in this picture.



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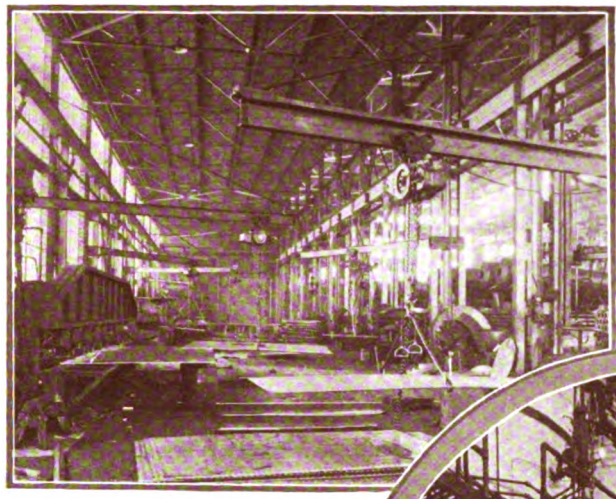


Fig. 6. Note the ten foot slings shown above, for lifting and moving sheet metal. This steel works finds such devices of quick utility.

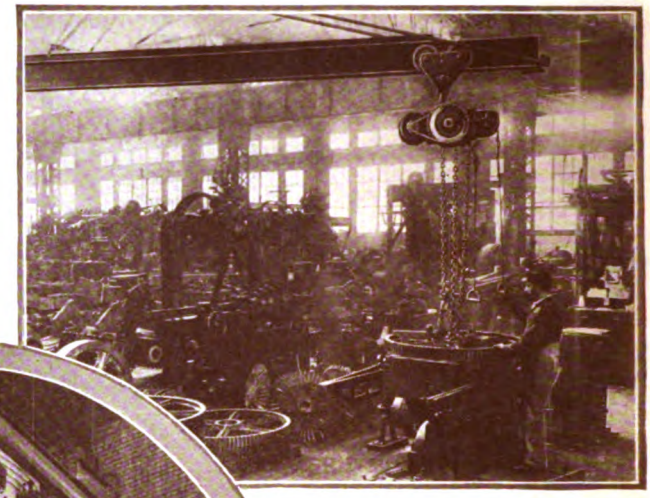


Fig. 7. Another adaptation in connection with a jib crane is shown above. Quick and accurate lifting is essential in machine shops.

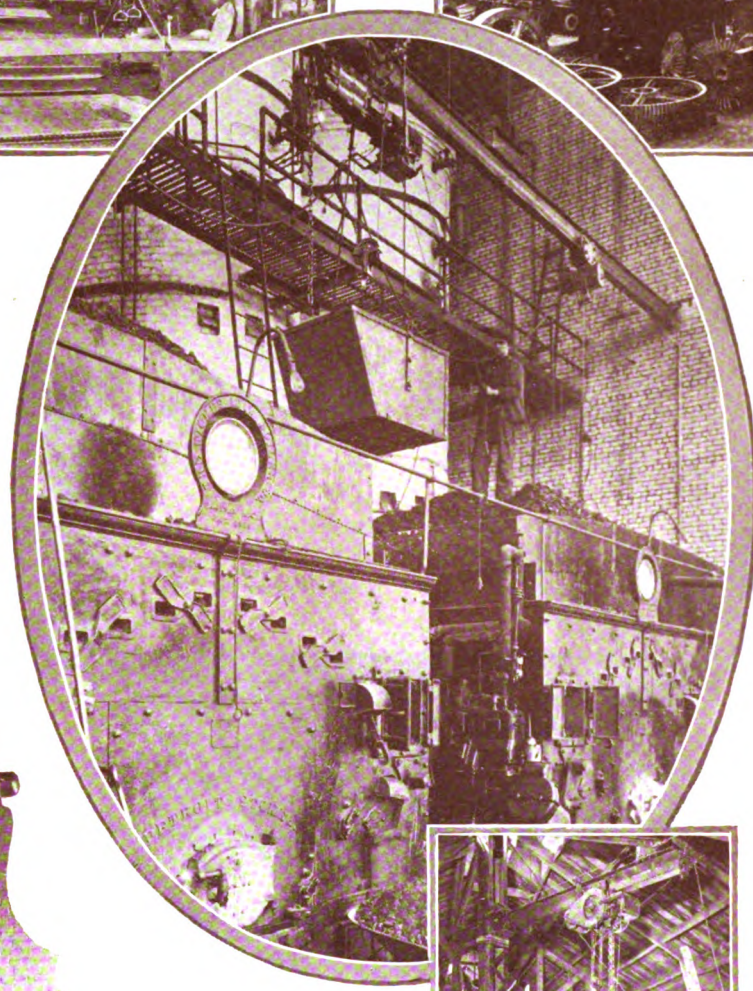


Fig. 8. In oval. This shows the application of monorail and electric hoist to the duty of coal and ash conveying in a power plant.

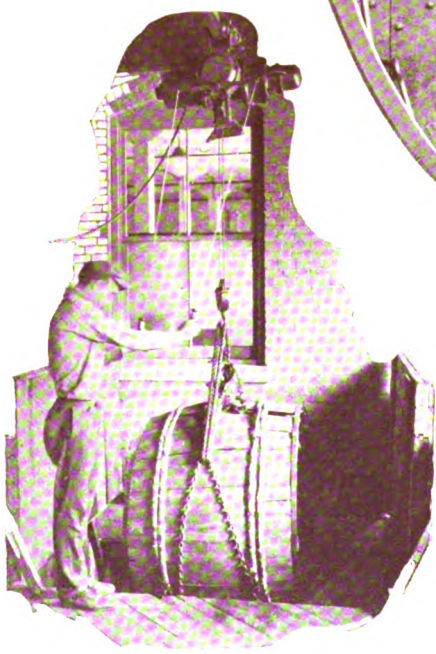


Fig. 9. Above. Here the electric hoist is assuming some of the duties of an elevator, for hoisting and lowering from one floor to another.



Fig. 10. For lifting long bundles of chains, the special sling shown at the right has been devised.

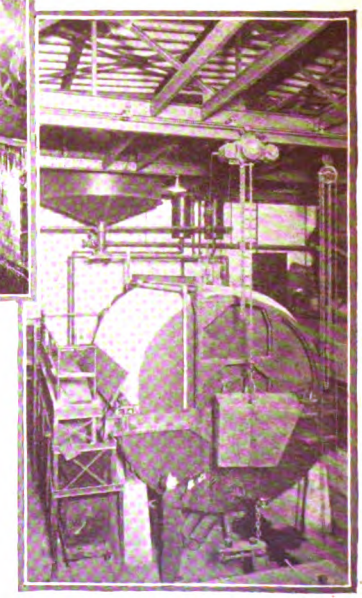


Fig. 11. At right. An unusual application is that shown here, in the handling of refuse in a disposal plant.

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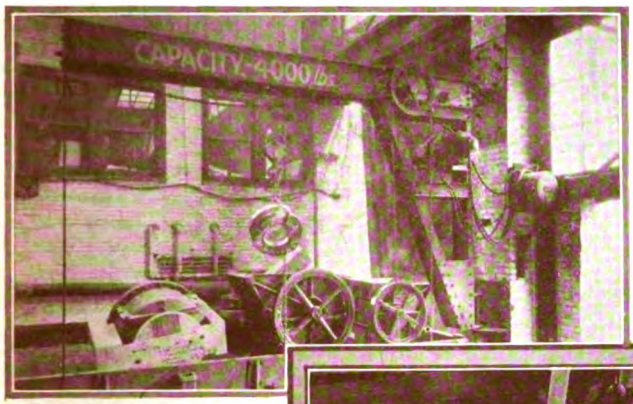


Fig. 12. Above. Here is an electric hoist whose duty is the loading and unloading of freight cars. It works with a jib crane.

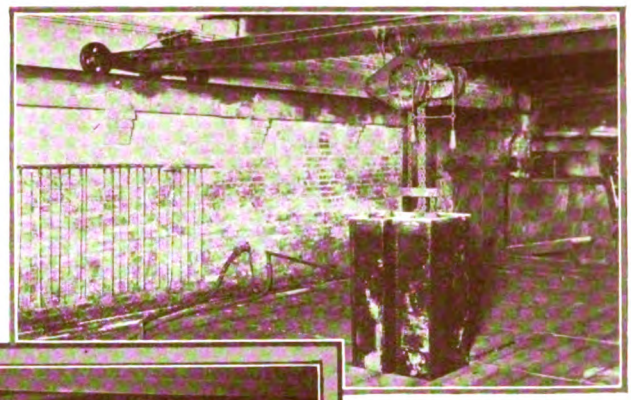


Fig. 13. Above. Slings are provided, in this ice plant, so that either one or two "cans" can be pulled at one time.



Fig. 14. Above. One of the first uses of electric hoists was in foundries. Today all foundrymen appreciate the utility of these conveniences.



Fig. 15. Above. Remote control for this electric hoist makes it easy to feed heavy steel plates to the riveter.

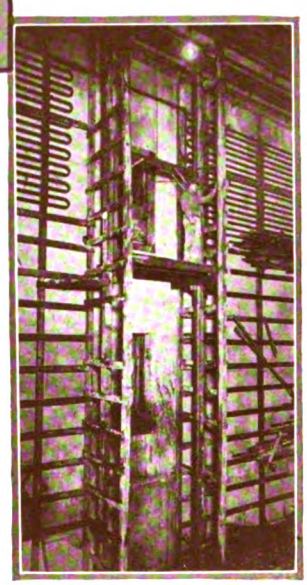
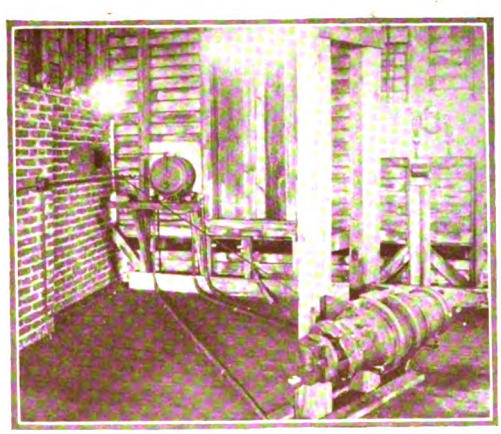


Fig. 16. Above. A construction job in which an electric hoist operates a platform elevator. The hoist itself is shown in the picture at the left.



(*Continued from page 27*)

hoist is one of our most widely used pieces of electrical equipment, and its full value has not been realized.

In a recent analysis made of the sources of business from which electric hoist manufacturers obtain their orders, it was shown that no less than 73 separate and distinct classes of users have bought from 1 to 966 of these lifting and lowering devices during a two-year period. These have gone into nearly every industry, to lift from the shoulders of man burdens which he has borne since the dawn of history. This industrial acceptance is, indeed, remarkable when we realize that the electric hoist has been developed during a period of only about 25 years.

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The Essentials of Textile Machine Lubrication

Reducing the Prevalence of the "Oil Spot"

By Allen F. Brewer

IN the textile industry the necessity for careful attention to lubrication is of extreme importance due to the more or less perishable nature of the yarns and fabrics being handled. The various processes of preparing raw wool, cotton and silk for weaving into fabrics are intricate and diversified. In all, whether they involve carding, combing, twisting or spinning, etc., there is ever a possibility of the product under treatment being stained to a more or less extent by the use of unsuitable or contaminated lubricants, or the careless application of these latter.

Mineral oils, or greases in which these latter predominate, will tend to produce oil stains on practically any type of yarn or fabric with which they come in contact. To a certain extent, dependent upon the purity of the oil and the degree of its refinement, stains of this nature can be emulsified by suitable soaps or fatty matter to bring about more or less complete removal under subsequent washing. The fact, however, that oil stains will very frequently have a tendency to reappear, especially in white or light colored fabrics renders it decidedly imperative that their occurrence be minimized. This care, of course, will also reduce the expense and time that would otherwise have to be given to washing and removal of oil spots.

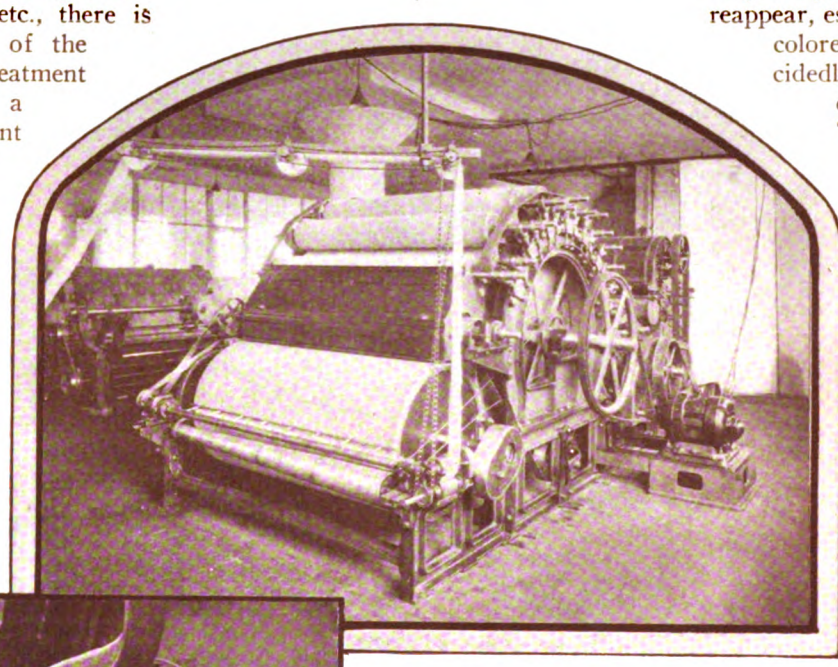


Fig. 1. A woolen breaker card showing the delivery of the roving or sliver at the delivery end. Note exposed driving chains and the numerous roll bearings which require careful lubrication.

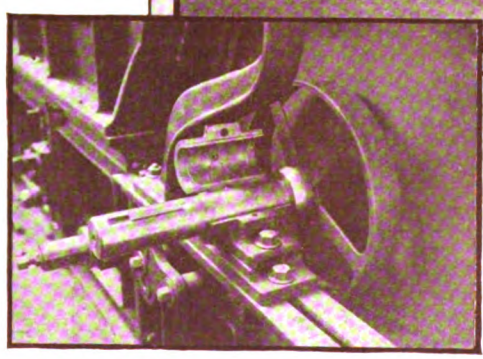


Fig. 2. Details of a doffer bearing showing oil grooves and general bearing construction.

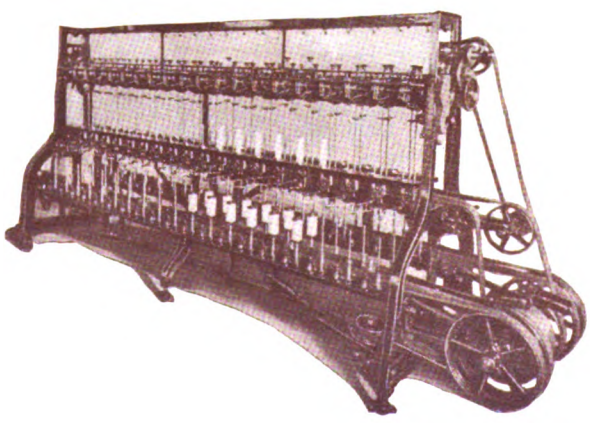


Fig. 3. A silk spinning, doubling and twisting frame. The spindles are belt driven being self-oiled and mounted in automatic swinging holders.

There are, of course, certain processes of treatment which, dependent on the type of yarn being handled and the extent to which it is finished, may not involve as serious consequences as others. In the preparation and drawing of wool for example, at certain stages, oils such as lard, neatsfoot, olive rapeseed or mineral products are used to a more or less extent to soften the fibres and render them more easily straightened and combed. Subsequently these conditioning or wool oils are removed in the bleaching, dyeing, fulling or shrinking processes.

In the preparation of both cotton and wool for drawing, twisting and spinning the first process which requires care in the lubrication of the machin-

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ery involved is that of carding. Essentially carding is the opening out of the fibres to render them as nearly parallel as possible. This is brought about by passing the product between rollers or cylinders whose surfaces are fitted with numerous small wire ends, resembling a brush in appearance.

The carding machine presents perhaps one of the outstanding lubricating problems in textile mill operation, by reason of the accuracy of setting which must be maintained between the comb and doffer cylinder. The action of this comb is vibratory, being brought about by a suitable eccentric mechanism or cam. This latter usually is designed to operate in a bath of lubricant. In order to maintain the requisite clearance as mentioned above, the temperature of this lubricant must vary as little as possible. A certain amount of churning will, of course, take place in the comb box, which will tend to give rise to abnormal internal or molecular friction within the lubricant. It can, therefore, be appreciated that too heavy or viscous a product may be a detriment. As a result a light grease or non-fluid oil is preferred by many textile operators, due to the fact that the relatively low viscosity oil used therein will lubricate with the least fluctuation in frictional temperature, while the soap content will prevent undue splashing. This latter must be prevented for the reason that contamination of the leather card clothing with mineral oil will result in more or less deterioration and necessitate ultimate replacement.

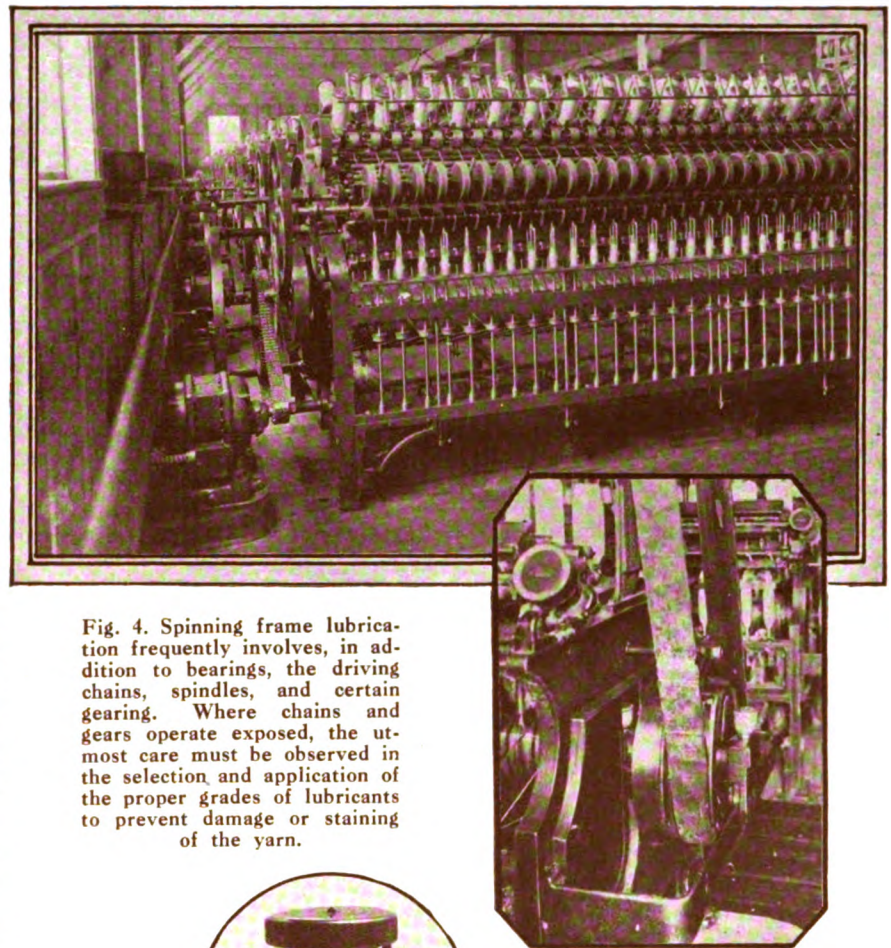


Fig. 4. Spinning frame lubrication frequently involves, in addition to bearings, the driving chains, spindles, and certain gearing. Where chains and gears operate exposed, the utmost care must be observed in the selection and application of the proper grades of lubricants to prevent damage or staining of the yarn.

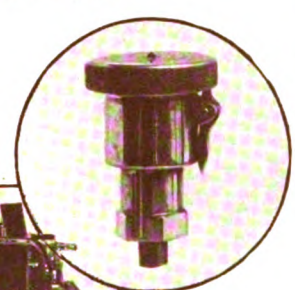


Fig. 5. Front-end view of a spinning frame showing pin type grease cups installed for bearing lubrication, and as a means of protecting the yarn against thrown or dripped lubricants.

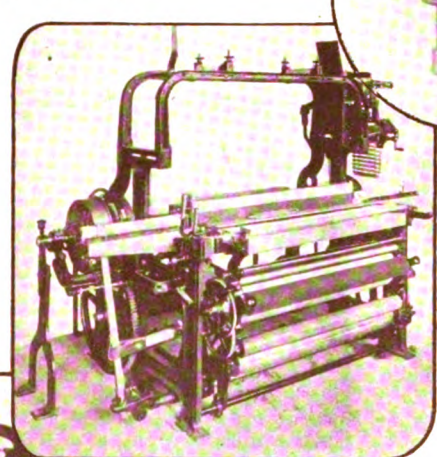


Fig. 6. In weaving, the yarns and fabrics are of course in a more or less finished state, and require even more care against oil spots than in spinning. On this loom there is no overhead jacquard machine to drip oils, yet the fact that bearings may often throw oil or grease requires their most careful lubrication. Note the pressure grease cups installed, and in magnified view above.

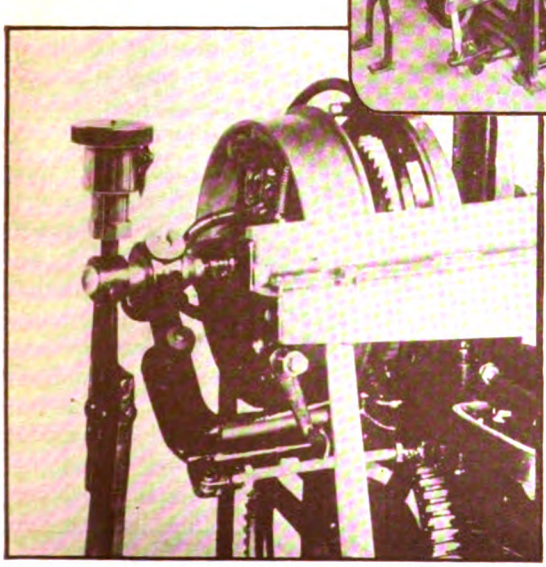


Fig. 7. Close up view of a spring actuated pressure grease cup on a loom bearing, which is designed to function automatically over the period of operation, or motion between the adjacent shaft and bearing, and the endurance of its charge of grease. A suitable indicator on certain of such lubricators tells us when re-charging is necessary.

When cotton and wool reach the comber, and these as well as silk are passed to the drawing, twisting and spinning machines for the purpose of forming the yarn or thread, the product is in more or less intimate proximity with the numerous roll bearings, cams, etc., which require lubrication. Raw textile products at these stages are in a condition where oil spotting may develop serious difficulties, showing up in the ultimate weave with discouraging prominence. In consequence the utmost care must be observed, not only in the selection of as nearly colorless oils and greases as possible, but likewise in their careful and sparing application to the wearing parts. As a general rule automatic lubrication is not as yet in extensive usage on textile machinery. Perhaps the most practicable device is the pin type of grease cup, yet it is not applicable to any but larger external bearings. The oil can is, therefore, still the recourse.

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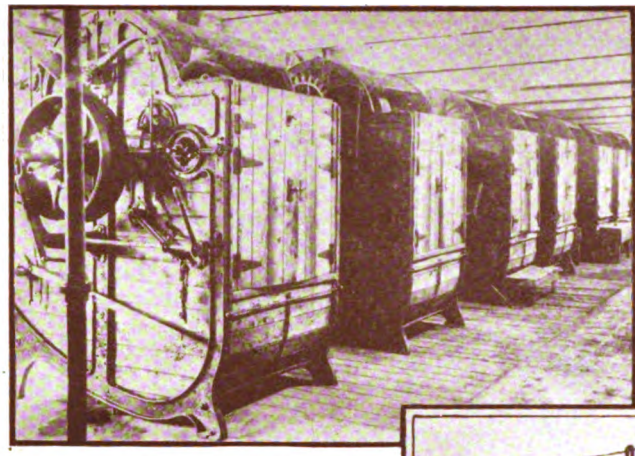


Fig. 8. The fulling or shrinking machine as used extensively for woolens and worsteds to give additional body to the goods, is also of interest from a lubrication viewpoint. In this machine more or less scouring and sluicing in soap solutions takes place which will frequently remove certain oil spots or grease stains which may not be too extensive or dark.

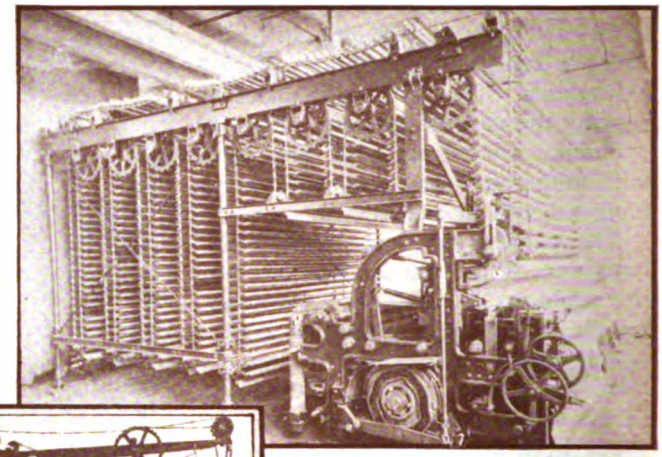


Fig. 9. The intricacy of the modern carpet loom is well brought out in the above illustration. Here again is a condition of exposed parts or wearing elements likely to drip or throw lubricants. But the modern carpet must be protected against oil stains. Operators should, therefore, be instructed to lubricate sparingly even though more frequently, and keep their looms clean.

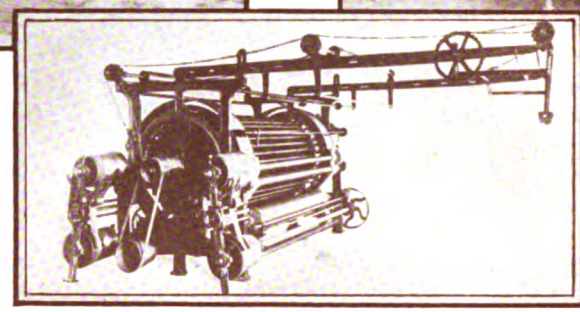


Fig. 10. Another essential machine especially in the finishing of woolens and worsteds is the napper, or device for opening or brushing up the fibres to form a nap. By subsequent cropping or shearing of part of this nap, the weave can be made to stand out in more or less prominence. The napping machine likewise must be very carefully lubricated, for the goods if stained at this stage might entail much trouble and loss.

In the use of an oil can there is of course always a tendency, especially on the part of careless operators to over-lubricate, with the idea that they will thereby save themselves work. The fact of the matter is, however, that this procedure will as a rule simply make work, not only in regard to correction of oil spots, but also in the cleaning of machines.

In the operation of drawing, roving, twisting and spinning frames the essential lubrication problem is involved in the oiling of the spindles and variable speed rolls. In such equipment relatively high speeds in the neighborhood of several thousand revolutions per minute are usual. Therefore not only are we confronted with the necessity of reducing friction and power losses to a minimum, but also the prevention of splashing of lubricants. In drawing frames another problem, similar to that involved in the carding machine is prevalent, i. e., the possibility of the leather coverings of the rolls becoming oil-soaked and the yarn stained. In operation there will be more or less tendency of the lubricant creeping from the roll bearings, therefore it must possess sufficient viscosity to insure against this. Soap-thickened oils of the nature of liquid greases have proven best capable of meeting the requirements most satisfactorily.

Relative to spindle lubrication, it is safe to say that this is frequently regarded as one of the most important factors in textile mill machine maintenance. The high speeds involved require that a relatively light viscosity oil be used in order to reduce frictional "drag" as much as possible. This latter if abnormal may easily impose excessive tension on the yarn and hamper spinning. In determining upon the suitability of a spindle oil the temperature difference, which exists between the surrounding atmosphere and the spindles, is frequently taken as a guide. It is practically impossible to attain the ideal of reducing this difference to zero, but by judicious selection of spindle oils it can be kept within reasonable limits. In other words, if oils of a viscosity ranging from 60 to 150 seconds Saybolt at 100° F., according to the types of spindles involved, are used, reasonably satisfactory service can be expected. On the other hand, if higher viscosity oils are used it is fair to expect that the amount of internal friction developed will be proportionally greater, with corresponding increases in

(*Continued on page* 34)

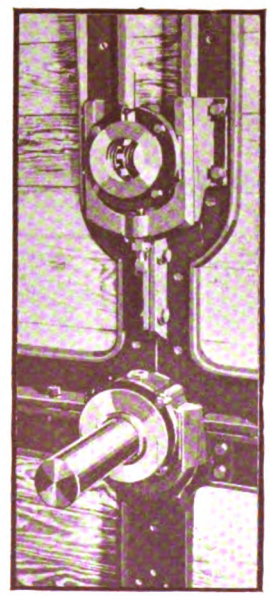


Fig. 11. Close-up view of an installation of flexible roller bearings on the shaft mountings of a textile washing machine. Special advantages of such bearings are their tightness, the relative infrequency of re-lubrication necessary, and the protection afforded to both bearings and fabric.

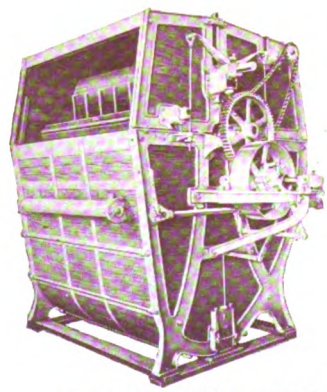
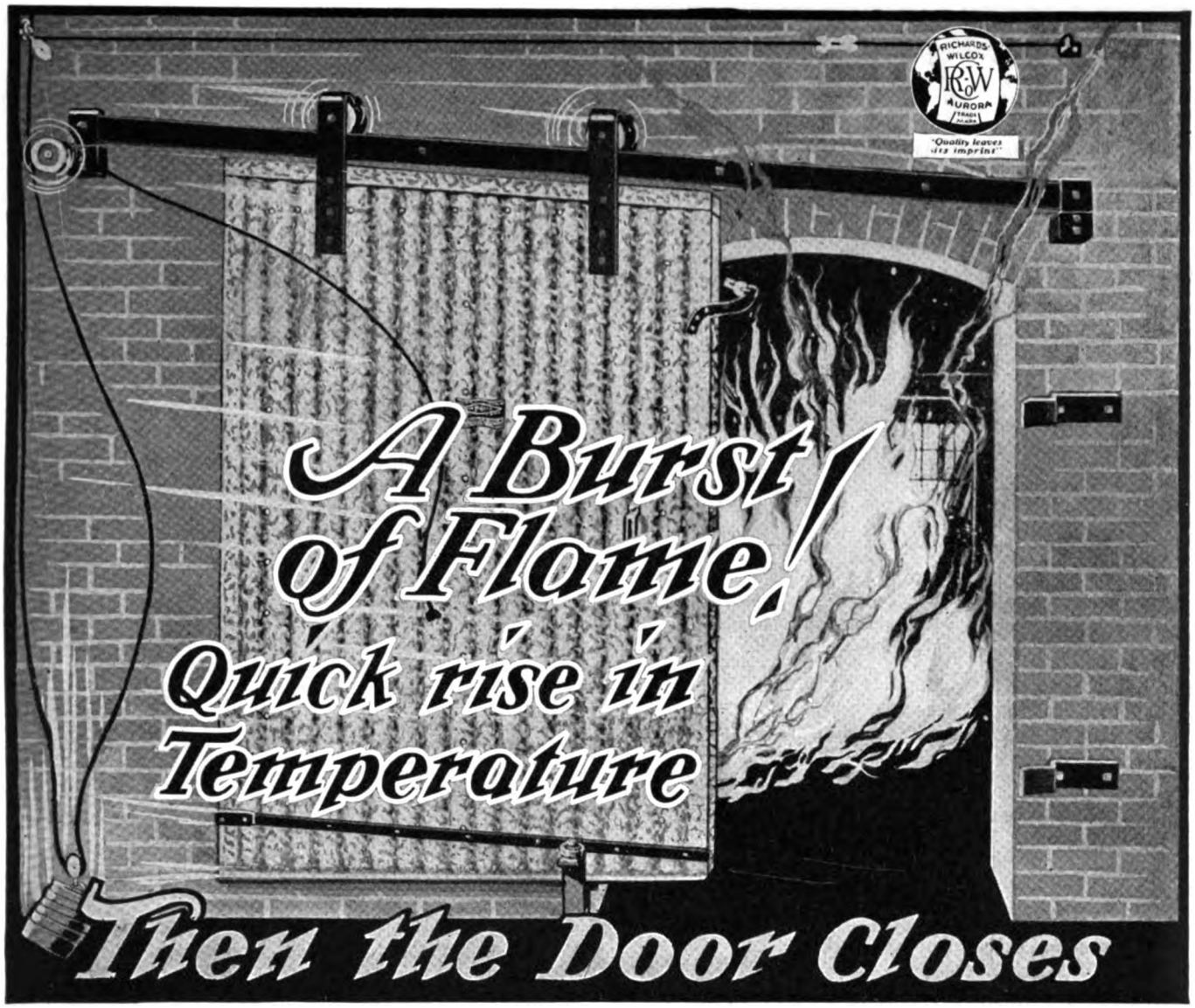


Fig. 12. Textile washing machines as indicated above, for example, have proven adaptable to roller bearing installations on certain of their roll or shaft bearings. Thereby is more positive lubrication assured, as well as protection of the bearing from washing fluids, steam, etc.

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Tractors and Trailers

(*Continued from page 32*)

yarn tension and power consumption.

With the spinning of the yarn it is then ready for weaving into silk, cotton, woolen or worsted fabrics according to its nature. As the process of fabrication proceeds towards completion, quite naturally does the product or fabric become more fragile or spoilable, and therefore requiring more protection. In the weaving department the problem of lubrication is essentially that of protecting both the wearing elements from undue friction and wear, and the yarn and fabrics from oil spotting. The loom is one of the most intricate of textile machinery in appearance. On the other hand, the lubricating requirements of its various wearing parts are relatively simple. For the most part plain bearings will be involved with certain accessory driving chains and gear equipment. Many of these wearing elements will operate exposed, with but little or no provision against throwing of lubricants. The utmost care must therefore be observed in their application. In many mills loom lubrication will be an oil can job. Operators must consequently be impressed with the fragile nature of the textiles being worked on and not allowed to squirt oil around in a haphazard manner.

Especially will this apply to overhead jacquard mechanisms which serve to bring about the patterns in weaving. The harness connections or cords involved are fragile and subject to deterioration and breakage if contaminated with lubricating oils or greases, therefore, the utmost care must be observed in the lubrication of overhead wearing elements. Oil should never be poured or squirted recklessly over such parts as the cylinder hammers, etc., for a certain amount will be bound to drip to the harness or even on to the warp or woven fabric below. It is for this reason that oil pans are installed beneath so many overhead jacquard machines in modern textile mills. But even drip pans are not always a protection. Therefore stainless oils or light greases should be used wherever practicable. The added expense involved due to their higher price is certainly a fair rate of insurance to pay for the protection received and the feasibility of removing oil stains satisfactorily if such do occur.

Elsewhere in the average textile mill, lubricating problems will be essentially akin to those typical ones discussed above. In finishing machinery a certain amount of heat may be met with, as on the tentering or stretching frame, or in pressing. Likewise water or soap solutions may be encountered in the fulling or shrinking of woven fabrics. These can readily be met by the use of oils or greases of suitable viscosity or adhesive characteristics on parts adjacent to heat or fluids. The same holds true in the dye house. Above all our problem is to protect the fabrics from staining and every piece of textile equipment should be lubricated with this object in view. On the other hand, no wearing element should be neglected. There is a happy medium, and the careful selection of proper oils and greases, and their cautious and judicious application will readily enable the attainment of efficient operation with a minimum of spoilage and upkeep costs.

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Six Steel Tanks Take New Positions

A Big Job of Industrial Moving

By George F. Paul

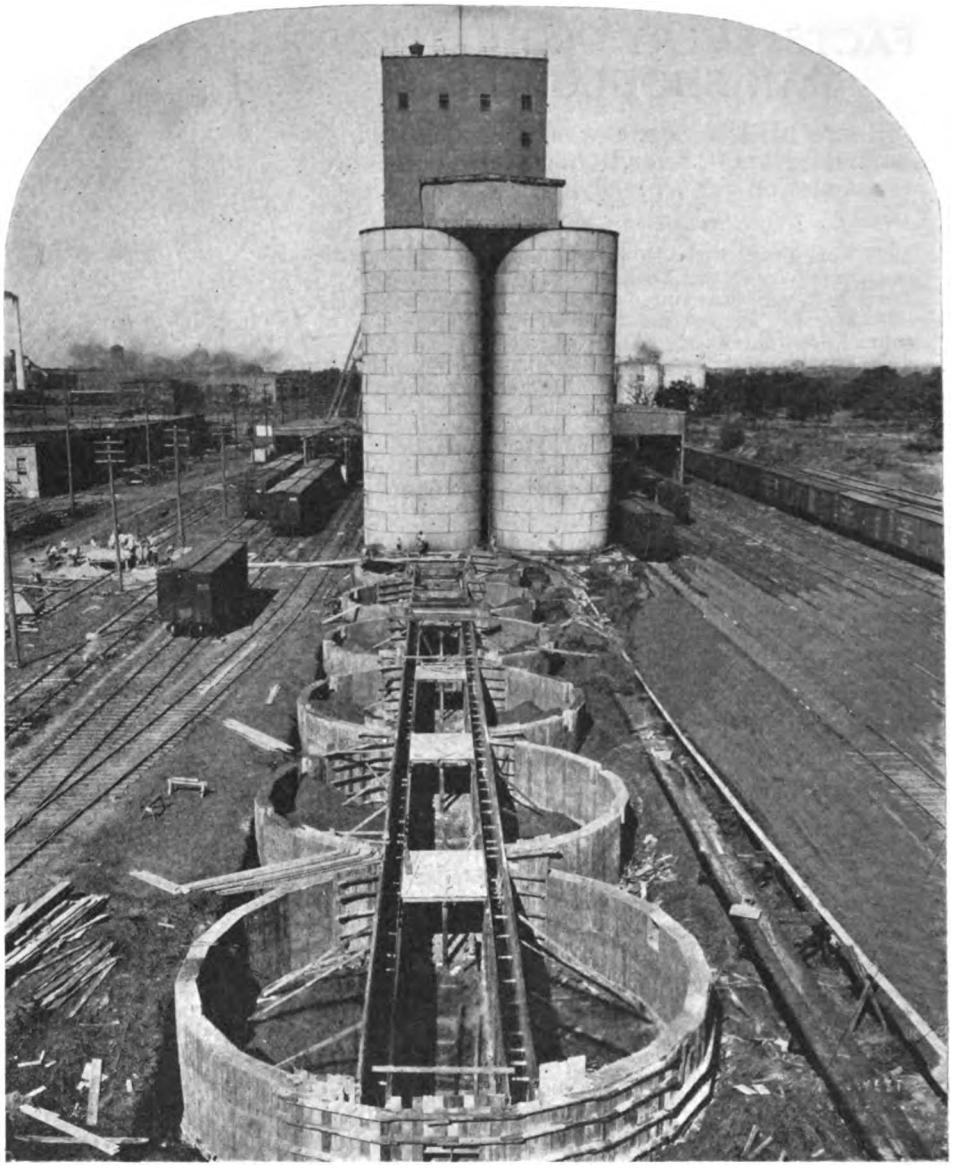


Fig. 1. Here are the new foundations ready to receive the six tanks, two of which are shown in the right background.

SIX huge grain tanks that were used for storage purposes at a feed mill in Minneapolis were left high and dry and very much alone when fire destroyed the feed mill. As these tanks were in perfectly good condition, it was decided to move them about three blocks to another site near a large concrete workhouse belonging to a grain company that was closely affiliated. Careful consideration was given to the many features entering into the proposed transplanting of the six tanks.

Several weeks were required to construct the new foundations. The job of preparing the tanks for their trip was made less difficult by the fact that the tanks were of steel construction and that, when they were built in 1905, they were intended to be merely temporary property; accordingly they were not erected on concrete foundations but rested on a sand fill.

Each tank measured 40 feet in diameter and was 50 feet high, having a weight of 55 tons. The tanks were loaded on three sets of moving trucks so as to give the tank a three-point bearing where loaded on the timber for moving same. There was no damage to the tanks whatsoever when they were placed on their new foundations. The last tank was brought upon the foundation by cribbing up with timber for 11 feet as the ground level at that point is 11 feet below the top of the foundation. These tanks were moved by capstan. The tanks have a combined capacity of 300,000 bushels.

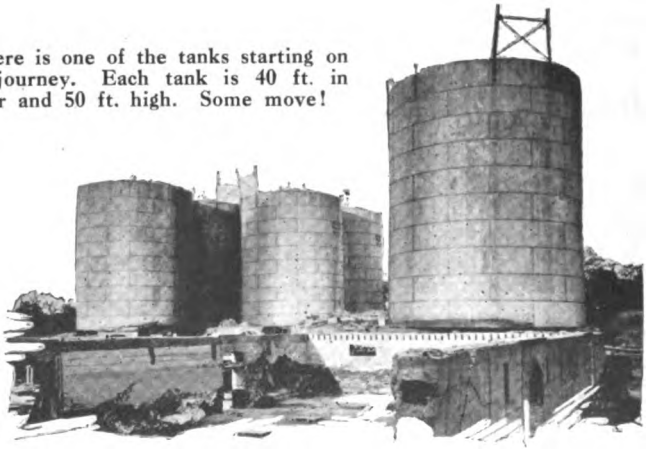
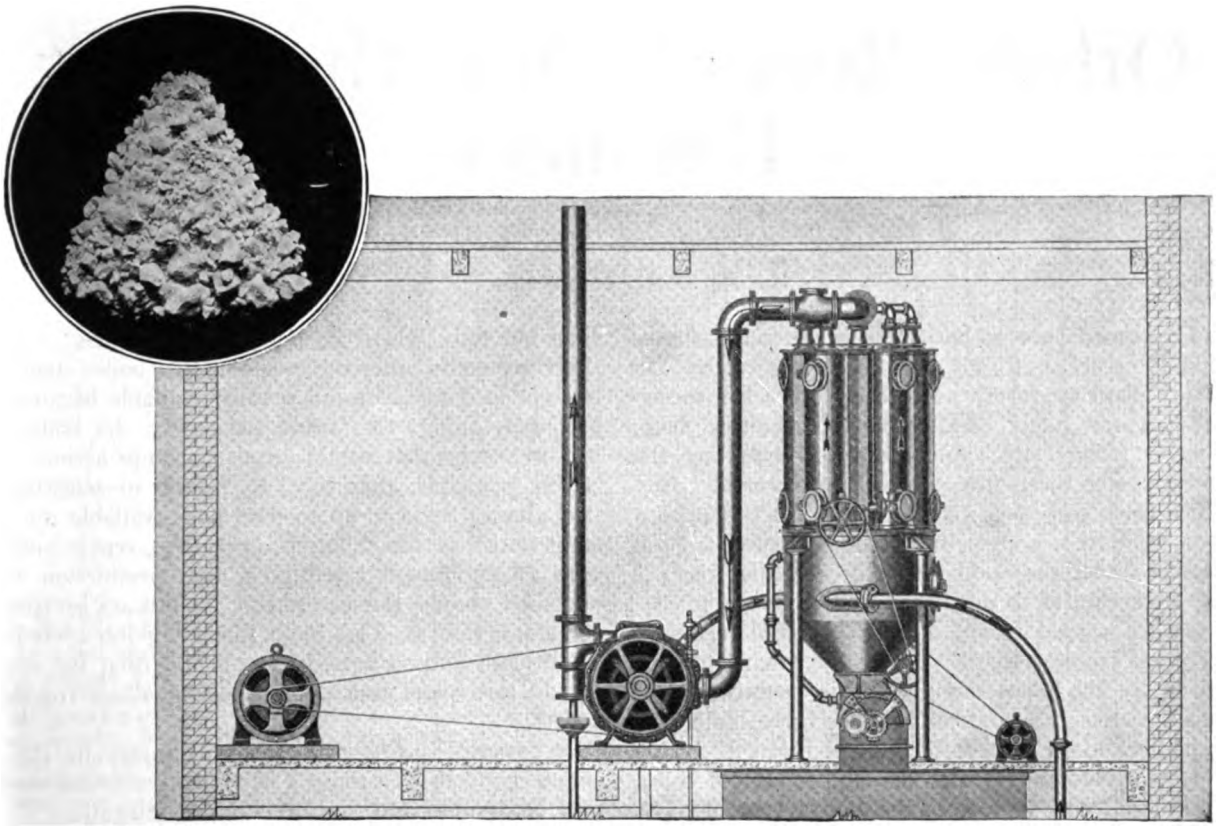


Fig. 2. Here is one of the tanks starting on its long journey. Each tank is 40 ft. in diameter and 50 ft. high. Some move!

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Office Records for the Plant Engineer

They Cut Loss of Time in Breakdowns

By C. C. Hermann

SOME records are essential, some are superfluous and some are used only once in a great while. Yet many plant engineers make their office life miserable and pay out many good dollars for clerical help, which never brings any visible returns, compiling the data and keeping these three classes of records. Any good office clerk can keep a record, it doesn't require a C.P.A. to compile a record, but it does require a good executive to direct the compilation of essential records and a better executive to use the records thus compiled.

The test of a good record and an essential record is the usefulness of the record. Generally when a record is required by the plant engineer it is required on a moment's notice. The tubes of number three boiler are leaking badly and to close it down will mean a serious handicap to production. What size and length of tubes are required and who was given the contract for the last tube job, what was the price paid and how promptly did they give service? These are some of the things that the plant engineer would want to know in a hurry. This is also one of the things that may happen almost any time but only when the boiler is in service. Likewise there are many other things about that boiler that should be kept in data form and readily available because there are many things that could happen to the boiler when it is in service that would require prompt action.

The principle, therefore, to follow in selecting data that should be kept up to date and available on an instant notice is: Installation, operating, repair and labor data on equipment essential in that production will be curtailed should the equipment go out of service even for a few hours. This looks like a big job even for the small plant and so it is, in fact so big that the engineer should not spend much time looking about for data to collect.

In general, the records found necessary by the plant engineer, or at least those I have always found essential, may be divided into the following classification.

First. Permanent statistics. These records should be made up at the time the equipment is installed and should contain such information as available at that time. A complete record should be made of each piece of equip-

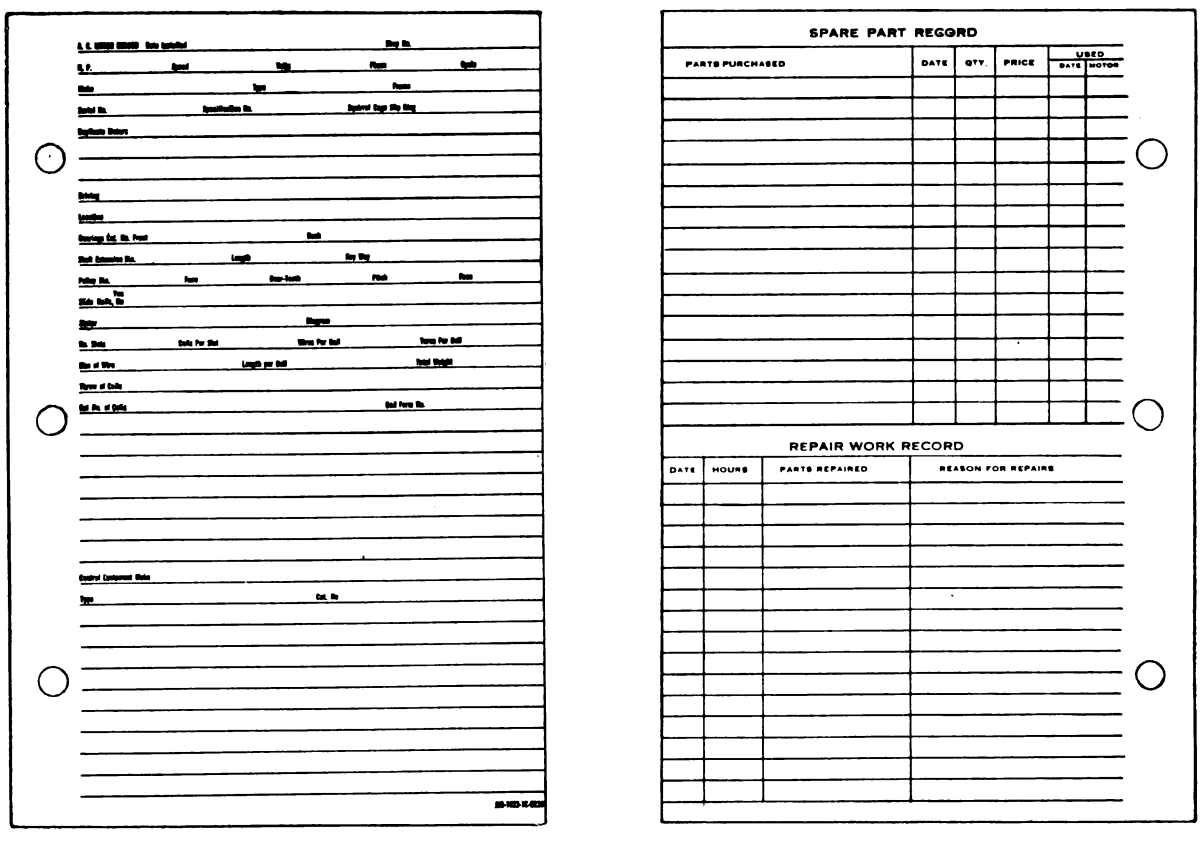
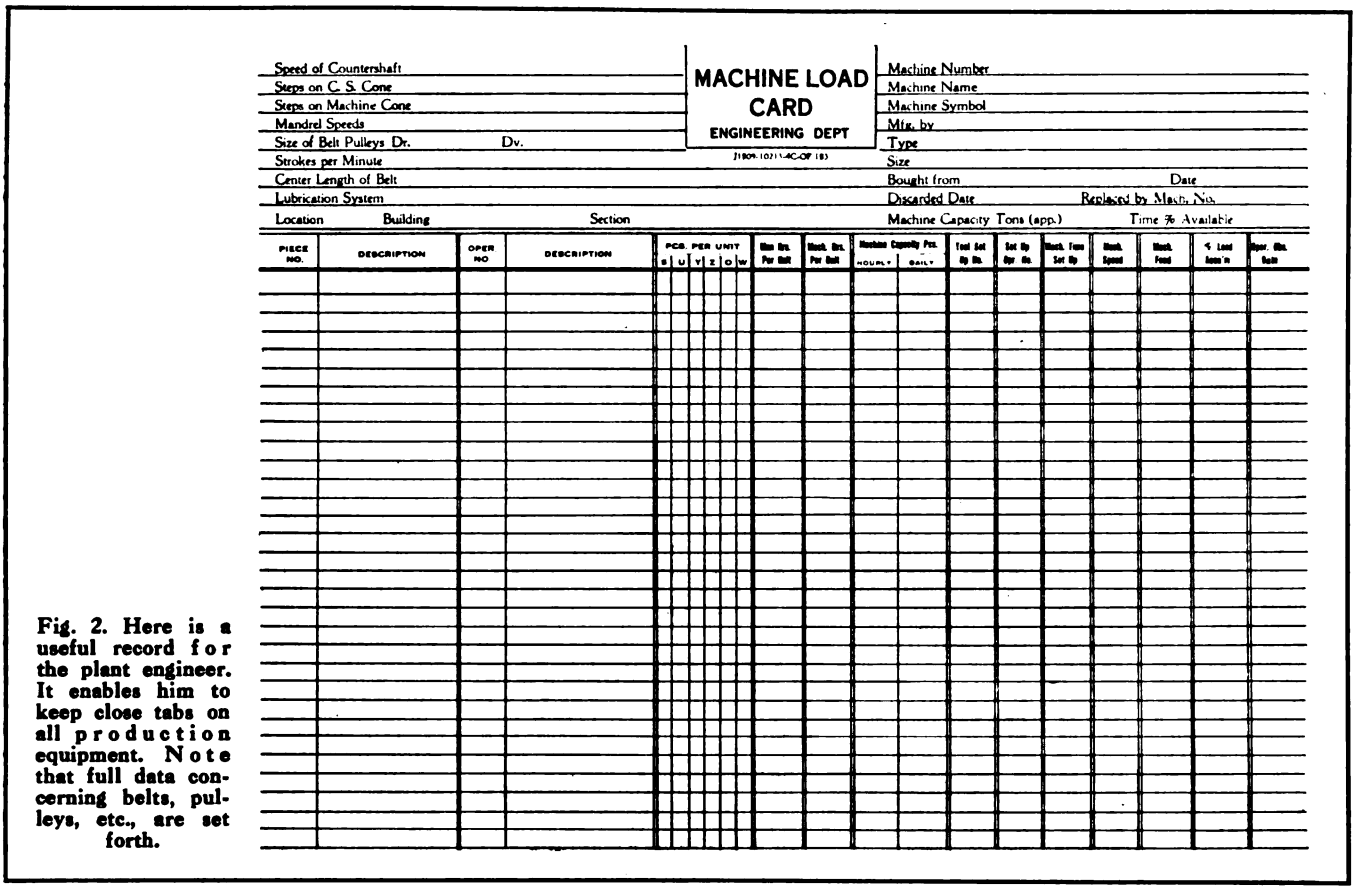


Fig. 1. Records of this sort should be maintained for all important pieces of equipment. They are particularly necessary for motive power and transmission equipment, when breakdown may cause great production loss.

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Speed of Countershaft
Steps on C. S. Cone
Steps on Machine Cone
Mandrel Speeds
Size of Belt Pulleys Dr. Dv.
Strokes per Minute
Center Length of Belt
Lubrication System
Location Building Section

MACHINE LOAD CARD
ENGINEERING DEPT

Machine Number
Machine Name
Machine Symbol
Mfg. by
Type
Size
Bought from Date
Discarded Date Replaced by Mach. No.
Machine Capacity Tons (app.) Time % Available

PIECE NO.	DESCRIPTION	OPER NO	DESCRIPTION	PCS. PER UNIT s	u	v	z	o	w	Min. Brk. Per Batt	Mach. Brk. Per Batt	Machine Capacity Pcs. HOURLY	DAILY	Tool Set Up Hr.	Set Up Per Hr.	Mach. Time Set Up	Mach. Speed	Mach. Feed	% Load Assm'n	Oper. Min. Each

Fig. 2. Here is a useful record for the plant engineer. It enables him to keep close tabs on all production equipment. Note that full data concerning belts, pulleys, etc., are set forth.

ment and filed away with a blue print, specification and any guarantees pertaining to that equipment. The data comprising the record should contain the date of installation, location, purchase price, installation cost, from whom purchased and other data of the nature of statistics. The characteristic of this class of records is that when once compiled and filed away they require no further attention until such time when additions or changes are made and these should be recorded or the file supplemented by them.

Permanent statistics are important data and should be amply protected by being kept in a fireproof place. Future expansion will call such data into action at which time it serves a purpose that well repays for the time consumed in keeping the record. Where guarantees are involved a card calling attention to them and the expiration date should be kept in the tickler file under the proper date to call attention to the expiration date in particular. An inspection can then be made prior to the time when the guarantee runs out and the proper action taken. An expired guarantee is not binding. Any action taken must be taken prior to the expiration.

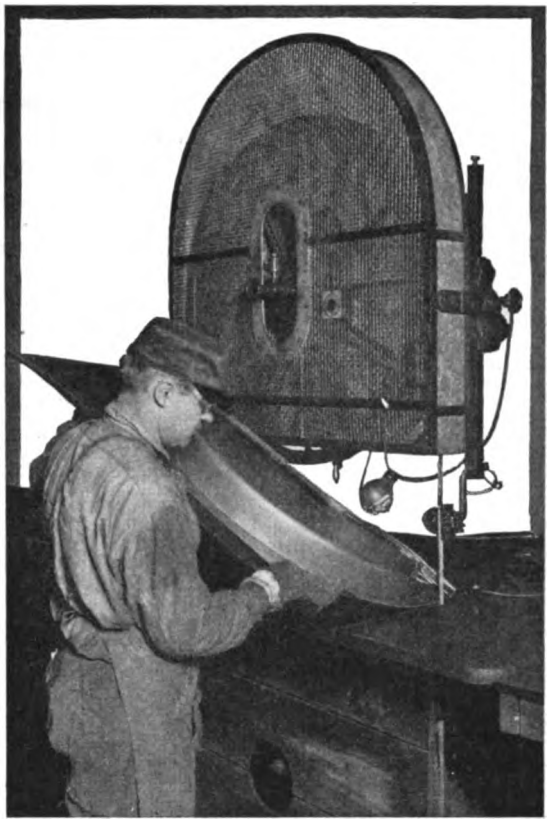
An example of permanent statistics is shown in the following which refers to a pressure blower:

Identification .....A B C Steel Pressure Blower Type P
Manufacturer's address.
Size 4
Installed ..... Dept. A2
Date installed 6/7/21
Initial cost ..... $
Freight ..... $
Installation cost ..... $
Speed ..... 2,880 r.p.m.
Pressure, oz. per sq. in. 10
Capacity air, cu. ft. per min..... 1,840
Brake, hp. required to drive blower..... 11.40
Diameter outlet, inches..... 8¾
Diameter of pipe, inches..... 13
Air velocity in pipe, feet per min..... 1,900

General dimensions:
Base, width ..... 19″
Length ..... 40⅞″
Bolting dimensions:
Base width, center to center of bolt hole..... 14¼″
Length, center to center of bolt hole..... 39⅛″
Bolt size required to fasten to base..... ⅝″
Number of bolts required to fasten to base.. 8
Height of blower over all..... 36⅜″
Pulley:
Diameter ..... 6″
Face ..... 4½″
Number of pulleys..... 2
Belt:
Width ..... 4½″
Ply 2
Length ..... 34′4″
Number of belts..... 2
Power:
Electric motor—60 cycle, 3 phase, 440 volt, A. C., 12 horsepower..... 1,200 r.p.m.
See motor card for additional information.
Cupola:
Diameter of lining, inches, inside..... 32″
Area inside, lining, sq. in..... 804
Number of tuyeres..... Continuous
Tuyere area, sq. in..... 281
Melting capacity, pounds per hour..... 7,200
Cu. ft. of air required per hour..... 1,650
Pressure required per sq. in., ounces..... 8
Spare parts kept on hand for blower:
Bearings complete ready to install..... 2
Location Stock Room Bin 190 section D.
Other matter contained in this file:
Blue prints of piping system 2. Number D Q-127-8.
Specifications of blower.
Specifications of piping.
Test sheets 5. T-321-2-3-4-5.
Other files having reference to this equipment:
Operating file O 51-FCB (Foundry cupola blower)
" " O 92-ACM (Alternating current motor)
" " O 125-C (Cupola)

The extent of the statistic data depends upon the equipment covered. The piece of equipment given above in the example will not require as much work and space as that regarding a boiler installation. To have avail-

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able at a moment's notice the complete detail of every piece of equipment is a valuable asset and when once compiled it will be found hard to get along without it. A motor installation will require very meagre reference in the statistical file, in fact I have found it more convenient to carry the entire motor record in the operating file.

Second. Operating records.

In manufacture we are familiar with cost accounting and bookkeeping to a greater or less extent and no manufacturer would think of running his business without some method of keeping account of his manufacturing cost or assets and liabilities. Accounting is an essential work in the operation of a business. Likewise the operating records of the equipment of the manufacturing plant are essential to the economical operation of the plant in producing its wares. These records are not, however, to be confused with production records which have a bearing only on the status of work in progress.

The type of operating records that are to be kept depends upon the equipment in use. There is no standard method of keeping these records to date; in fact this would be a rather difficult phase of business to standardize since the requirements differ widely for different kinds of equipment. For instance the operating records of a boiler plant would depend somewhat upon the type of plant in operation, its size and the use to which the steam is placed. The extent to which the records are to be maintained depends upon the apparatus available, as for instance means for weighing the coal and water, temperature measuring instruments, pressure and power measuring apparatus as well as the system in vogue for keeping track of the oil, waste, general supplies and repairs. In large stations autographic and integrating appliances are used in a great measure to keep track of coal used, ashes removed and steam produced. In the smaller plants these instruments are not as a rule installed and the engineer must rely upon other methods in obtaining amounts, quality and efficiency.

Modern equipment and instruments for the purpose of recording performance comprises a very small percentage of the initial cost of the plant and facilitates as well as reduces the cost of keeping account of these essential data. They are, therefore, advisable even in the smaller plants; however, where they are not available, recourse must be had to the usual indicating devices.

The boiler plant operating records comprise the most important records of this class; however, the importance of other equipment records must not be overlooked. I mentioned above that the permanent statistics records of the motor in connection with the blower installation were carried with the operating records. As an example of operating record I have therefore selected the motor record shown in Fig. 1. The card is self-explanatory. The face of the card "A" Fig. 1 shows the permanent statistics of the motor, while the back of the card "B" Fig. 1 shows the operating data. The upper half of the card is given over to a record of spare parts, giving the date purchased, the purchase place, quantity, price and date used. In the last column is given the motor number on which the part was used. This is necessary since there is every likelihood that several motors of the same size, rating and make will be used in the same plant and would therefore take the same repair part. The duplicate motors installed or on hand are given on the face of the card under permanent statistics and this serves

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as a ready reference in case a motor should burn out or for some other reason would require quick replacement. A like motor may be located in a moment's time from the card.

The lower half of the card is given over to a record of the repair work columns being provided for the date, hours of labor, parts repaired and the apparent reason for the repairs. After a while the card readily shows the most common type of repair on the motor and by comparing the records of several motors a very good decision with regard to the best motor for a given service may be made.

Besides the card there are carried in the operating file a copy of all tests on the particular motor and any other data found desirable regarding the installation.

In Fig. 2 is shown what is known as a machine load card. This card is a composite record of each machine used in the manufacture of the product with regard to the permanent statistics of the machine, operating record and machine load. The right hand side top section of the card is used for such information as the machine identification, capacity and obsolete data with reference to the machine. The machine symbol is generally assigned at the time of installation and is used principally by the planning department. The machine capacity in tons is the assigned value placed upon it by the manufacturers. The per cent. time available is placed upon the machine by the plant engineer after allowing time for anticipated repairs plus the usual allowance for contingencies. This time will vary for different types of machines from 75% to 95%. A punch press will run about 80% of the time, 20% being allowed for repairs and other idle time that generally creeps in such as absence of operator.

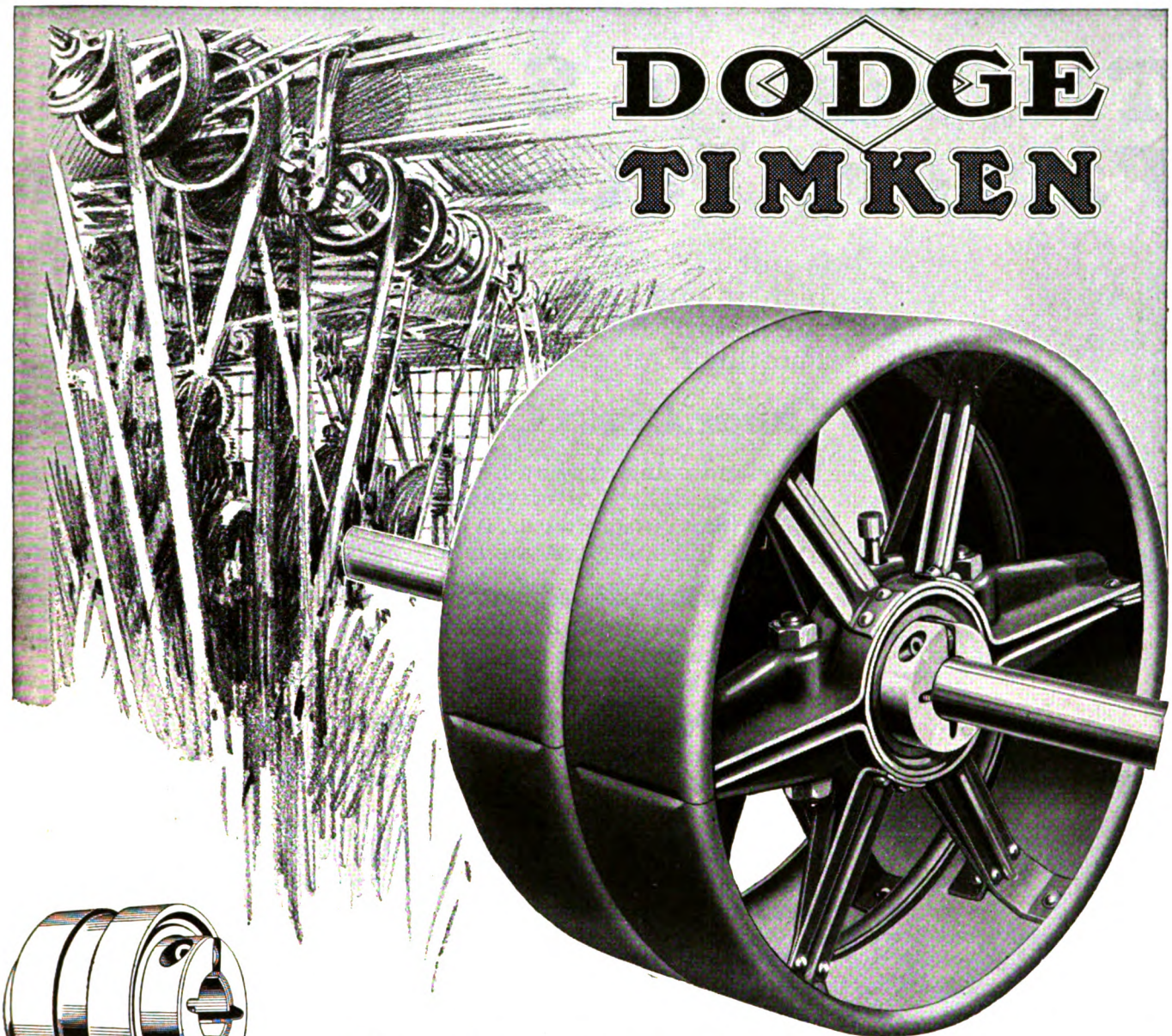
The left hand side top section of the card is used for such information as speeds, feeds, pulley, belt and lubrication data of the machine. The machine location is also taken care of on this side of the card.

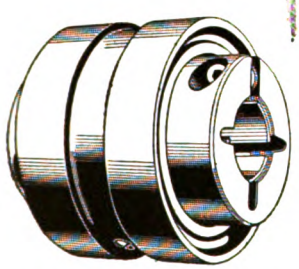
I have always considered it of importance to know to what extent the machines were loaded and since the efficiency engineer was under my supervision, I provided the lower section of the card for recording data from the time studies of production. The object of this data is to keep tab on the machine load, machine requirements and show the importance of each machine as well as indicate the type of machines that were best adapted to the product.

In order to obtain the data from the time studies the time study is turned over to a clerk who copies the data therefrom direct to the card. The accumulated load is carried in order to avoid loading the machine over the machine capacity as established by the capacity at the top of the card. Since operations are often changed an obsolete column is provided at the right margin of the card and when an operation is canceled the total load on the machine is reduced that amount. A deduction is therefore made in the per cent. load accumulative column. The accumulative load on the machine, of course, depends upon the quantity production and varies with the production schedules. Adjustments are, therefore, necessary whenever a change is made in the production schedules; however, this is taken care of on a percentage basis as compared with a standard production.

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DODGE TIMKEN

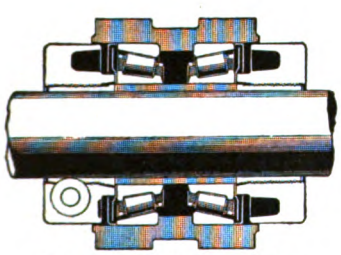




The Dodge-Timken unit mounting—a self-contained unit requiring no adjustment after leaving the factory.

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HERE is another contribution to Industrial power savings—Dodge-Timken Roller Bearing Steel and Iron Loose Pulleys, available in standard sizes from stock. We will gladly send you a bulletin covering this rugged, well lubricated, trouble-free product on request.



Sectional view of unit mounting, showing Timken bearings and special grease seals which positively prevent dust from working in or lubricant working out. The lubricating feed pipe is easily accessible through a hole in the pulley hub.

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The Way to Save Factory Painting Costs

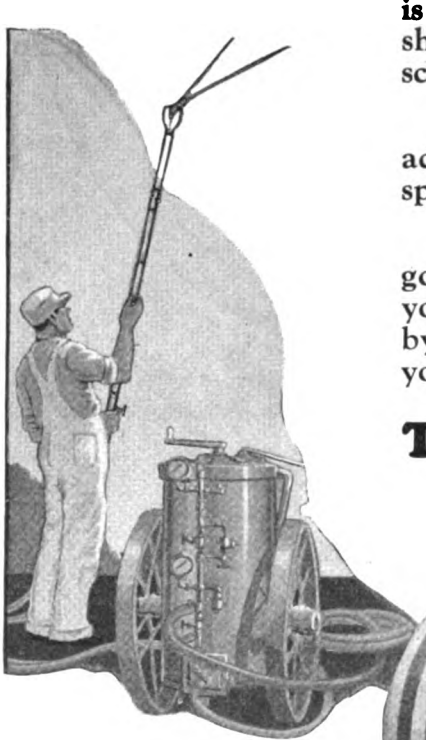
is not to "shop" for paint. Use Vorcolite, the highest quality gunning paint and apply it with the rapid, high power, trouble-proof Vortex Painting Equipment, which we loan to purchasers.

Labor Costs Cut Down 80 to 90%

Hand painting often means a labor cost in excess of the paint cost. The Vortex painter in the hands of your unskilled man cuts application cost to 10% or less of the total painting bill and gives you a better job.

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Vorcolite Works With Any Gun but we advise use of the Vortex Painter because of its superior speed and proven economy.

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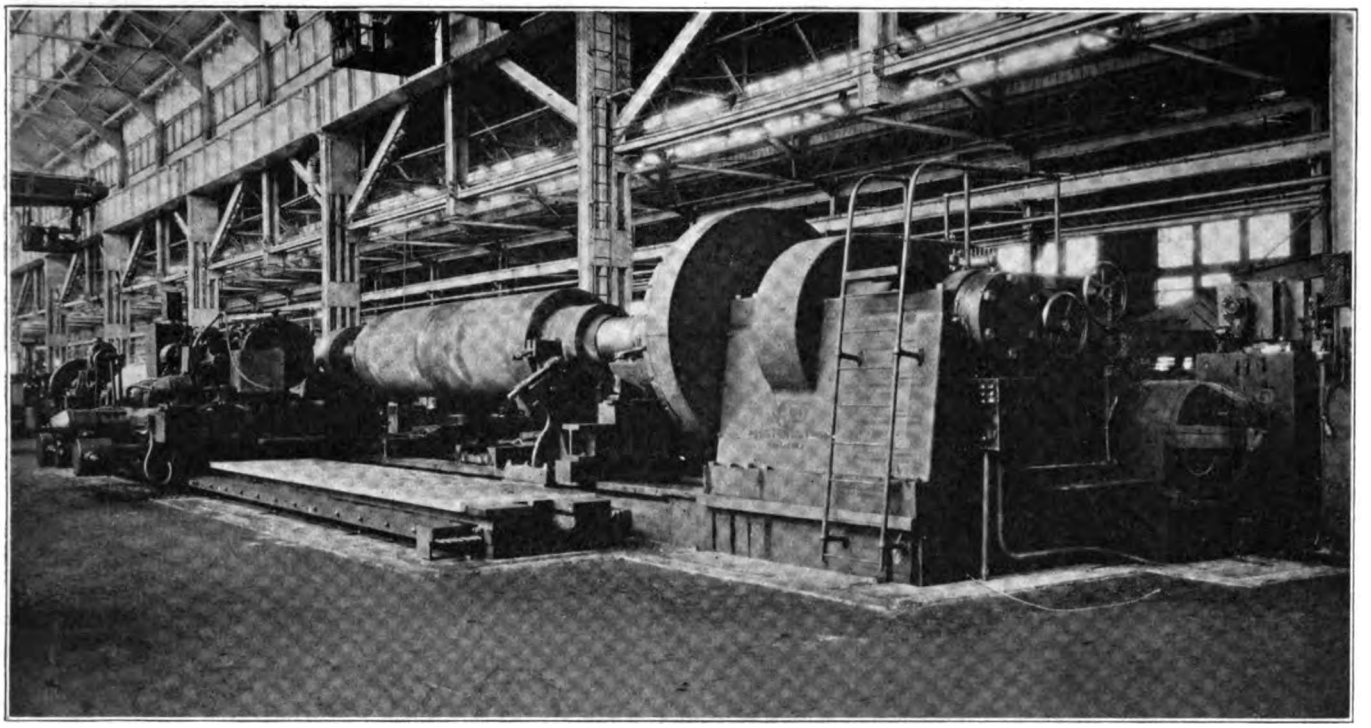


Fig. 1. Eight different electric motors, ranging in size from 1 hp. to 75 hp. are used on this 113 inch lathe. Full magnetic control is supplied by various push buttons.

Push Buttons in the Machine Shop

The Modern Means of Machine Tool Control

By B. S. Havens

A COMBINED lathe and grinder recently installed in one of the shops of the Schenectady plant of the General Electric Company provides an excellent example of modern, magnetic control. This machine, of Niles-Bement-Pond manufacture, has a 113-inch swing over the bed and 94 inches over the carriages. It will accommodate work up to 45 feet between centers and is capable of supporting a working load of 300,000 pounds. On one side of the bed are two tool carriages, each with cross slides and with compound and swivel tool rests. The other side of the bed carries a complete Landis grinder with a 36-inch grinding wheel.

The electrical equipment consists of a total of eight motors, five of which are controlled entirely magnetically from push button stations. The remaining three are controlled from drum switches. All of this equipment is mounted on the machine except the main drive motor panel, which is floor mounted. A number of trolleys suspended in a pit beneath the bed provide power and control circuits for the traveling members: namely, the two carriages and grinder bed.

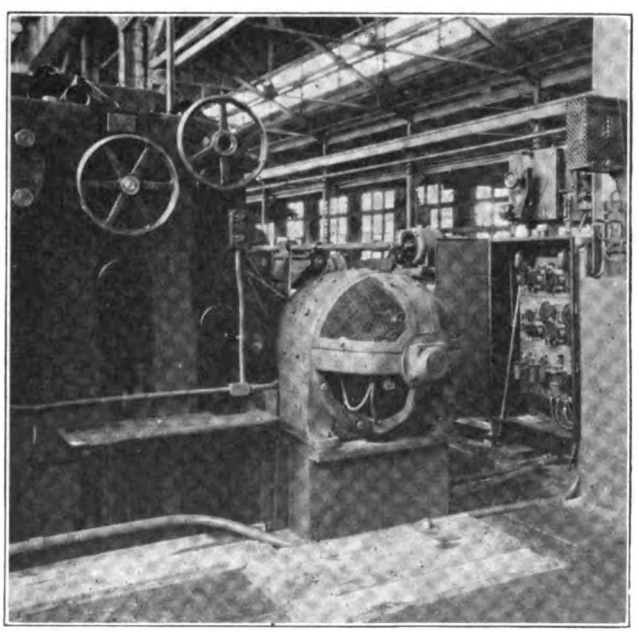


Fig. 2. This shows the main motor which drives the headstock spindle and face plate. The filed rheostat is motor operated.

The main drive motor is a 75-horsepower, 230-volt, shunt-wound machine with three-to-one speed range. The controller is of the standard reversing magnetic type with the addition of several interlocking circuits. Speed control is effected by means of a motor operated field rheostat. Push button stations to control the direction and speed of rotation are located on both carriages, on the girder and at the headstock. On each of these main control stations is a "safe" button which may be set to prevent the motor from being started from any station until it is released at the station at which it was set.

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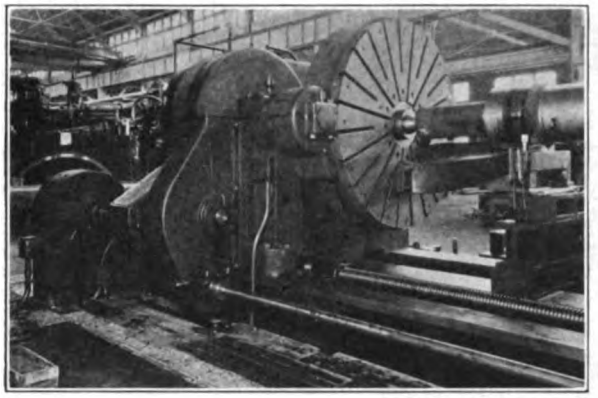


Fig. 3. The push buttons which control the speed of the headstock spindle are shown just below the main headstock back gear shaft primor bearing.

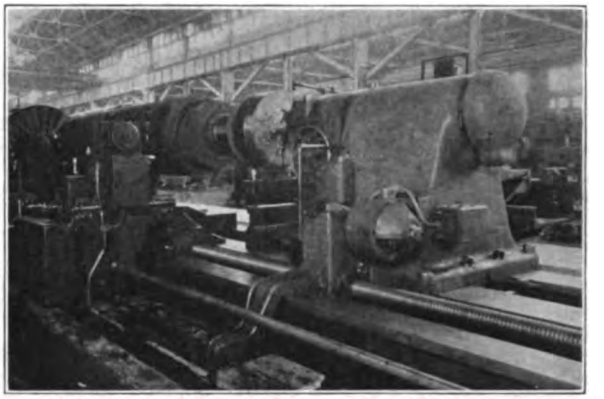


Fig. 4. Even the tail stock of this big lathe is motor actuated. It would be some job to have to move it by hand. Note also automatic lubrication system.

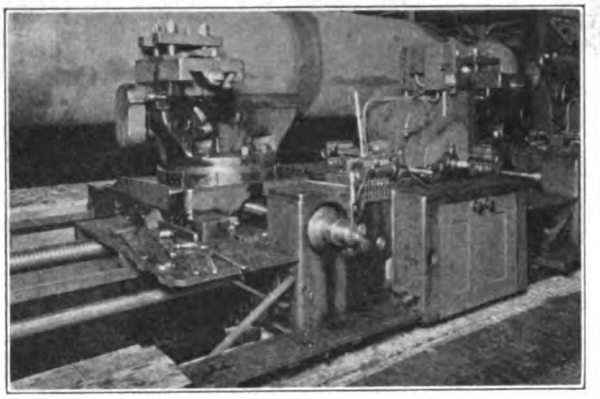
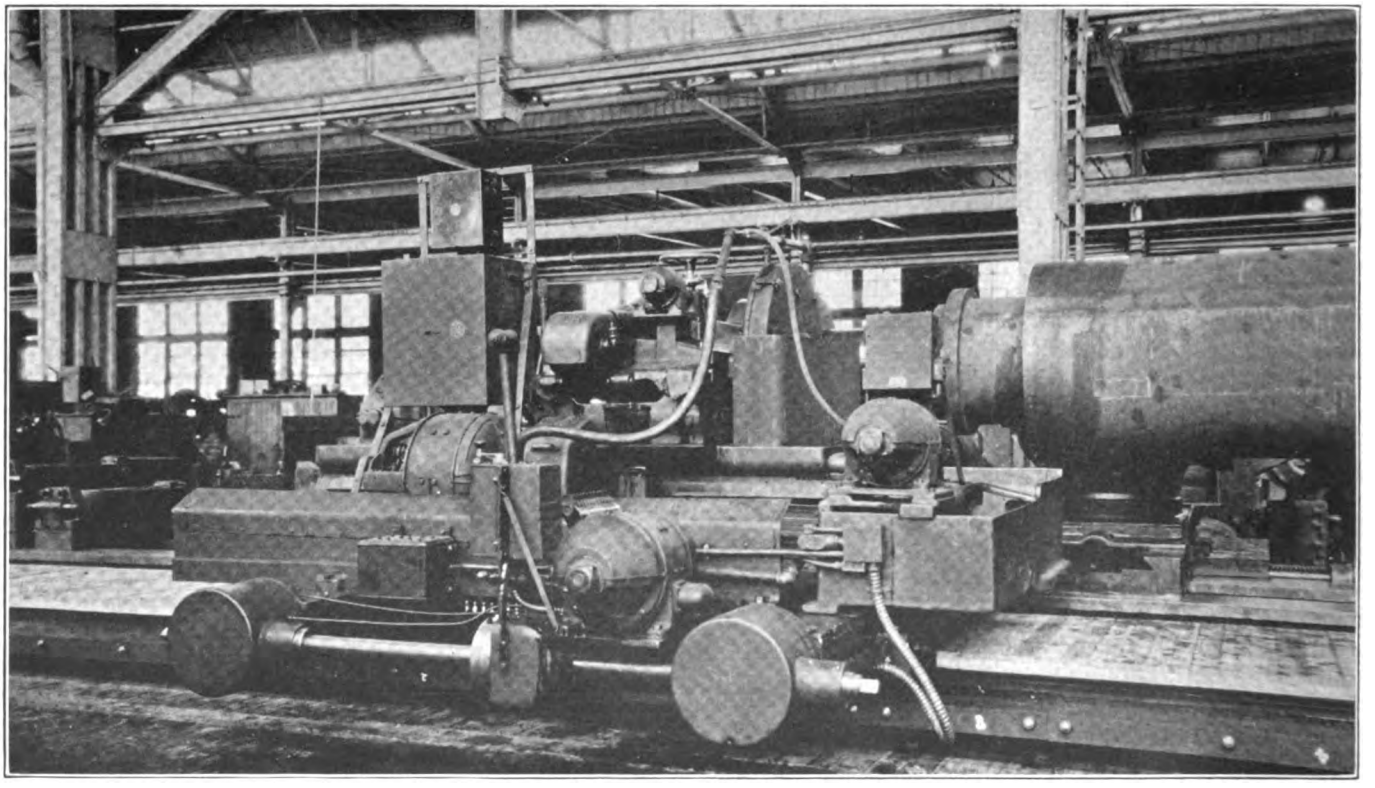


Fig. 5. Here is the motor for governing the carriage movements. A push button station for controlling the main driving motor is also provided.

Fig. 6. One of the unusual features of this lathe is the grinder attachment, mounted on the rear way. This also is motor driven and push button controlled.

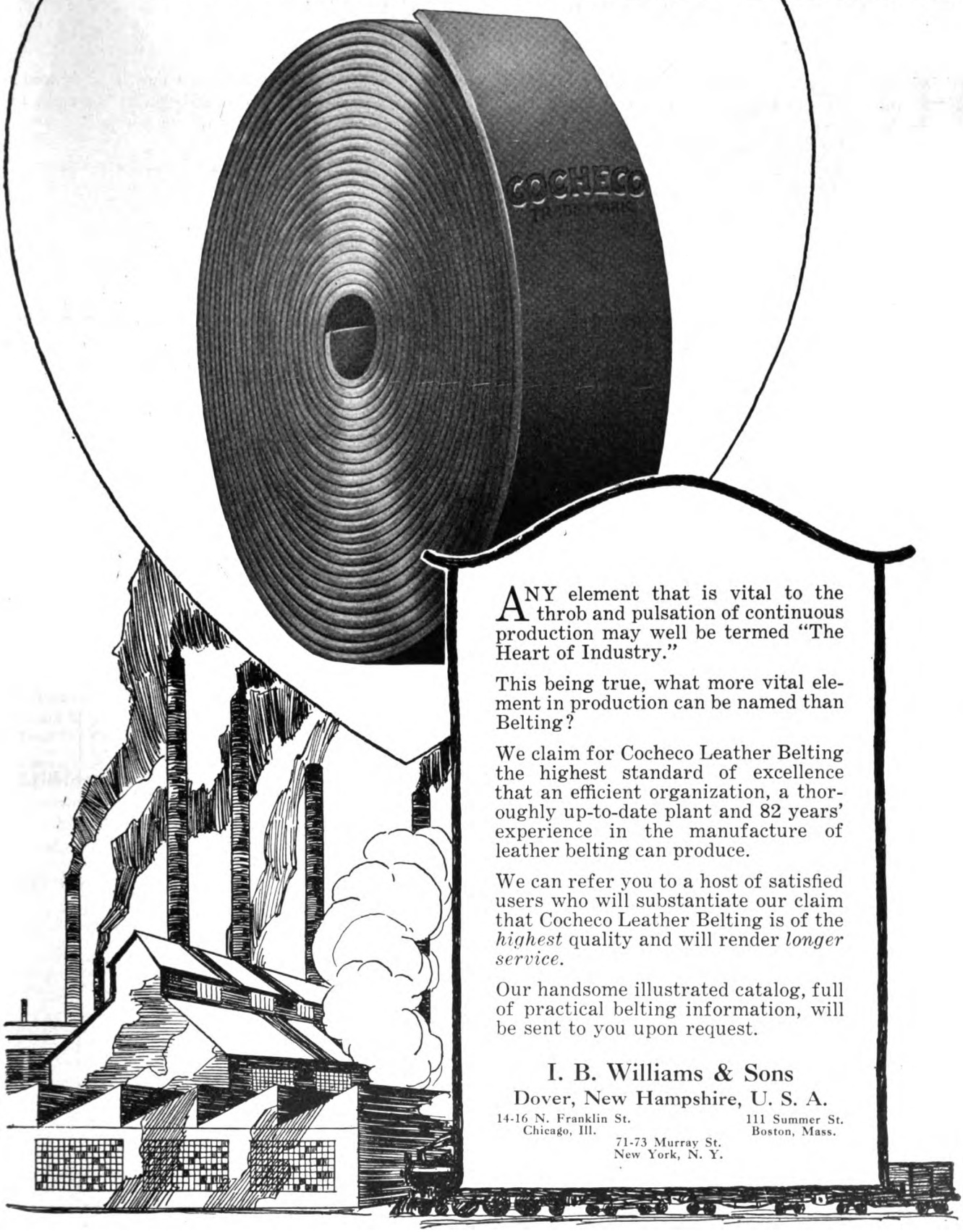
The 10-horsepower, 230-volt shunt wound motors on each of the two carriages are individually controlled from reversing magnetic controllers with push button stations. These panels are so interlocked that, in case a tool should gouge in, thus throwing an overload on the main motor, full field will be applied to the carriage motors, thereby slowing them down. The overload on the main motor is registered by a field accelerating relay used in this case as an overload relay. These motors are also further interlocked to prevent a feeding speed being established unless the main motor is running. A limit switch actuated from a gear shift lever stops the carriage motor when shifted from a feed to a rapid traverse position and opens up the holding circuit to the magnetic control panel, thereby providing rapid movement of the carriage only so long as the "traverse" button is depressed.

The grinding wheel is driven by a 25-horsepower, 230-volt, two-to-one shunt motor. The controller is a standard, non-reversing, magnetic device but without dynamic braking. Reversing drum switches control the grinder feed and the grinder traverse.



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What Width Belt; Thickness; Horsepower; Pulley Diameter?

This Chart Tells at a Glance

By W. F. Schaphorst

HERE is a chart that quickly tells nearly everything that one might want to know about a belt drive. Simply zigzag across as indicated by the dotted lines and get whatever value is desired.

Complete tables covering all of the information contained in this chart would occupy a great deal of space and would require much time for compilation. It takes care of all widths of belts varying from 1 inch to 60 inches, for all revolutions per minute varying from 3 r.p.m. to 9,000 r.p.m. and for pulley diameters from 2 inches to 1,000 inches. It also gives the horsepower for single, light-double, double, triple and four-ply belts.

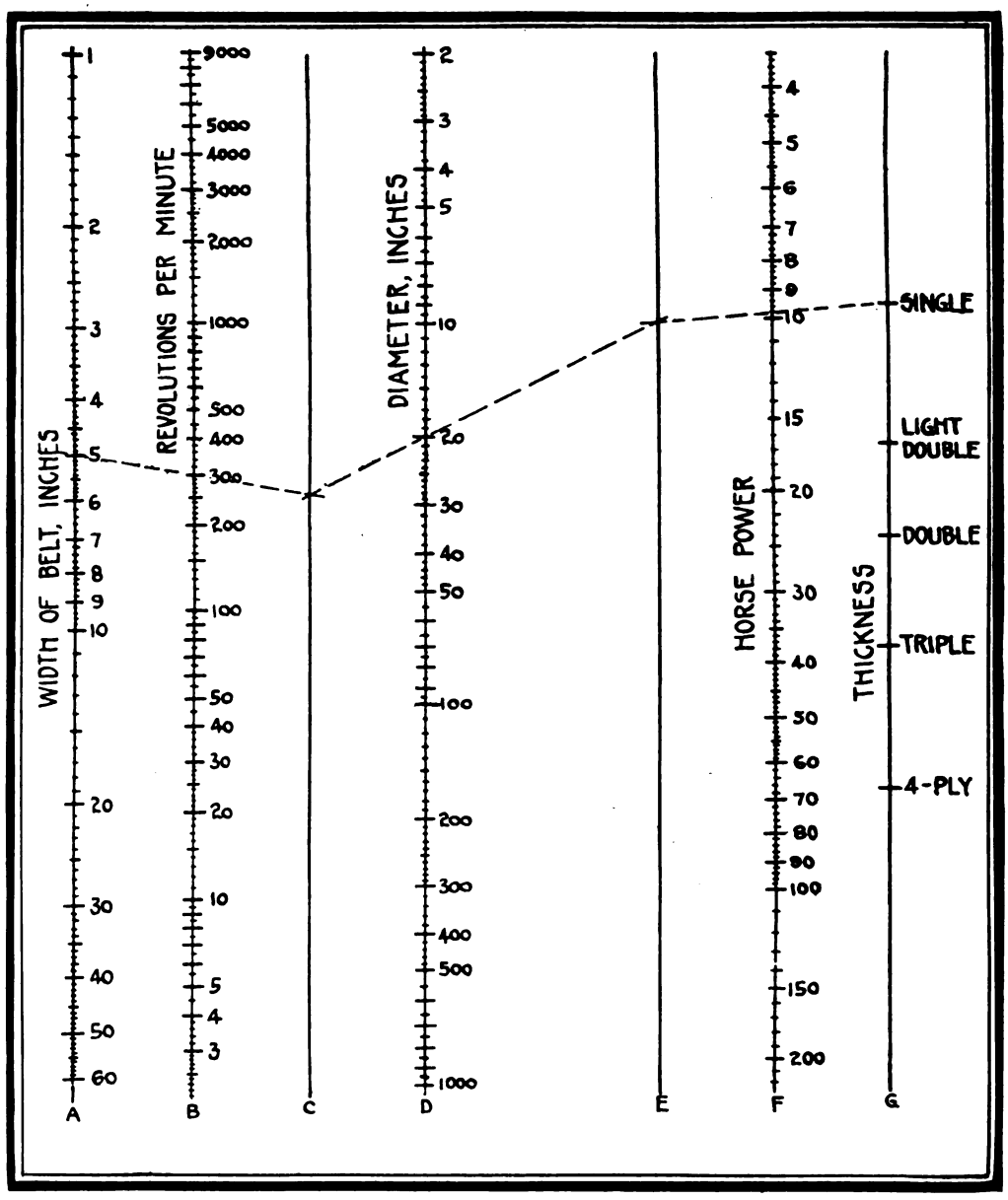
To use the chart, find the width of the belt in inches in Column A and then run a straight line through that width and the revolutions per minute made by the pulley in Column B and locate the intersection in Column C. Then from that point of intersection run through the diameter of the pulley in inches in Column D and locate the intersection in Column E. Then from that point of intersection run over to the thickness of the belt in Column G and the intersection in Column F gives the horsepower.

Or if, after reaching Column E the horsepower is known and it is not certain whether the belt should be a single, light-double, double, triple or four-ply, run a straight line through the intersection in Column E and the horsepower in Column F and the intersection of Column G will give the number of plies or thickness of the belt.

Inversely, if the thickness of the belt, horsepower, diameter and revolutions per minute are known and it is desired to determine the width of the belt, begin at the right and zigzag over toward the left and the width is found in Column A.

In other words, if four of the factors are known, the fifth is easily determined by simply running straight lines across the chart as indicated by the dotted lines on this chart.

Column F shows that the chart takes care of all quantities of power from 4 to 200 horsepower.



For example, this chart shows that if the width of the belt is five inches, the pulley makes 300 r.p.m. and is 20 inches in diameter, and if the belt is a single belt, it will then transmit 9.8 horsepower.

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TRADE **YALE** MARK

YALE—the Key to lower handling costs. Chapter 28 on *Storage Battery Trucking.*



Yale No. K 21 well loaded with Rolls of Sheet Rubber.

Strength

THIS is a point in truck design worthy of every buyer's close attention. Industrial trucks in the normal every-day work in shops, piers, warehouses and railroad terminals, are constantly and severely abused.

It's all in a day's work. But more than that, every truck gets accidental shocks in excess of the usual jolts of service.

Strength—means low maintenance costs.

The Yale Electric Industrial Truck in this respect, as in every other single detail of its construction, is outstanding.

The Yale pressed steel frame assembly, for instance. The material of pressed steel, combined with Yale design in the assembly, gives a truck of the greatest strength—plus the lightness in weight that contributes to ease in handling. Yale Trucks are always consistent low-cost performers.

The Yale & Towne Mfg. Co.
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Yale Material Handling Equipment includes Ball Bearing Spur-Geared Chain Blocks, Screw-Geared and Differential Chain Blocks, Ball Bearing Electric Hoists, I-Beam Trolleys, Overhead Crane Equipment, and Electric Industrial Trucks, Tractors and Trailers.

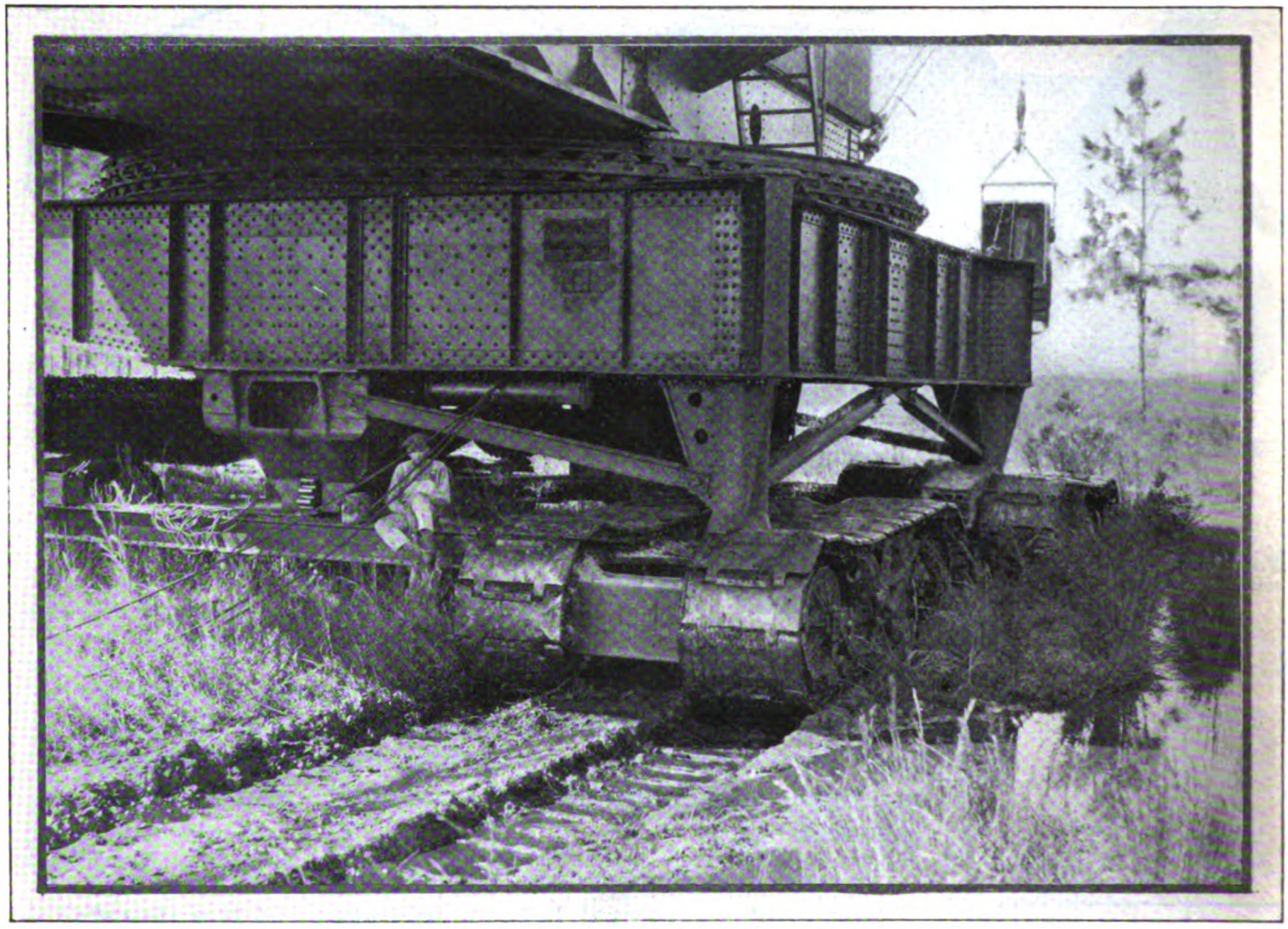
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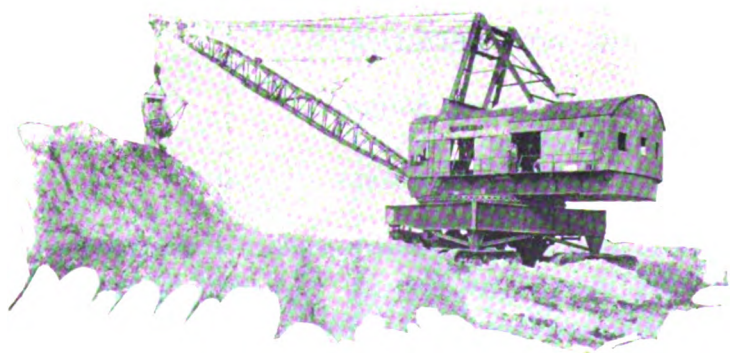
Here Is a Monster for You!

This Steam Shovel Weighs a Million Pounds



An 8 yard dragline excavator weighing approximately a million pounds and mounted on self-propelling caterpillars.

The caterpillar mounted dragline moving through low-lying, wet ground.

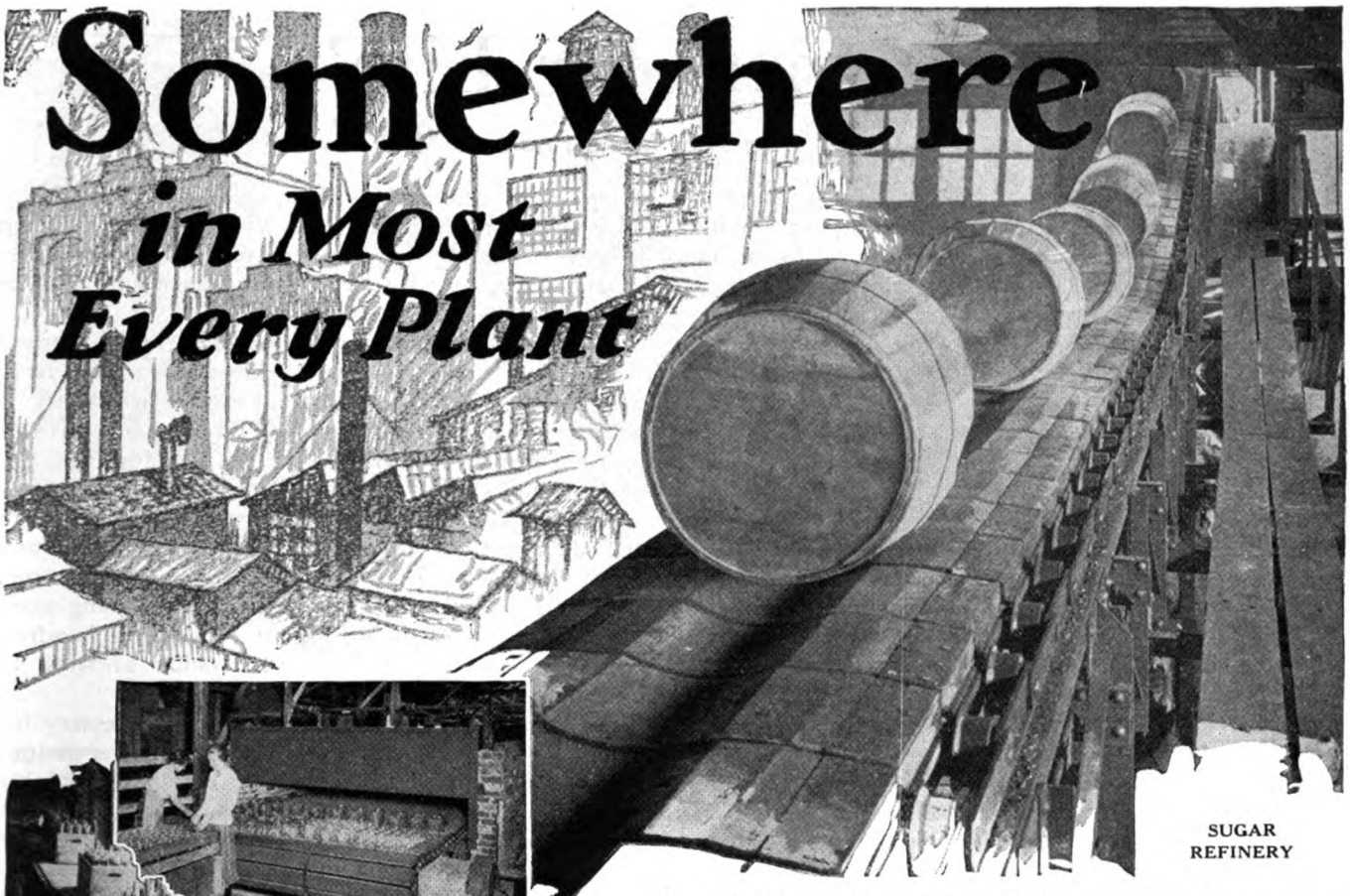


TO get a fair idea of the size of this outfit, find the man in the picture of the caterpillar mounting. This huge shovel was made by the Bucyrus Company of Milwaukee.

The caterpillars are almost shoulder high to an average man. Some idea of the size of this new caterpillar-mounted machine is given by the fact that, ready for operation, it weighs approximately a million pounds or 500 tons. In spite of this tremendous weight, the bearing area of the caterpillar belts is such that it can propel itself across soft, yielding ground without difficulty.

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Somewhere in Most Every Plant

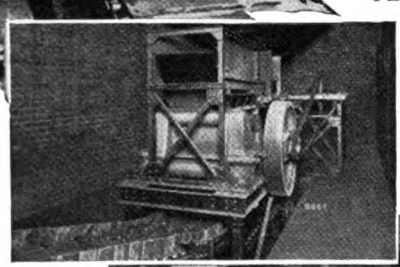


SUGAR REFINERY

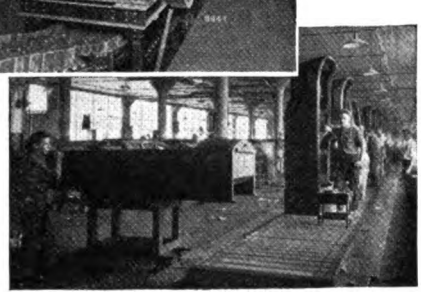


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Lehr Conveyor

BOTTLING PLANT



POWER PLANT.
Handling coal from crusher.



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Assembling Conveyor.

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Wood Apron Conveyors for handling large bulk materials such as packages, barrels, bags, boxes, bales, and bundles.

Steel Apron Conveyors for handling coal, coke, ore, chemicals, refuse, scraps, trimmings, and other loose materials.

With either wood or steel flights, they are ideally suited to progressive operation on automobiles, vehicles, stoves, wheels, machine parts, furniture, etc.

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"Partners for Life"

By King Hamilton Grayson

"THREE hundred and eighty-seven unquestionable assets,—every one of them one hundred per cent. Americans,—ultra-loyal to me and to my company,—our silent partners, but they don't really know it!" Charlie Flemming proudly exclaimed, pointing with a sweeping gesture to the group assembled on the recreation lawn of the factory grounds. "They're worth more to us than ten times all of our other assets put together! We've founded the most unique,—the most efficient,—the greatest thinking organization in this state,—possibly in the United States!"

The startling growth and success of the Flemming Company was mentioned with an air of awed mystery by those "on the street," as salesmen are frequently known. They could not account for Charlie Flemming's almost miraculous rise from a little twenty-five foot factory to one of the finest plants of its kind in America, —and in the West, too. There was only one way to learn the secret,—they told me,—"get a personal interview with Charlie Flemming!"

But the president of the Flemming companies, for there are many of them, was a very busy man, and, besides, his secret was original and he was somewhat backward about telling the story for publication. He finally granted the interview under certain conditions,—"he was willing to talk about his system and employees but not about Charlie Flemming." The secret back of his success was the main issue—consequently an agreement was quickly reached.

"Several years ago when we first started our business," Charlie reminiscently began, "I recognized that every industry is only as strong as its weakest part, and that loyal, efficient, happy employees are the best assets which any firm or corporation can have!"

He opened a large book—one of many entitled "Results," which he had taken from a bookcase before we resumed our seats—then somewhat dreamily he continued, "Lots of plans have been tried by America's great industries to create organizations of loyal employees—some have given stock—others have sold stock; bonuses have been tried as well as pensions, but results always tell the most truthful story! This is our story —my employees', our stockholders', and mine! I recognized that employees were the weakest part of every organization—the most changeable—the most uncertain part, but I believed that they could be made the most valuable assets which could be at our command!"

Placing his index finger above a photograph in the book, he called attention to a very attractive young woman of about twenty-three—then moved to another picture on the opposite page, where a pug-nosed, freckle-faced lad in his early teens smiled at me.

"Our first secret service!" Charlie smilingly exclaimed. "They were regular 'police dogs,' and they had Sherlock Holmes 'skinned to death!' Miss Marshall is now the wife of our general manager in California, but Jimmie is still here! He is our salesmanager whom you met on the way to the tennis courts!

"Well, our police dogs are still on the job—there's three of them now—another girl like Miss Marshall, a young fellow who is chief clerk, and Mickey, our latest office boy—but their principal work consists in being detectives, hunting for signs of unhappiness and discontent—however, Mickey's the only one who thinks he is a human bloodhound!"

Then, for three solid hours, Charlie Flemming turned the pages of those books and related one of the most interesting stories in the industrial history of the city.

Every employee's history, from birth to and through their employment by the Flemming Company, was minutely recorded. Their personal traits and characteristics, their education, likes, dislikes, and weaknesses were all known to Charlie Flemming, and he was governed accordingly in his decisions. His motto had become, "Once a Flemming employee, always a Flemming asset and partner," and yet not one of those three hundred and eighty-seven "assets" owned a dollar of stock in the Flemming Company.

The "house detectives" had secured the necessary information—the next step had been to crystalize it into helpful form, consequently Charlie Flemming and his board of directors first organized the Suburban Homes Corporation to build attractive small homes in a new section not far from the factory. All employees who were living in rented houses were urged to purchase a home of their own, and none suspected the connection between the Flemming Company and the "Homes Corporation" to be other than that of business friends.

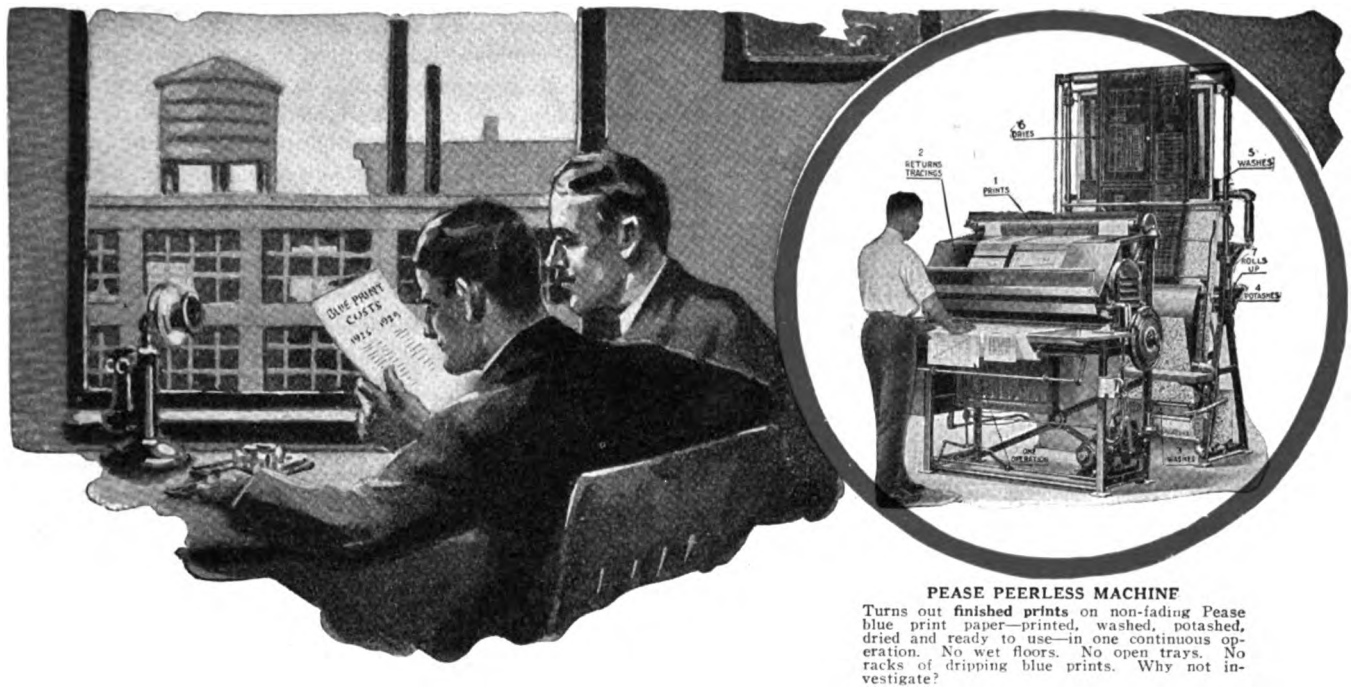
However, each employee was summoned before the president for an after-business hours conference in the employee's rented home, and before his wife, mother, or other dependents. A bond of relationship was thus established which caused the employee to pour forth the innermost secrets of his or her heart—they won Charlie Flemming's sympathy and coöperation—and he won their undying loyalty.

Another corporation, the Employees' Salary Loan Association, also owned by Flemming and his associates, agreed to make salary loans at a nominal rate of interest in order that the employees could purchase their new homes, and which were sold to them at actual cost.

Then the health and accident association among the employees was formed, and a sum equal to one-fourth of the total monthly dues from employees was paid by the Flemming Company; a regular physician, chiropractor, dentist and oculist were employed, and physical examinations became compulsory once each month. This feature extended to the families of all employees. They not only built a health organization but one of happiness and security. The health organization included an athletic department, and a certain amount of funds were set aside to build a gymnasium and tennis courts. The gymnasium is also used for weekly dances and lectures —for the night school class rooms, and for such events as the gathering of "baskets of clothing and food for the poor" at Thanksgiving and Christmas time.

The pet hobby on Charlie Flemming's part is to act as matchmaker for his unmarried employees. For this purpose, the Evergreen Club was organized, and an attractive club house was built in the heart of the moun-

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Turns out **finished prints** on non-fading Pease blue print paper—printed, washed, potashed, dried and ready to use—in one continuous operation. No wet floors. No open trays. No racks of dripping blue prints. Why not investigate?

"The Pease Machine Saves Us the Labor of One Man"

Four years ago, the Peerless Motor Car Company, Cleveland, Ohio, replaced another type of blue printing machine that required separate washing and drying with a Pease Peerless that prints, washes, and dries—all in one operation. Substantial savings were immediately noticed in the cost of producing blue prints.

Produce 1,000 Prints Daily

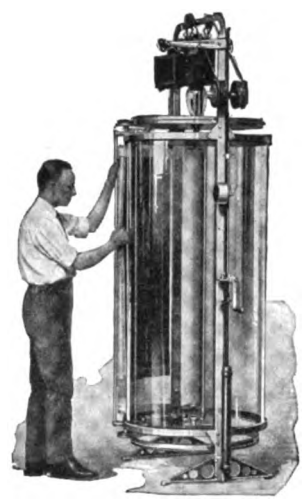
Today, the Peerless Motor Car Company are making about 1,000 blue prints daily. They blue print piece part drawings, assembly drawings, stock sheets, material specifications, prints for estimates, patent sketches, factory schedules, management charts, engineering and experimental department curves—anything of an engineering nature requiring duplication. Each model requires 3,500 different piece part drawings, copies of which are distributed among seven factory departments.

In commenting about the tremendous savings the Peerless Motor Car Company are making, Mr. A. L. Neal, Chief Draftsman, says: "Our prints run from 6 x 9 inches to 36 inches by 12 feet in size—most being 9 x 12 inch prints of the piece parts.

"The Pease Machine is meeting the present heavy demand for Peerless car production most satisfactorily. On our present blue print production, the Pease Machine saves us the labor of one man, as compared to the old hand drying method."

The savings the Peerless Motor Car Company make by having their own blue printing equipment is typical of hundreds of plants. Wherever Pease Blue Printing Machinery is used, substantial savings are reported. If you use blue prints in volume, it will pay you to investigate Pease equipment.

Let us send you a copy of our new catalog and reports showing how Pease equipment is saving money in every line of business. You are not obligated in any way.



PEASE VERTICAL MACHINE
Regardless of weather conditions, this machine will turn out blue prints faster than any other equipment of its type on the market. Absolutely noiseless. Requires little space. Get the facts about this machine.

THE C. F. PEASE COMPANY
828 N. Franklin St., Chicago

PEASE
BLUE PRINTING MACHINERY
LET BLUE PRINTS TELL YOUR STORY

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—*for many purposes*

You will find many uses for Guaranteed Witt Cans.

Especially built for heavy duty, they are the ideal cans for handling ashes, garbage, waste and scraps, and are guaranteed to outlast 3 to 5 ordinary cans.

The body is made of special analysis sheet steel, corrugated for added strength, and reinforced at top and bottom with electrically welded, solid beaded steel bands—not frail wire hoops. The bottom, made of one-piece heavy gauge sheet steel, is raised completely from the floor. The lid fits snugly, keeping the odors in, and smothering any fires that may start. The entire unit is hot-dip galvanized after construction, making it watertight.

The longer you use Witt Corrugated Cans and Pails, the more uses you will find for them. Place a conservative order for Witt Cans today and compare them with any other Can you have ever used or seen. Your Jobber can supply you, or write—

THE WITT CORNICE COMPANY
2117 Winchell Avenue
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Manufacturers of

WITT
CORRUGATED
•CANS and PAILS•

tains. Twenty small log cabins surround it and the club owns excellent streams for trout fishing and its own milk cows.

Every employee is permitted to spend his or her vacation at the Evergreen Club, and none ever misses the opportunity. At the club house proper each unmarried girl or young man in the employ of the Flemming Company may invite two guests of the opposite sex during the two weeks' vacation period—each guest being allowed to remain free of expense for one week, or one guest for two weeks. This expense is borne by Charlie Flemming and his associates from their personal incomes. Has it paid? The Flemming Company has not lost a single employee except through marriage since the plan was started with "Jimmie, the first house detective," and every marriage has been one of happiness to date.

The business of the Flemming Company is rapidly growing—many by-products are being added to their line. Kingdon Maynard, the chief engineer, suggested that every employee should be able to fill three positions at one time—his own, the one above his, and one below his. He also inaugurated the suggestion box.

Charlie Flemming went one better—he decided that every employee should be trained to know every detail of their business from the lowest position to that of president. He started a night school to which all employees and their families were admitted if they chose to come. None remained away, and the competent instructors soon had the livest, most sincere group of students to be found. The course of studies is equivalent to that of the most complete technical institute, specializing in the business of the Flemming Company, but with many side-lines.

Hundreds of applications are received from outsiders for admission to the classes. To meet that demand twenty scholarships are awarded each year, and those receiving them have the assurance that upon graduation from the Flemming course, they will be given a position in the Flemming Company factory, or with one of several other firms who are eager to secure Flemming graduates.

The library in the Flemming building is such a busy place that three trained librarians are on duty for an hour before the opening of the factory, an hour at lunch time, and an hour from five to six. There are more than ten thousand volumes on the shelves, with more being added all of the time. A minimum charge is made which pays for the new books, services of librarians, and replacements.

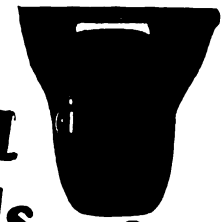
One of the greatest tributes to Charlie Flemming's far-sightedness is the "Coöperative Trading Company," which operates a store in the basement of the main factory building. By teaching the employees the value of purchasing, the Coöperative Trading Company has now become an important buyer of supplies from the canners, the packers, the flour mills, sugar company, and other food manufacturers.

The Coöperative Trading Company is owned by the employees of the Flemming Company. They make a profit on all that they sell, but each individual employee is able to purchase food at retail at prices equal to wholesale. The profits from the trading company are being set aside to build a school for specialized education of the sons and daughters of employees who do not wish to follow the trade of their fathers.

The Flemming Bank is not only the strongest, but its

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You didn't know there were such perfect truck caster wheels? Neither did we—till we perfected Bassick Ruboids



HERE'S just *one* big point—*Ruboids Save Floors.* They were created to do that, of course. But we proved it by rigorous tests (see official report in the booklet you get when you mail the coupon). Ruboids save floors because they roll smoothly—ride the bumps lightly—because they are built to "give and take." Yet they are easy on the floors without being hard on themselves. And they roll easily—and silently. Also they're strong—and don't cost much. Can you match all that?

Never before has **there** been a wheel **that** could do all the **things** this wheel **does**—but **there**never **has** been a wheel **built** like Ruboids—**laminations** of **staunch** wood held **fast** in vulcanized **rubber.**



How easily it rolls on Bassicks

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Ruboids Roll Easily ~ Silently!





Just let us know where to send your sample cross-section slice of a Ruboid wheel—with booklet of trucking facts.

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City ..... State .....
Kind of business .....

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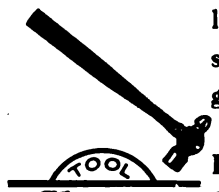
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If it was any vise but a Prentiss

Well, you know what would have happened. You know what usually happens when a man uses a vise for work that should be done in a press.

And even a Prentiss Vise has its limits though there's this to be said, it will stand an awful lot of grief. Here's why:



A Cheney Hammer is a mighty good companion for a Prentiss Vise. Both are made by men who know their work. Ask your dealer.

It has a press-forged lever; press-forged head on the screw, a castellated collar with prongs set into the shaft—no set screw—the front jaw *can't* work loose on the lever; detachable steel jaw faces; and, a sliding arm machined separately on all four sides to .002" tolerance.

When you buy vises specify Prentiss—it saves trouble for everybody.

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PRENTISS
106-110 LAFAYETTE ST. NEW YORK CITY
VISE CO.
CHENEY HAMMERS

assets are all convertible into cash at one hundred cents on the dollar at any critical moment. It does not operate with a banking charter, nor is a single employee of it under bond—if Charlie Flemming cannot trust a man without a bond, he won't trust him with one.

Savings funds deposited with the treasurer of the Flemming Corporation are invested in three classes of securities only—about fifty per cent. in government bonds, twenty-five per cent. in high grade municipal bonds usually netting about six per cent., and twenty-five per cent. in farm mortgages. Regular checking accounts on the treasurer are also part of the Flemming Bank idea, and those checks are accepted in leading stores with a kindlier feeling and lack of suspicion which does not exist with those drawn on any National Bank or Trust Company—the merchant knows all about the integrity of the Flemming Company and its employees.

It usually happens, however, that when an employee of the Flemming Company wishes to purchase a piano, radio, or something else which the Coöperative Trading Company does not purchase in quantity, that they make their selection and then send the general storekeeper of the trading company to the seller's store to make the final purchase, and they save a great many extra dollars in this manner. The dry goods stores generally allow the Flemming Company employees a trade discount of ten per cent. when they present a "discount slip." Charlie Flemming had to fight for that concession before he convinced the merchants that they would gain by helping his employees. When they refused, he threatened to have the trading company include clothing, shoes and household goods in their stocks of merchandise.

A pleasant-faced chap of about thirty-five entered the office shortly before our conference was finished, and after he had completed his audience with the president and had departed, Charlie Flemming proudly exclaimed, "That boy is one of my very finest employees! He is a graduate of two colleges—Yale and the State Penitentiary! He didn't learn much at the first one, but he learned a lot in the second one which he shouldn't have been taught. When we caught him here one night getting ready to blow our safe, we decided to keep him—he was too valuable to send back to the "human wreckage pile'! He has made good—three years with us now—has a lovely, devoted wife, a beautiful child, a pretty little home, and a good position as assistant superintendent is his reward! We're proud of that boy, and of eighteen more that the 'law' said were all bad! We'll make room for them as fast as they graduate from the 'Pen' if they prove to us that they are willing to try, we'll do the rest!"

It suddenly became clear to me why the startling growth and success of the Flemming Company was mentioned with an air of awed mystery by the "men of the street." Charlie Flemming had become a sort of god to those three hundred and eighty-seven employees—he was a true friend and partner.

The Flemming Company stands like a solid stone wall, without crack or fissure to be seen, and none can break it down, even during the most severe financial depressions, for Charlie Flemming has seen to that protection—that the assets of his firm, of his associates, and of every employee, are so safeguarded that nothing short of a national catastrophe could sweep the Flemming Company out of business.

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economy begins here

Economy, of course, usually begins with the purchase of *good* belting—and there is none better than Duxbak. But belt economy need not end in the purchasing department.

There are large belt savings to be made in the shop. Literally, economy begins here. See that the same care is exercised in the operation of your belting as in the buying of it.

We have a booklet that will help you make this saving in your shop. We will send it to you or any man in your plant—free. Use your letterhead or the coupon.

DUXBAK BELTING
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ESTABLISHED 1868

Tanners and Belt Manufacturers
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Chas. A. Schieren Co., 31 Ferry St., New York
Gentlemen: Please send me your book that answers questions on belt care and operation.
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The Crooked Hand of the Watch

Clever Detective Work in the Factory

By Chester Lyndelle

AROUND and around clicked the reel, methodically wrapping a two-inch band of tough paper on the new tire with all the meticulous accuracy of a top-sergeant spiralling his puttees.

"Nothing mysterious about that process, is there, Blanding?" Norcross, superintendent of the Crossley Rubber Company, demanded of his visitor. "Not much chance for the machine to go wrong?"

Blanding shook his head. "Apart from the fact that your tire-wrapping machine must be stopped by hand, introducing the possibility of a variation of two or three turns, I'd say the process might be called a repeat operation."

"Tires wrapped times feet of wrapping per tire ought to give our consumption, you'd say?" queried the superintendent, a wistful note in his voice. "But it doesn't. Three times during the past two months we have run short of wrapping rolls. A little thing, you'd think, but enough to delay shipments and ball up the department, and *I* get the blame. We've even had the expert here from the factory to check up, and he says they never made a machine that turned out better and smoother work. It's just another mystery, like the tube department coming out short on its 'heavy duty' tubes every few days."

"Losing tubes, or just piece-work padding?"

"Lost tubes, as many as a dozen at a time, and *that* gets the 'Old Man' wild. He just laughs at my wrapping troubles. Advises me to learn 'two times two'; but when the tube boss reports a loss of finished stock it hurts. I understand he has had both gates watched for a month, now."

Blanding stretched comfortably.

"It's a shame to bust in on my vacation this way, Norrie, but I can already diagnose symptoms of acute swelling in the region of my bump of curiosity. Don't suppose you need a sweeper in this department——"

"It isn't good sport to hit a man when he's down," Norcross frowned. "This is my first real job, and I am falling down before I have really begun. It's serious, to me."

"Same here. I've got three free months before I've got to go back to guiding the verdant freshman's thoughts from coeds to cosines—and I'd willingly forego a Canadian canoe trip to help a friend. Besides, there's that aforementioned bump."

Norcross brightened. "Tony, the trucker, is quitting tonight. If you want to show up at seven to-morrow I'll give you his job, and if you can help——"

"Help nothing! I'm positively feline in my curiosity, and this Crossley Rubber difficulty offers a convenient whetstone. Just give me a time-clock number and lend me a pair of your old overalls. I haven't had any on since our shop days."

And when David Blanding went to pushing a truck in the tire department of the Crossley plant the men sized him up as a bookish college chum of their superintendent working through a vacation, dusted sulphur down his back, sprinkled powdered talc in his sandwiches, and otherwise treated him as a nonentity.

The new job was five days old when Norcross beckoned Blanding aside.

"Been checking up on the machine, I see," he began. "Find anything wrong?"

"Nothing," came the response. "It's mathematically as accurate as squaring the circle. Losing again?"

"Out three rolls since four o'clock yesterday afternoon. Teddy, on the machine, drew four then, and used only part of one before the whistle blew."

"That's going some," Blanding admitted. Then: "Call the tube stock room and see how many they are short on yesterday's check. I mean it," he insisted, when Norcross hesitated.

There was a look of vindicated skepticism in the superintendent's eyes when he hung up the phone.

"'O. K. with the tally sheet,' the stock clerk says, why?"

"Tell him to check up again, even if he does have to do a little work," Blanding returned. "If that's the way he counts I'd hate to play golf against him."

"You think there is any connection between my loss and the one in the tube department?"

"I haven't begun to think, yet. But you tell me there are two leaks. I'd merely like to know if they both drain into the same sewer. Be a good fellow and make the call."

"Good Heavens!" Norcross gasped, as he turned from the 'phone. "Fourteen 31x4 red tubes gone! How did you know?"

"I didn't; merely suspicion. Your vanished wrapping strips are undoubtedly being used in connection with the tubes—and that fact materially shortens the length of time I'll have to break my back on this truck. Do you ever come back nights?"

"Not when I can help it. The wife——"

"Wouldn't like to see you hunting another job," Blanding finished. "Think we can stage a fake break-down that will bring you back here for a couple of hours after supper tonight? I want to get an owl's eye view of the plant."

There was a twenty minute wait on the sidewalk before the watchman appeared to unbar the heavy firedoor and admit them.

"It's you, is it, Mr. Norcross?" greeted the watchman, surlily. "I was out on me rounds and didn't hear ye ring till now."

"That's all right, Flynn," Norcross placated. "We have a couple of hours' work in the department, and will hunt you up when we're ready to go out."

Thirty minutes later there was a dismantled machine to bear out the hypothetical repair job, but little had been done in the interim.

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Protection

of your property is cheap at any price, but it is unusually so when VALDURA ASPHALT PAINT is used.

Daily, VALDURA demonstrates its economy, lasting and preservative qualities for such concerns as: the American Steel Foundry Co., Borden Milk Co., Cadillac Motor Car Co., Ford, General Electric and thousands of others.

In VALDURA you have an absolute waterproof, acid and alkali resisting paint—a paint that has a large covering capacity and is easy and clean to apply.

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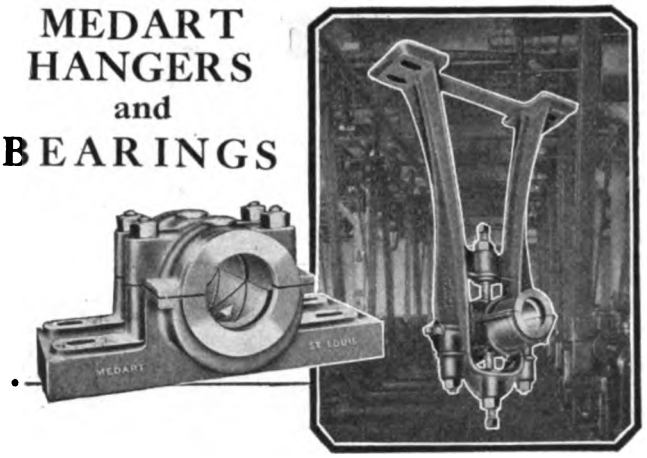
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Put up in convenient sized metal containers and in colors—Black, Brown, Red, Green.

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The Roadbed For Line-Shafting Equipment

MEDART HANGERS **Designed to have ample strength to carry any reasonable load with safety—and maintain proper rigidity under operating vibrations. They may be quickly erected, easily and accurately adjusted and aligned by means of 4-way adjustable screws with jam nuts. Bases are ground level by special machinery to insure true and accurate setting—frames are widely interchangeable. Furnished in six types—Universal Drop, Standard Drop, Single-brace Drop, Adjustable Extension, Closed Post and Open Post.**

MEDART SELF-LUBRICATING BEARINGS AND PILLOW BLOCKS. **Hanger Bearings are furnished split to facilitate erection and are of sufficient length to provide ample bearing areas. Bearing surfaces are lined with anti-friction metal with oil-fed grooves cut into their surfaces. Fitted with laminated fiber shims between halves of the bearing—to compensate for natural wear. All bearing ends are faced. Furnished in ring-oiling, wick-oiling, plain- and collar-oiling types.**

Medart is also prepared to furnish shafting supports of all types—Bracket-post Bearings, Angle Bearings, Pillow Blocks, Vertical Shaft Bearings, Floor Stands and Base Plates.

Immediate shipments—standard or special types—that's the "plus" in Medart service.

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MEDART
Everything in Line Shafting Equipment

"Noisy neighbors you have," Blanding commented, as pounding was heard. "Who owns the hammer on the other side of this brick wall?"

"Some new concern, makes hair tonics and cosmetics, I believe; and across there's a cloak and suit company. The fire insurance people made us erect extra walls on both sides before we could use rubber cement without boosting rates all along the block."

"Then the only way out of the plant is through the shipping room—other than the office and employees' entrances?"

"Yes. And Mr. Crossley will put up a bond there has not been a chance to smuggle anything through them."

"How about this man Flynn? Strikes me he's about as communicative as an oyster with the lock-jaw."

Norcross vouched for him. "Been with us five years and never missed a night. He has put out the only two fires we've had before they got big enough to call out the department. He's O. K."

"You can't tell an egg by its shell, my boy," scoffed Blanding. "I'm suspicious of some even after they've been opened. Anyway, it won't hurt to turn the spotlight on him. Is there any time Flynn isn't on the job?"

"He's never here on Sundays. His oldest boy, a fireman down in the power plant, stands the day trick unless we're working a shift—then they're both off."

"Flynn rings each station once every hour, you say. How long does it take him to make his rounds?"

"He has a schedule, the same as most watchmen: a specified time for each station. Young Flynn makes the rounds every two hours on Sunday—there's not the need for so much caution in the daytime."

"No, I guess not," Blanding agreed, absently. "Think you can keep young Flynn interested in the office next Sunday while I do a few stunts here? And arrange for Mr. Crossley to come down with you and spend all or part of Monday night up on the third floor with me? And ask no questions in the meantime? Fine!"

The Sunday program went off as scheduled, Norcross and the younger Flynn looking in on the department twice while Blanding appeared to be tinkering on the wrapping machine.

Monday night Norcross and Blanding checked out with the others, only to go around to the office entrance and be admitted by the "Old Man." Pausing to ascertain that Flynn was chatting with the outgoing workmen, the three made their way to the big storage room on the third floor, concealed themselves behind some old machinery, and settled down for a long wait.

Exactly at 6:37 Flynn tramped the length of the room to insert the key in his clock, to repeat at 7:37, and again an hour later. Then, when Blanding sat up to listen intently, all three could hear a muffled "whuff" on the floor below.

"Somebody knocked over a tire down in your floor, Norcross," Crossley whispered. "Flynn isn't due there for fifty minutes yet."

"Sh-h-h-h!" Blanding cautioned.

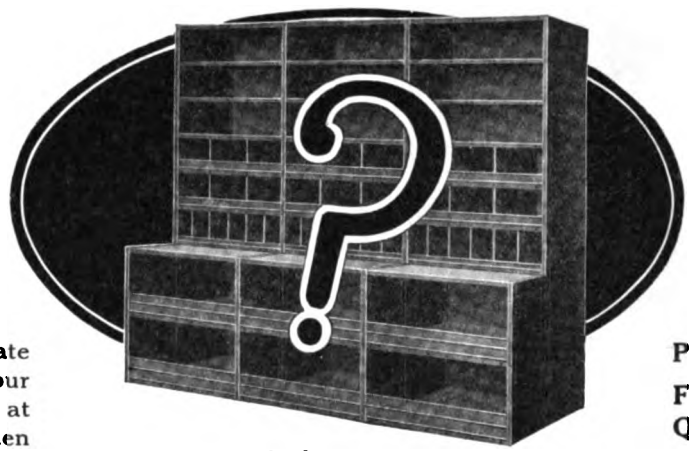
"There followed the soft whirr of an electric motor, and then the rhythmic clack-clack of the tire-wrapping machine, and Norcross started to his feet.

"Wait!" Blanding ordered, carefully shading a flashlight as his watch ticked off the seconds. "Give him a little more time. Now!"

With the word came the loud clanging of the fire

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IS FLOOR SPACE VALUABLE



YES, is the only answer. Normal, healthy business growth brings this fact home to all of us. Crowded conditions do not always demand an immediate building program. Your storage system may be at fault. Perhaps, wooden racks are occupying valuable floor space which steel shelving could release. Durand equipment increases storage capacity 20% to 40% in the same floor space through adjustment features which eliminate air spaces over stock in the bins.

Steel storage equipment will pay dividends surely and often because of:

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The application of these features enables us to serve without obligation but with profit to you.

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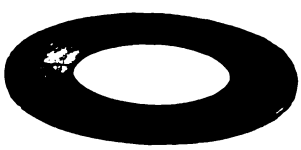


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Keep Bristol's Steel Belt Lacing at strategic points in your shop. It is insurance against idle machines and lost time, so often caused by broken belts.

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Send for sample fasteners and illustrated bulletin CE-719.



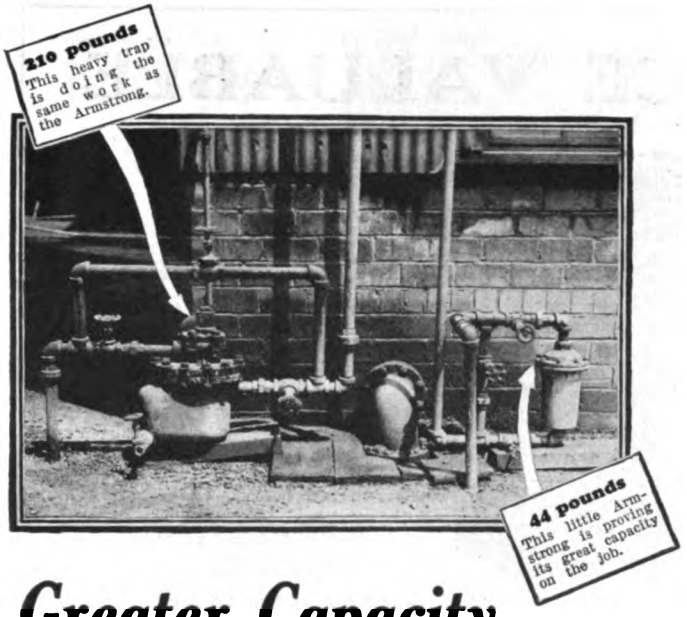
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Greater Capacity Smaller Size

THE inverted, submerged bucket principle, exclusive with Armstrong, gives it unequalled capacity.

At an Ironton, Ohio plant an Armstrong and another trap were installed side by side, as shown above. Both are draining 36 2-inch pipes 25 feet long. The Armstrong weighs 44 pounds—the other 210!

Here's what Armstrong's great capacity brings you:

1. Low first cost
2. Low heat loss from radiation
3. Low shipping cost
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(Foundations and brackets aren't necessary)

And here are other advantages you get:

5. No air-binding
6. No scoring
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Prove this for yourself. Send the blank below for an Armstrong to test. Try it out—then return it collect.

Test an Armstrong for 90 days

Please ship prepaid an Armstrong for 90 day test. It is understood that when test is completed the trap is to be returned collect.

Size of trap..... Size of pipe connections.....

Maximum pressure.....(Do not neglect to state maximum)

Firm .....

Address .....

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Signed ..... Position.....

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Send the catalog only; send no trap

Mail to ARMSTRONG MACHINE WORKS
326 MAPLE STREET, THREE RIVERS, MICHIGAN

II 3-R-RTG

gongs throughout the plant, the spring-rain sound of the sprinkling system, and the quick plap-plap of a man running on a wet floor.

Down the steps crowded the three, Blanding in the lead. At the sprinkler system valve protecting the tire department he paused to shut off the water and then, with Crossley, turned to see Flynn, dripping from head to foot, returning. For an instant the watchman stood agape in the glare of Norcross' flashlight and then again took to his heels.

Norcross switched on the department lights and stared at the dripping sprinkler heads.

"What in thunder set them off?" he demanded, when his eye caught sight of a tire in the machine, nearly wrapped. On the floor lay half a dozen inner tubes, each partially inflated and tied at intervals with string so that they resembled large Bologna sausages.

Norcross stooped to pick up one of the tubes, only to let it fall. "It's full!" he exclaimed.

And full it was. Securely held within the walls of the tube by each of the constricting strings was a pint pop bottle, carefully corked and containing pure grain alcohol. The tube had been slit, the cut vulcanized shut, and air enough pumped in to round out the tube and cushion the contents. Within the partially wrapped tire was found another of the "sausage" tubes; and when Blanding finished the job, after fiddling with the wires an instant, it was evident that the wrapped tire would withstand a severe jolt without damaging the precious bottles within.

"Pretty damned clever," grunted Crossley, when Blanding had demonstrated the shock-proof qualities of the scheme. But what happened to Flynn?"

"Funk; a plain case of funk. I hooked up a wire so that when Flynn started the motor on the wrapping machine it would heat up a bit of resistance wire and, eventually, set off the fire alarm."

"But the sprinklers went off, too!" Norcross protested.

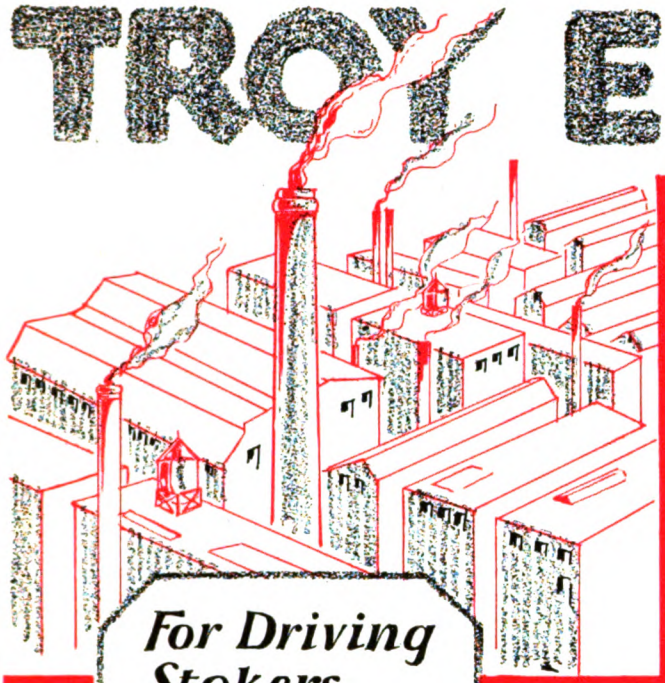
"Admitted," Blanding acquiesced. "I had to be sure Flynn would not wait to remove the evidence before he beat it—and there's nothing like a sudden shower to drive a man to cover. I merely carried my new circuit past a few of the sprinkler heads with a bit of resistance wire at each nozzle and when the wire got things warm enough to melt the solder, they automatically released and Flynn showed that he was only human, for all his clever scheme, by ducking for cover first and thinking afterwards."

Through the shipping room records the half-wrapped tire was found to be consigned to a local tire house; whence, on advice of the prohibition enforcement officers, it was sent out with the others in the morning.

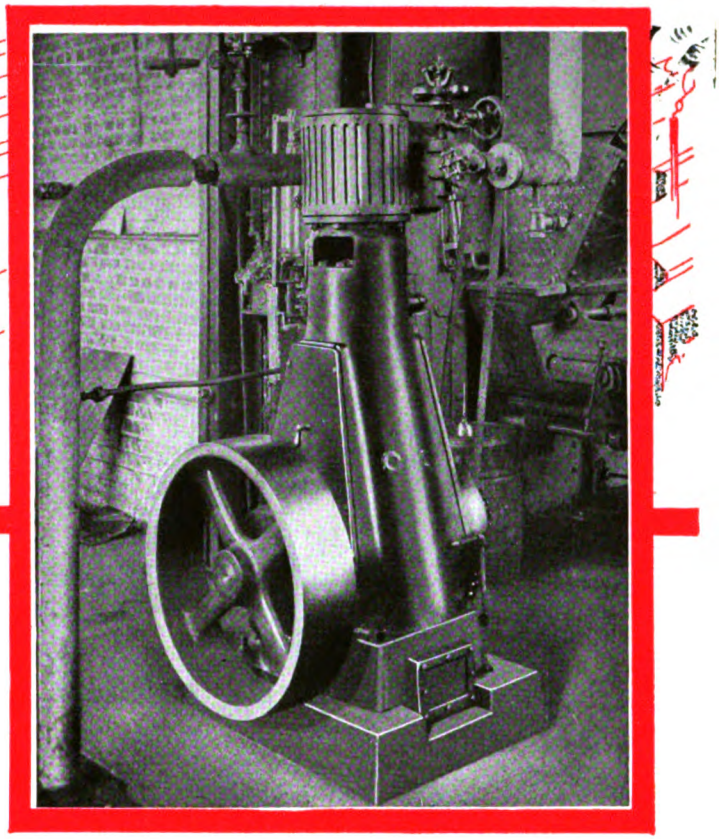
On the evidence of the filled bottles, the "charged" tire, the cleverly concealed rubber tube through the brick wall and the long-sustained loss of alcohol which the cosmetics manufacturers had not dared admit, the case was built. Flynn, a brother-in-law found to be occupying a watchman's post next door, and the receiving clerk for the local tire jobber were arrested, and with their conviction the loss of tubes—and wrapping strips—ceased. And a new man pushed the truck in Norcross' department.

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TROY ENGINES



For Driving
Stokers
Fans
Blowers
Pumps
Generators



Why Prominent Stoker Manufacturers Recommend TROY Engines

THE majority of the manufacturers of well known makes of stokers now specify Troy Engines.

With Troy Engines as stoker drives they can assure users of greater flexibility, more economical operation and fewer shut downs due to engine troubles. In fact, there is no better stoker drive made than a Troy Engine, considered from every angle.

Troy Engines have served industry during the past 35 years. Built in a plant which specializes in the making of good engines only, the result has been, high quality engines sold at a reasonable price. Economical production methods, ideal labor conditions, the location which makes low freight rates possible, are all factors which have helped to lower the cost of manufacture.

Troy Engines have the self-compensating, steam tight valve which automatically clears the cylinder of any condensation. They are oil and dust proof—entirely enclosed. Bearings are always assured of a continuous supply of oil through the Troy Automatic lubricating system.

Built in sizes up to 200HP both in horizontal and vertical types.

Write for Troy Catalog

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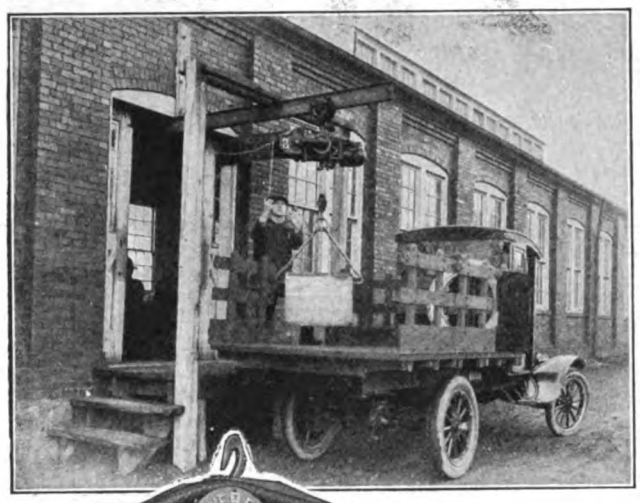
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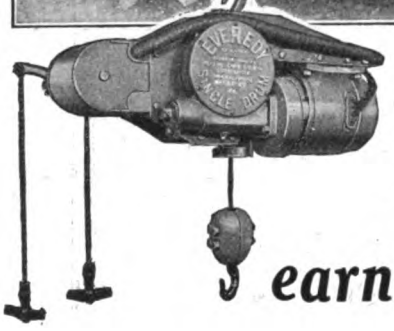
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Trucks earn nothing while they wait to be loaded

The way to get the most out of your equipment outside of the plant is the same way that you get the most out of the machines inside—keep the wheels turning.

Trucks that spend hours each day standing idle while they are being loaded or unloaded are losing valuable time and much money for their owners. It is remarkable how few men study this phase of their business. Two or three laborers sweat, pull, strain at heavy loads, wasting precious hours that could be turned to more profitable investment if only a simple arrangement like that shown in the photo above had been installed. The cost is small, the saving in labor and time is valued as several thousand dollars a year.

Write today for complete information on the necessary Reading Overhead Equipment that will put your plant on a really efficient basis as regards its materials handling problem. To do this in no way obligates you.

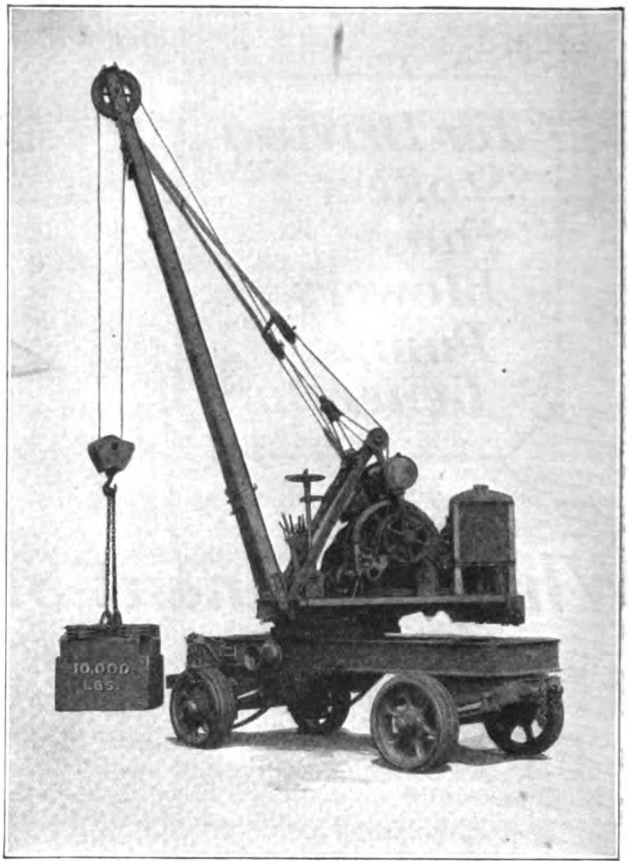
READING C AND B

Reading Chain and Block Corporation
READING, PA.

A New Truck and Trailer Crane

A NEW truck and trailer crane has recently been placed on the market by the Harnischfeger Corporation (formerly Pawling & Harnischfeger), of Milwaukee, Wisconsin. This crane—known as the P&H Model 203-A Truck Crane—is the final result of a long series of tests and developments made by the P&H Engineers, and the machine is said to embody the valuable combination of speed, compactness, light weight, sturdiness and complete accessibility.

The truck or trailer mounting enables it to move at regular truck speed, thus cutting down the inactive time to a minimum. This is especially advantageous when there are a number of jobs, all at different points. When



on the job, it is fast in operation—having a line speed of 125 ft. per min. and a swing speed of 5 r.p.m.

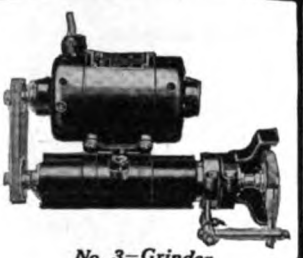
The light weight of this machine is realized at once from the total weight of 13,000 lbs. This weight includes the entire crane equipment with the structural frame which fits on the truck, but does not include the weight of the truck.

This light weight makes it possible for a 5 or 7½ ton truck to handle the crane and also reduces the danger of miring in soft ground.

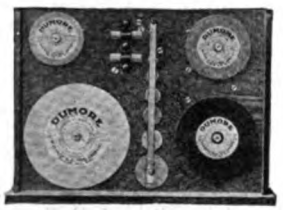
This machine is built to handle a ½-yard clamshell bucket on a 25 ft. boom, or for lifting 10,000 lbs. at 10 ft. radius.

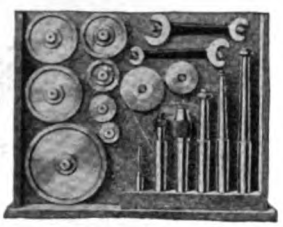
The machine is driven by a 4-cylinder, 40 hp. motor, which operates at a governed speed of 1,000 r.p.m. The motor is placed at the rear of the revolving frame and is entirely accessible for care and operation.

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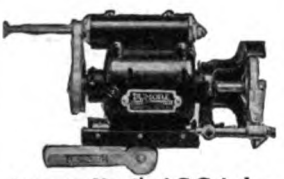


No. 3—Grinder





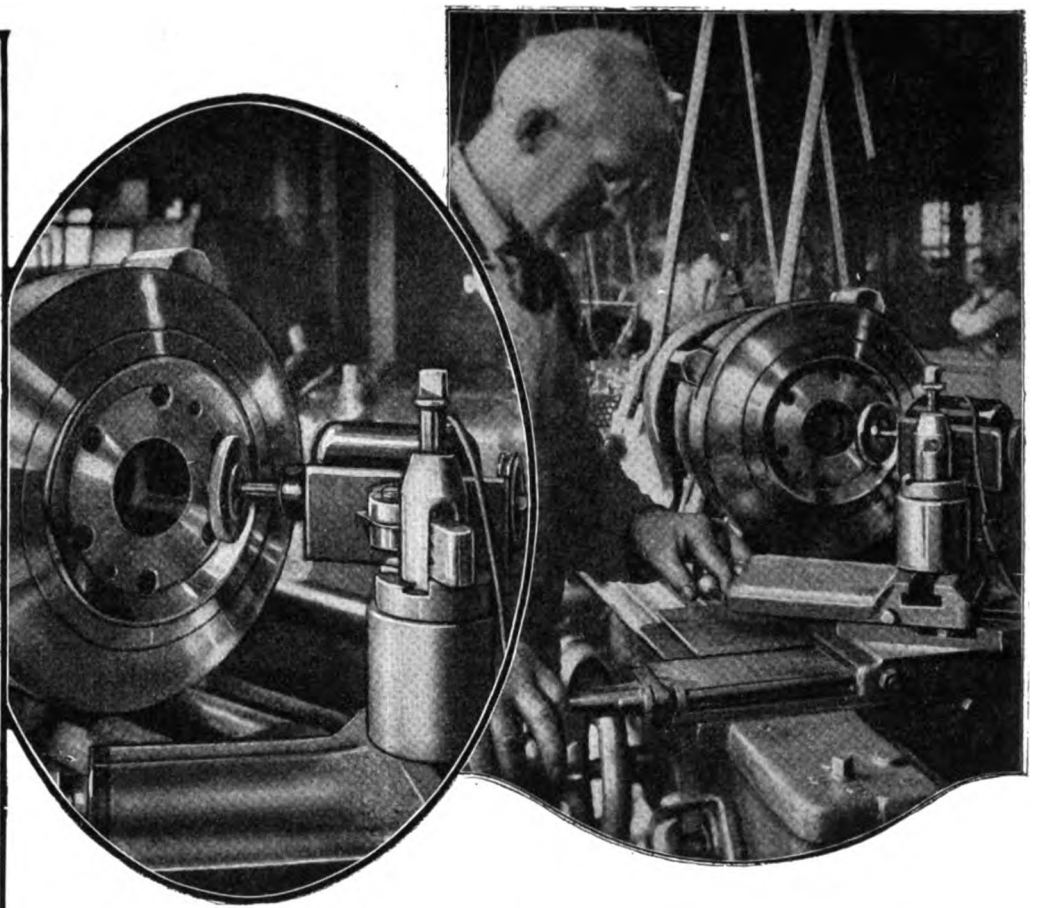
Wheel & Spindle Equipment Furnished with Dumore No. 3 Multi-Speed Grinder



Dumore No. 2½—AG Grinder
For general tool-room use. Length of internal spindle 3". Spindle speed 10,000 to 30,000 R.P.M. Self aligning ball bearings. Comes completely equipped.



Dumore No. 1—JG Grinder
An inexpensive tool for garage, repair shop or tool-room. Speed 15,000 R.P.M. Length of arm 4¼". Extension spindle 2". Grinder pivots on base.



For six years—five days a week—a Dumore No. 2 AG has done the Die Grinding in one of the largest Wire Wheel Plants in America

With the work set up on an engine lathe, and the Dumore grinder set up on the tool post, this hardened steel center pad, 14" in diameter, is ground to a perfect die in 12 hours. Working five days a week for six years, this Dumore High Speed Grinder has set a high standard of service in this busy auto plant.

Nor is this unusual performance. You'll find Dumore Grinders in factories all over the world—uncomplainingly turning out their quota of perfect work, day after day and year after year.

Dumore grinders are sturdy and dependable, with construction and adjustment that permit grinding to limits of .0001 without taper, bell mouth or chatter marks. Six styles and sizes—all operating on either alternating or direct current.

Send for this Free Book

Here's a book that should be on every foreman's desk. Full of actual photographs showing how others have cut costs on hard jobs with Dumore grinders. You'll find it a real help. Just ask us for it—on the coupon. It's free!



WISCONSIN ELECTRIC COMPANY, 70 16th Street, RACINE, WISCONSIN

DUMORE

HIGH SPEED GRINDERS

Wisconsin Electric Company
70 16th St., Racine, Wis.
I'm interested in cost-cutting grinding stunts and short cuts. Send me your booklet, "Hitting the High Spots."

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The New

Ettco



Every Part Hardened

To keep pace with the demands for Increased Production and Lower Maintenance Costs, Ettco Drill Chucks are now being made with All Hardened Parts. They are stronger and better.

1. Lighter in weight.
2. All Hardened Body.
3. Keyless.
4. Hand Operated.
5. Ball Bearing.
6. Continuous Grip.
7. Simple Construction.

Seven good reasons for using the new Ettco.

Cash in on your old Drill Chucks. Send them to us and we will allow 15% on the exchange from the following list prices:

No. 1A	Ettco—0 to ¼ in.	$ 5.50
No. 2	Ettco—0 to ⅜ in.	6.50
No. 3A	Ettco—0 to ½ in.	9.00
No. 3½A	Ettco—⅛ to ⅝ in. ...	11.00

ETTCO Chucks increase the value of electric drills

Eastern Tube & Tool Company, Inc.

594-602 Johnson Avenue, Brooklyn, N. Y.

Filming the Industries

By Charles Fitzhugh Talman

THOUGH it employs no high-priced stars and has launched no million-dollar spectacles, the United States Government is assuming a prominent place among the motion-picture producers of this country. Official motion-picture studios and laboratories flourish in Washington and elsewhere, and their productions serve a variety of purposes, from inculcating scientific dairy methods to depicting the joys of life in the Navy.

As long ago as 1913 the Bureau of Mines, then under the Interior Department, began to use "movies" in its



educational campaign on the subject of safety first, especially in reference to the dust hazard in mines. Soon afterward the Bureau undertook to distribute approved films presented to it by certain industrial concerns. Finally, the Bureau of Mines and the Department of Commerce set on foot a comprehensive plan for obtaining the coöperation of various mineral and manufacturing industries in the production of industrial films. More than a hundred of these films have been made. They have been produced at very small cost to the Government, as the principal expense is borne by the industries. The Bureau of Mines (now a branch of the Department of Commerce) provides a single expert to supervise the making of the pictures, and handles the distribution of the films. The principal distributing center is the Pittsburgh Experiment Station of the Bureau of Mines, in addition to which there are 23 subordinate distributing agencies, located mostly at universities and colleges. The pictures are available without expense except transportation charges for the use of schools, churches, clubs, business organizations and the motion-picture theatres.

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Handling Bags of Grain from Ground to Cars.



Link-Belt "A" Loader. Note Shaking Screen. All-Metal.



Link-Belt "C" Loader for anthracite coal. Loads and screens.

Guaranteed Portable Loaders

YOU take no chances when we recommend a Link-Belt machine—

Our complete line of bucket loaders, also 18″ and 24″ wide troughed "Service" belt conveyors, are on the job day in and day out—

Handle coal, sand, stone, broken glass, cord wood, oxide, oyster shells, briquets, salt, etc.—quickly and economically the Link-Belt way.



31 ft. Conveyor with gas engine in a quarry. Loading rocks.

Write for latest prices and descriptive literature.



Unloading coal from cars to barges.

LINK-BELT COMPANY, 2045 HUNTING PARK AVE., PHILADELPHIA, OR 300 W. PERSHING ROAD, CHICAGO (ADDRESS NEAREST OFFICE)

Please send me full particulars about your_____Portable Loader. 2375

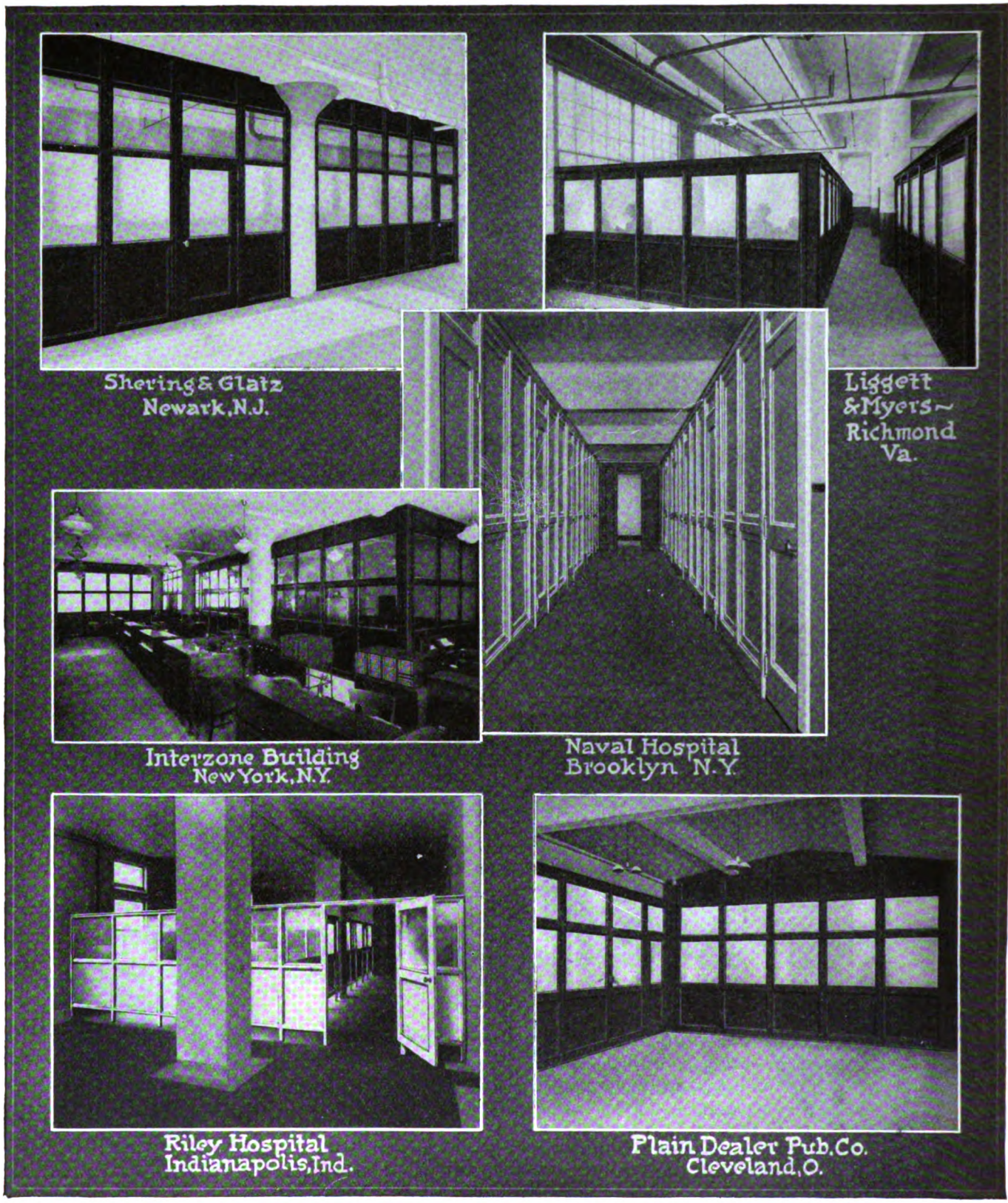
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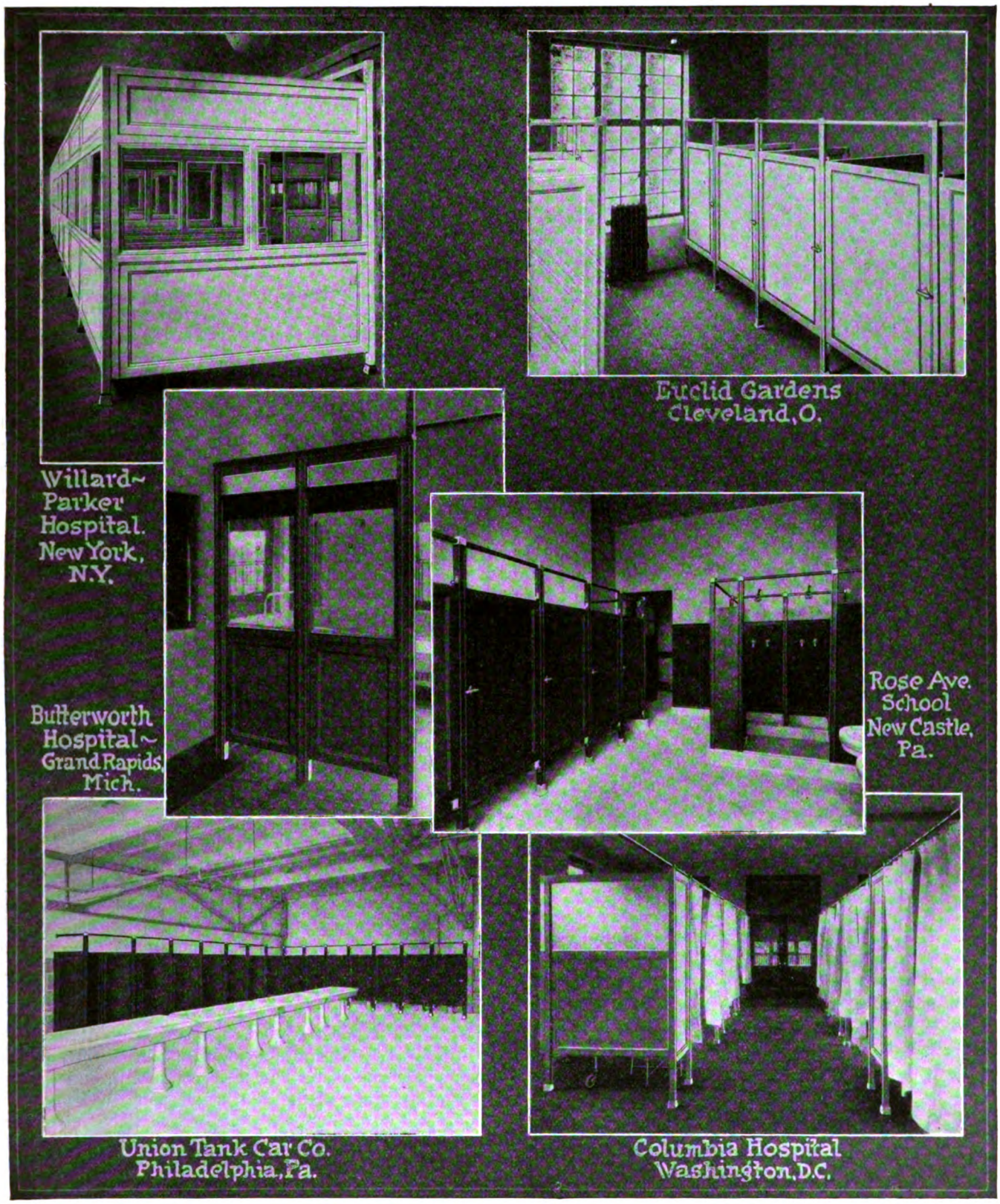
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19 Times More Light!

Increased from 2 to 38 Foot Candle Power Illumination by Cleaning the Glass with SKYBRYTE!

That in 17 brief but strong words and 2 pictures tells the story of what SKYBRYTE did for the Conveyor Chipping Room at THE OTIS STEEL CO., Cleveland (Lakeside Plant).

SKYBRYTE, *"The National Glass Cleaner"*—

—cleans the dirtiest glass instantly
—floods your plant with daylight
—cuts down electric light bills sharply
—decreases accidents and spoilage
—accelerates production
—is harmless to paint, putty and sash
—costs only ¾c per sq. ft. (including labor)

And we'll prove it *at our risk* by actual demonstration on your own glass. Just use the coupon below.

Skybryte CLEANER (LIQUID)

"Lets the Daylight In"

The SKYBRYTE Company, 1195 Kieth Bldg., Cleveland
Chicago Branch, Monroe Building, 104 S. Michigan Avenue

TRIAL OFFER

The SKYBRYTE Company,
1195 Keith Building, Cleveland, Ohio.

You may ship us five gallons of Skybryte on trial and one regular 75c Skybryte brush FREE. We will use enough to make a thorough trial—enough to clean several hundred square feet. If we are not fully satisfied we will return the balance to you within 30 days return charges collect and you will cancel invoice. Otherwise we will pay your invoice for five gallons Skybryte at $3.00 per gallon, F. O. B. Cleveland.

Skybryte in bbls. $2.50 per gallon freight allowed.

Company .....
Street .....
City .....

An Estimating Form for Work and Reference

By Donald A. Hampson

IN all large industrial establishments, there are fully organized planning and estimating departments, and the manufacturing work is so systematized that there is little or no guesswork included when an estimate is required upon a special job. It resolves itself into a clerical process wherein the different items are tabulated from filed records or rates and certain pluses are included in accordance with the plant's percentage for profit, selling, etc. There is very little uncertainty about costs, and that uncertainty diminishes as the particular job approaches the plant's standard product or its units.

But where the work is radically different from anything that has been done before, there must be more uncertainty. In such cases, engineers must go over the details, foreman of departments, that represent widely different trades must be consulted, and any records or experiences with kindred unknowns must be used in an effort to make the estimate as (1) low as possible, in order to secure the business and (2) sufficiently high to cover contingencies and to net the plant a legitimate profit in order that it may satisfy the owners and take care of depreciations.

Smaller plants do not have estimating departments and so that work falls upon the manager or the draftsman or a foreman or some of the assistants to these men, if the business is large enough to keep more men in these "non-productive" positions.

The accompanying form is that of a special machine which was built in a machine shop that caters to this class of work. It is submitted because, in principle, it may be applied to any line of manufacture. It shows losses as well as profits and it places those losses just where they were incurred, not in a lump at the end.

Analyzing the form, it will be seen that there were some seventeen prints covered, numbered from A to Q. Each one was considered separately and was divided into such elements as labor, materials, patterns, etc. The total of these individual estimates gives the estimated cost of all the work upon that particular sheet.

Following through the work, it will be noted that some parts were "stock," that is, were found ready to use in the catalogs of parts makers. One of the pieces —the frame—was put outside the plant entirely, as being of a size not adapted to their equipment, and the estimates are those of the contracting company.

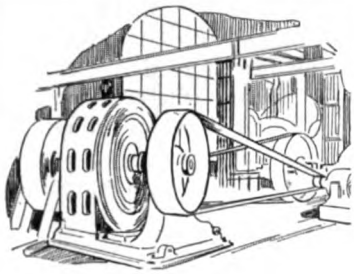
It will also be noticed that there is a column reserved for the actual costs of the different sheets, to be filled in as work progresses. This is very important. Doing this at a time when everything is fresh in mind makes for accuracy; put in a column with the estimate, it involves practically no clerical work *and* it keeps the whole record in small space—theory and practice may be compared at a glance.

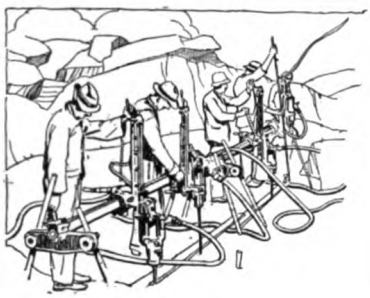
When the work was completed, the shop had a chance to see where they had lost and where they had made. Those items which came out even are checked off and it will be noticed that they are the negligible ones in the list. The horizontal totals show the entire estimated cost of the parts detailed by each sheet of the drawings while the vertical totals show the full estimated amount

(*Continued on page 72*)

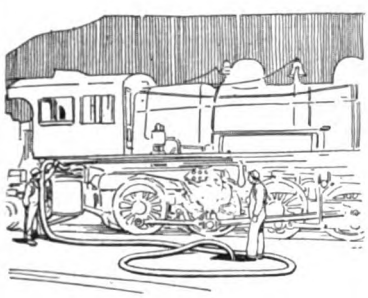
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Good rubber—an industrial necessity









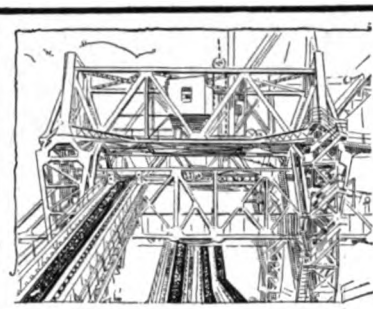
The steel which, rolled into rails and fabricated into hulls, transports our manufactures; the stone and brick which house our industries; the cast iron and brass of our machinery—these have fired men's minds by the sheer bulk of their creations.

Rubber is less spectacular, but it is as indispensable to our industrial life as any of these materials.

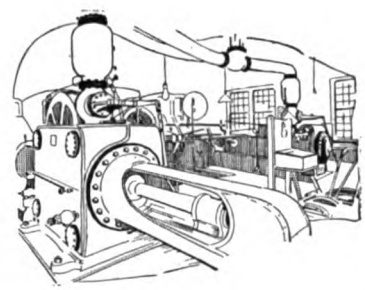
Rubber air hose, driving rivets by the million, gives form overnight to either factory or ship. Rubber packings and rubber insulated wire make possible our modern steam and electric power plants. Rubber hose carries to the drills of our mines, quarries and oil wells the pressure to operate and the lubricant to cool them. Rubber belting conveys the raw material at points of transfer, and drives machines which turn out finished products.

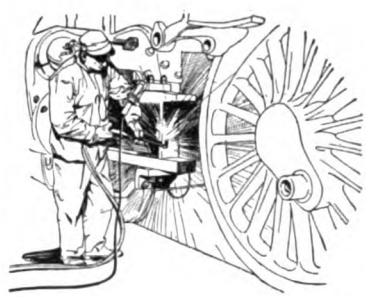
Such tasks deserve good rubber, and the United States Rubber Company has played a leading part in making good rubber a recognized industrial necessity. It has made important contributions to the development of almost all the rubber products used by industry. It has acquired extensive plantations to assure a permanent supply of high grade crude rubber. Looking always to the future good of the rubber industry and of industry as a whole, it has earned a name for high quality and well tested values.

Mechanical rubber goods can have no better guarantee than the "U. S." trade mark.











United States Rubber Company

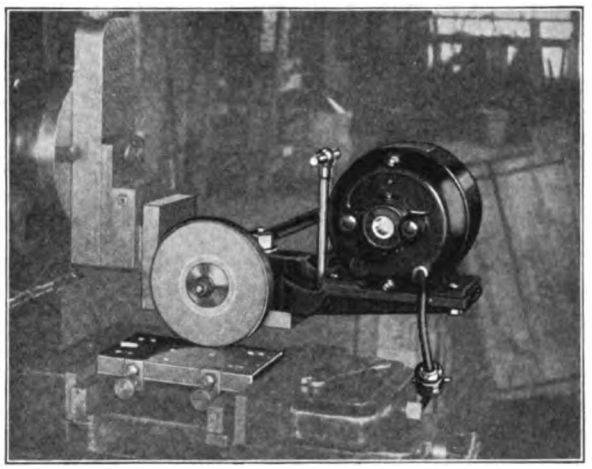
1790 Broadway, New York City

Branches in every industrial center

US RUBBER SYSTEM — UNITED STATES RUBBER COMPANY AND ASSOCIATED COMPANIES

Trade Mark

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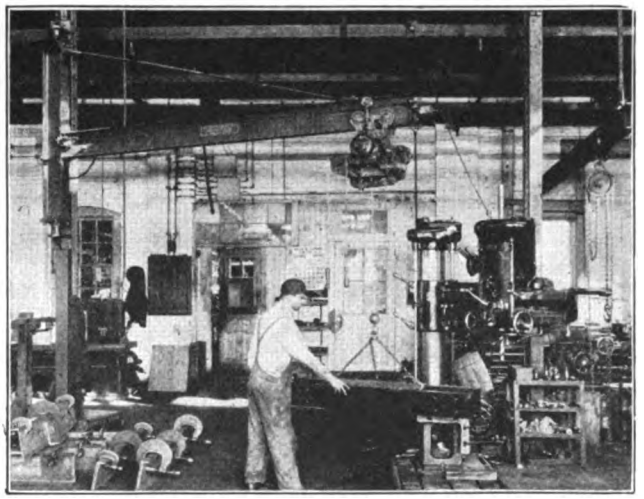


The Gilbert Portable Precision Grinder

—will replace several of the more bulky single-purpose machines. It is adaptable for external, internal, surface, thread and extra-deep-hole grinding.

Full details on request

J. E. GILBERT GRINDER CO.
214-16-18 Greenbush Street
MILWAUKEE, WISCONSIN



LIGHTEN LABOR
WITH
ROEPER ELECTRIC HOISTS

Keep the machines active so they produce the utmost.

The above outfit—Hoist, Trolley and Post Crane—can all be bought for less than $500.00.

Ask for full information.

ROEPER CRANE & HOIST WORKS, Inc.
1728 N. 10th St., Reading, Pa.

Traveling Cranes Electric Hoists Trolleys

(*Continued from page 70*)

for such things as labor, patterns, special tools, and so forth.

Again, the last lines, vertical and horizontal, give the actual costs separated both as to drawings and class expenditure. It will be noticed that the actual costs were about $200 more than estimated, the biggest difference coming from the item of labor.

But under "Summary of Costs" there is an amount to cover the anticipated miscalculation and the unlooked-for which the job might entail. This is the twenty-five per cent. item which is added in. Such a charge is not

ESTIMATE ON ONE SPECIAL RIVETING MACHINE—H. H. CO., 2/8/23

Sheet	*Labor*	*Material*	*Pattern*	*Spl. Tool*	*Stock*	*Total*	*Remarks*	*Actual Cost*
A frame	$85W	$120W	$85W	$26W		$316	All to be Wilson's	$422
B ram	28	2	8			38	Machined to their die	38
C pitm'n	15	3	3			21		24
D rods	6	2	5			13		12
E rocker	14	3	6			23		19
F	2				50	52	Stock crankshaft	52
G	1				29	30	Standard spur gear	30
H	2				8	10	C. I. pulley	10
I clutch	60	6	15	12		93		118
J index	45	18	20			83		104
K carri'r	23	4	3	10		40		52
L links	12	3	4	4		23		18
M feed	34	2	5	16		57		74
N	9	3	4			16		16
O magaz'e	8	1	6	3		18	For A. W. Co. hollow riv't	55
P start'r	5	2	5			12	Bz. lever	10
Q brack't	8	1	6	1		16		14
Total	357	170	175	72	87	861		1068
Actual	511	195	201	73	88			1068

SUMMARY OF COSTS

Total as above	$861
Fit and assemble	150
Add 25% to above	253
Superv'n, draw, and overh'd	142
Freight and mis. handling	35
Grand total	$1441

LOSSES ANALYZED

$38—our mistakes.
42—unchecked prints.
35—prints were wrong.
106—Wilson's mistakes and miscalculations.
12—inspector's alterations.

excessive and every manufacturer knows that he must make one of this nature on new jobs.

Referring again to the second form, the summary of costs includes the assembling, the overheads and non-productive, freight, etc. These were estimated high enough to cover fully.

The third form separates the causes of losses. It was added for information and as a warning another time. One thing that it shows is that the shop men's mistakes were relatively small—only $38—whereas the outside shop's work cost them nearly three times that amount.

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Don't Clog Up Your Shelves

Stock one complete line of good screws. You'll be able to satisfy ALL your customers and keep your investment down.

Ferry Process Screws cover every need—a complete line.

They're the best screws that can be made—exact in micrometer measurements—uniform in strength and toughness through heat-treating.

Made clean-cut and smooth by careful machining.

And Ferry Screws cost no more than ordinary screws.

Ferry is the line to concentrate on. It means quick turnover to *satisfied* customers. Write for prices.

"If It's Upset—It Must Be Heat-Treated"

THE FERRY CAP & SET SCREW CO., Cleveland, Ohio

FABRICATED HEAVY SHEET METAL PARTS

have fully demonstrated their economy and practical usage when compared with castings.



¼ inch gauge and lighter

The Machine trade has steadily increased their use of

SHEET METAL PARTS

in the construction of their equipment because sheet metal parts require no machining; being lighter in weight (but of high tensile strength) shipping costs are reduced and as each sheet metal part is perfect it further reduces manufacturing expense by eliminating defects and breaks found in iron castings.

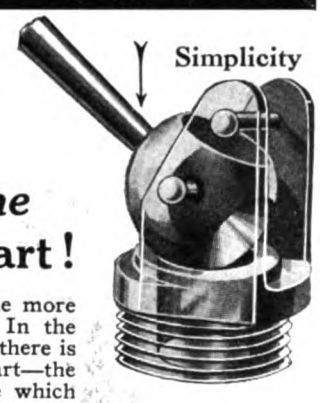
Send us your blue prints or pencil sketches and our engineers will offer recommendations as to how you can reduce your operating costs.

STEEL—IRON—BRASS—COPPER—MONEL METAL Requiring

Stamping—Forming—Drawing—Blanking—Punching

See Data A.S.M.E. Condensed Catalogue of Mechanical Equipment. Also Hendricks' Sweets Engineering, and Thomas Catalogues.

THE BREESE BROS. CO. Cincinnati, Ohio



Only *One* Moving Part!

The more parts, the more chance for trouble. In the Paracoil Steam Trap there is only one moving part—the solid recessed sphere which rotates over the valve seat. Even after long wear, this simple construction cannot cause trouble and it always assures a tight contact.

You can save big money and end steam trap troubles by installing tested Paracoil Steam Traps, which are guaranteed against repairs for two years, if installation and operating instructions are followed.

Designed for capacities up to 75,000 lbs. of water per hour. Stock pressures 30 lbs., 125 lbs. and 200 lbs. Other pressures furnished upon application.

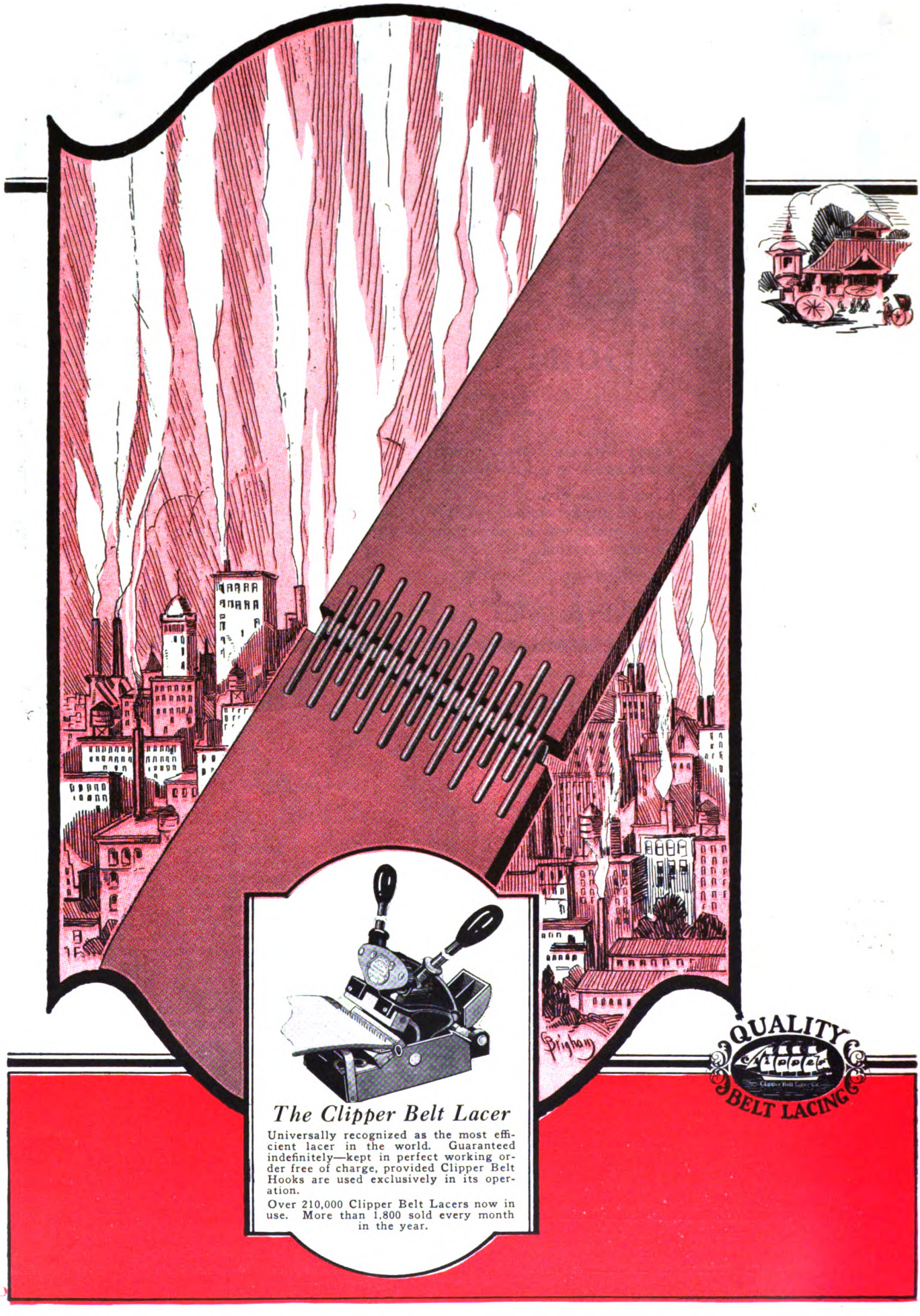
Write for catalog A-12

DAVIS ENGINEERING CORP.
90 West Street New York
Factory—Elizabeth, N. J.

Paracoil STEAM TRAP



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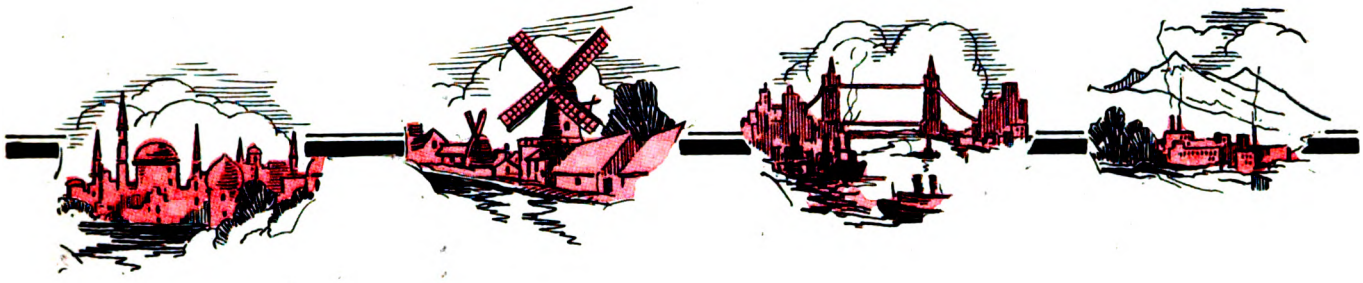
The Clipper Belt Lacer

Universally recognized as the most efficient lacer in the world. Guaranteed indefinitely—kept in perfect working order free of charge, provided Clipper Belt Hooks are used exclusively in its operation.

Over 210,000 Clipper Belt Lacers now in use. More than 1,800 sold every month in the year.

For products not advertised in this issue write Industry Illustrated

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Clipper Products Are Used Throughout the Manufacturing World

IN every section of the world, wherever factories hum and wheels go round, belts are being held securely and efficiently with Clipper lacings.

One third of the enormous daily production of 4,000,000 Clipper Belt Hooks is exported over seas and into foreign lands. A large part of the world's belting is fastened with Clipper Hooks.

It is evident that Clipper Belt Hooks must sell at very reasonable prices in order to meet foreign competition in foreign countries. These reasonable prices are possible only because of large scale production.

But price is not the only reason for the popularity of Clipper Hooks. They are produced with the utmost care, of the best fatigue-resisting steel to withstand the greatest strain. High grade special machinery is employed to make each hook as mechanically perfect as possible.

Clipper Pins are the best we know how to make.

Clipper joints have a staggered double grip, thus distributing the tensile strength over a wide section of the belt.

Clipper Belt Lacers are sold under a perpetual guarantee that they will be kept in perfect working order free of charge provided Clipper Belt Hooks are used exclusively in their operation.

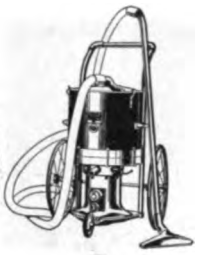
Standardize on Clipper—for increased production, economy, quality and satisfaction.

Clipper Belt Lacer Company

GRAND RAPIDS MICHIGAN

Clipper

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read these 10 facts

then fill in and send the coupon

1 The "INVINCIBLE" Industrial Vacuum Cleaner will remove that troublesome dirt which is a hindrance to your production. It will pick up all kinds of dust and dirt, glass, metal filings, and other abrasive material, without injuring the vacuum unit in any way at all.

2 The "INVINCIBLE" is extremely portable. It can be used all over the shop—thru narrow aisles and in otherwise inaccessible places

3 One of the great advantages of this type of vacuum cleaner is the fact that there is no installation expense entailed by users.

4 It is of unusually rugged construction, and is designed and built to withstand rough plant handling and to give constant service.

5 This machine has years of service built into it. Some of our installations being in constant use for 19 years.

6 It has the combined advantages of both a vacuum cleaner and a blower.

7 The type of floor in no way affects the usefulness of the "INVINCIBLE." It works equally well on concrete, rough wood, and tile floors.

8 It holds as well as picks up all kinds of dirt.

9 Its usefulness is not confined to the cleaning of floors. It works with equal effectiveness on walls, ceilings, overhead pipes, lighting fixtures and machinery. Its usefulness in cleaning walls before painting has often resulted in a saving equal to the value of the machine.

10 In every factory and plant which has installed this equipment, many additional uses have been found for it. Our service men will be glad to suggest additional uses in the light of our broad experiences with the more general applications of these machines all over the country.



INVINCIBLE VACUUM CLEANER MFG. CO.
Dover, Ohio

Fill in the attached coupon and we will be glad to send you full descriptive data on a vacuum cleaner built especially for industrial plant use which embodies all of the above qualities—the "INVINCIBLE."

Name.....

Street No.....

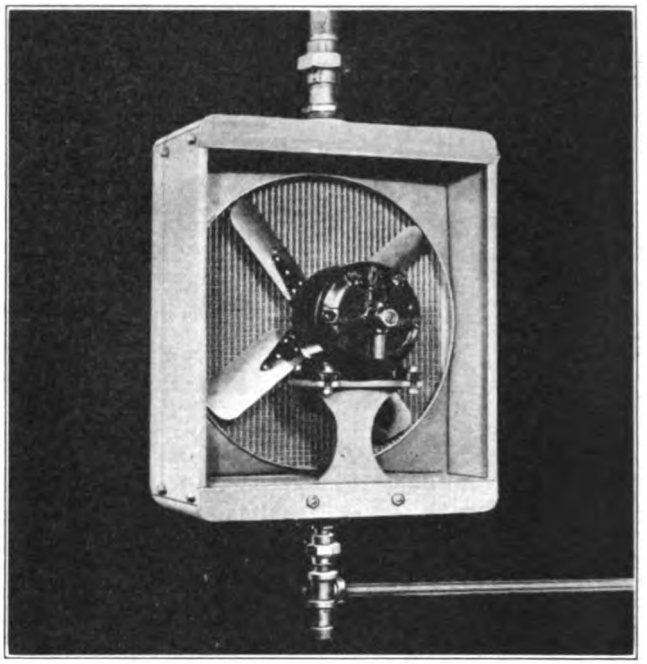
City..... *State*.....

Kind of business.....

Floor Space.....

A New Unit Heater

THIS unit heater is a recent product of the Modine Mfg. Co., of Racine, Wis. It consists of three major parts; the condensor assembly, the manifold assembly, and the motor and fan assembly.



The total weight of the heater is 125 lbs. It is rated at 165,000 B. T. U. per hour with five pound steam pressure and room temperature of 60 deg. Fahr. Approximately 2,000 cu. ft. of air per minute pass through the heater.

Erratum Notice

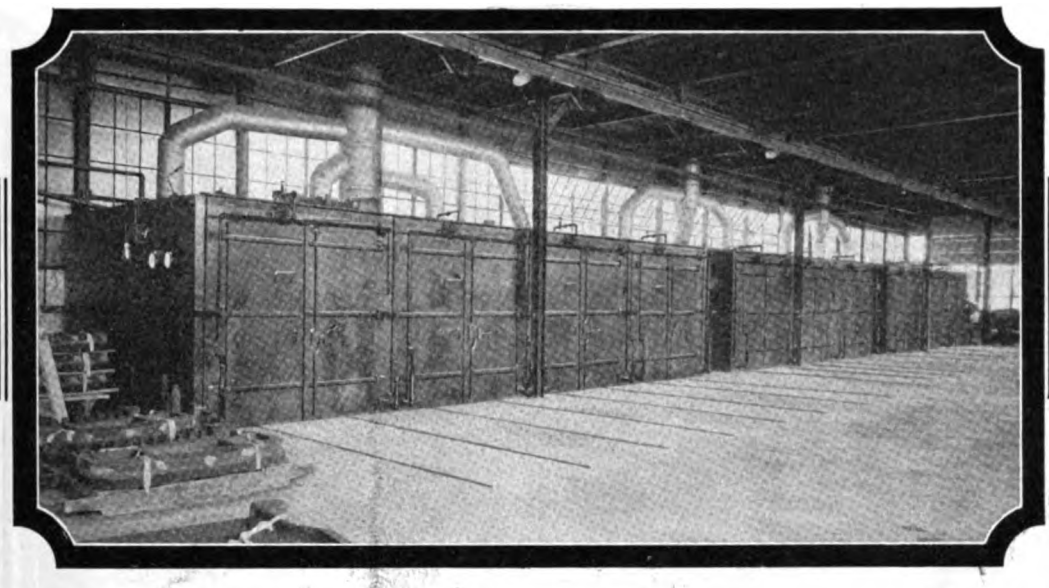
IN our January number, we published an article by Francis Juraschek, entitled "Stop Building Concrete Walls Inside Your Boilers." In preparing this article for publication, we failed to note that certain illustrations were copyrighted.

It is not our usual policy to print the names of manufacturers of equipment shown, because limitations of space make it impossible to do justice to competing manufacturers. Nevertheless, where, as in this instance, illustrations are copyrighted by the owner, the case is different.

We wish to acknowledge our indebtedness, therefore, to the Permutit Company, of New York, through whose courtesy we were permitted to reproduce the copyrighted illustrations shown in Figs. 1, 2, 3, 4, 7, 8 and 9, on pages 34, 35 and 36 of the January issue of INDUSTRY ILLUSTRATED.



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STANDARD EQUIPMENT
IN THE FOUNDRY

An earned reputation for thorough dependability and low cost operation has given Young Brothers Ovens first place in the core and moulding departments of the modern foundry.

Here are a few of the increasing list of foundries using Young Brothers Oven.

Acme Motor Truck Company.
Acme Pattern Works.
Aluminum Manufactures, Inc.
Anderson Foundry & Mach. Co.
J. Anstice & Company.
Ashland Malleable Company.
Auto Specialties Manufacturing Co.
Beckwith Stove Company.
Belknap Manufacturing Co.
Bohn Aluminum & Brass Mfg. Co.
Bostwick Stove Company.
Bunting Brass & Bronze Co.
Campbell, Wyant, Cannon Fdy. Co.
Connecticut Electric Steel Co.
Connecticut Fdy. & Mach. Co.
Wm. Cramp & Sons Ship & E. B. Co.
Crane Enamelware Company.
Creamery Package Mfg. Co.
Crompton & Knowles Loom Works.
Dayton Steel Foundry Company.
Dodge Manufacturing Company.
Domestic Eng. & Pump Co.
The Dunham Company.
Eastern Malleable Iron Company
Electric Manganese Steel Co.
Eureka Vacuum Cleaner Co.
Farrell Fdy. & Mach. Co.
Fate, Root, Heath Company.
Ford Motor Company.
Fuller & Warren Company.
General Electric Company (Schenectady, Baltimore).
General Motors Research Corp.
General Railway Signal Co.
Gillespie Foundry Co.
The Gleason Works.
Griffin Wheel Company.
Hershey Mach. & Foundry Co.
Hart & Crouse Co.
Humphreys Mfg. Co.
H. S. Lee Fdy. & Mach. Co.
Liberty Foundry Co.
The Lunkenheimer Co.
Malleable Iron Fittings Co.
Manufacturers Foundry Co.
Monroe Auto Equipment Mfg. Co.
Muncie Foundry & Mach. Co.
Ohio Brass Company.
Ohio Steel Fdy. Co.
Pratt & Whitney Co.
Philadelphia Stove & Iron Fdy. Co.
The Pullman Company.
Pusey & Jones Co.
Rhode Island Mall. Iron Works.
Rundle Mfg. Co.
Singer Manufacturing Co.
Sprague Electric Works.
Stover Manufacturing & Engine Co.
Taylor Wharton Iron & Steel Co.
Temple Malleable Iron & Steel Co.
Tri-City Malleable Iron Works.
Troy Foundry & Machine Co.
Troy Laundry Machinery Co.
United Shoe Machinery Co.
U. S. Navy Yards (Boston, Washington).
U. S. War Department.
Utical Heater Company.
Henry Vogt Machine Company.
Willys Overland, Inc.
Worthington Pump & Machinery Corp. (Cambridge, Cincinnati).
York Manufacturing Co.

YOUNG BROS. COMPANY

6509 Mack Avenue, Detroit, Michigan

District Sales Offices:

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1424 Guarantee Title, Cleveland
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248 Central Bldg., Seattle, Wash.



—OVENS FOR—

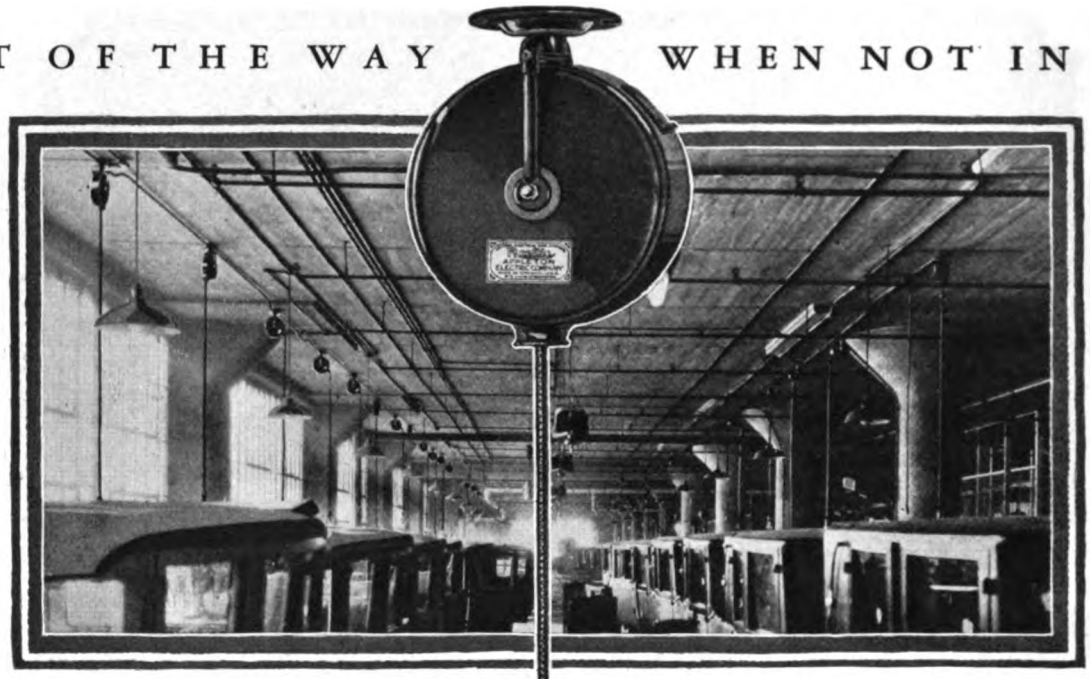
Core and mould baking.
Low temperature heat treating.
Drying.
Japanning and enameling.
Electrical appliance baking.
Adapted to all methods of heating

INDUSTRIAL OVENS

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OUT OF THE WAY WHEN NOT IN USE



Puts light in just the right place
for speedy efficient work

WHEN a man is twisting himself into knots to get at almost inaccessible parts of a motor chassis or body, good light, just where he wants it, is indispensable.

And when he moves to the next spot, five feet to left or right, five feet higher or lower, he wants the light to go with him to the job without leaving a coil of tangled cord for him to trip on.

Reelite has been the solution of getting perfect light to the job in hundreds of factories, garages, shops.

Annually, thousands of feet of expensive cord are saved because Reelite keeps it off the floor, out of the oil and dampness, unkinked, uninjured by sharp heels.

There are numerous places where Reelite will save money and time for you. Look for them, or let us send an expert without obligation. Drop us a line today.

APPLETON ELECTRIC COMPANY
1716 *Wellington Avenue* · *Chicago, U. S. A.*
New York—265 Canal Street Los Angeles—340 Azusa Street

Reelite
The Handy Light on a Reel

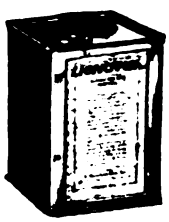


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LAPIDOLITH is the original concrete floor hardener. It will add years of wear to even an old concrete floor. It is a liquid, chemical compound that penetrates the porous cement, binds the loose particles together, and fills up the voids. It will make your concrete floors almost as hard as flint, and make concrete dust a thing of the past. Lapidolith is as easy to apply as water, and dries overnight.



LIGNOPHOL will add years of wear to apparently worn-out wood floors. It is a preservative dressing that penetrates the wood fibres, and restores the natural gum and oils. It does away with the use of floor oils. It will give you smooth, hard, dustless wood floors. One treatment will last for years.



STORMTIGHT stops leaks instantly. If it is applied to the entire roof it will add years of wear to even an apparently worn-out roof. Stormtight is a thick, adhesive, rubber-like substance. It may be applied by anyone to any roofing material. Stormtight has often saved manufacturers the cost of a new roof. It can be secured in either the semi-liquid or plastic form in practically any quantity.

Wasteful Costly Repairs

This is how leading industrial plants have reduced them

1. They protect their concrete floors against wear with Lapidolith, a concrete floor hardener that puts an end to dusty, easily-worn-down concrete floors.

2. They add years of life to their wood floors with Lignophol, a preservative dressing that keeps wood floors from splintering, rotting, or drying out.

3. They make their repainting jobs less frequent by using Cemcoat, a remarkably economical paint that may be washed again and again without turning yellow.

4. They make their buildings proof against dampness. By treating their exterior walls with Hydrocide Colorless they are assured of warm, dry interiors.

5. They stop roof leaks before they become serious by using Stormtight. Stormtight stops leaks quickly and easily. If used on the entire roof it gives permanent leak insurance.

L. Sonneborn Sons, Inc.

114 Fifth Avenue, New York City





HYDROCIDE COLORLESS will give you warm, dry buildings. This waterproofing compound is applied to the exterior of a building. It will not run in hot weather, as it contains no paraffin. It will not detract from the natural beauty of the walls, as it is absolutely invisible when applied. It will give you positive guarantee against any water or moisture seeping through the walls of your buildings. It will cut down your heating expense.



CEMCOAT. When your next repainting job comes around, try Cemcoat. The wearing qualities of this paint are remarkable. Even on brick, plaster, or concrete walls it will not crack or peel. It may be washed again and again. Because of its unusually heavy body it generally requires one less coat to a given surface than most paints. Cemcoat comes in white and colors for exteriors and interiors.

The above products have helped many manufacturers reduce their maintenance expense. Concerns such as the Ford Motor Company, Swift and Company and the Bethlehem Steel Company have used some or all of these products for years. Let us send you free samples.

L. SONNEBORN SONS, INC. C-2
114 Fifth Avenue, New York City

Please send me, without any obligation, demonstration sample and literature on:—Lapidolith....; Lignophol....; Cemcoat....; Hydrocide Colorless....; Stormtight..... Check those products that interest you most.

Name.....
Mail Address.....
.....
Company.....
Position.....

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MARTIN STEEL BUILDINGS
Standard Units for Factories • Garages • Warehouses • Etc.



SAVE MAINTENANCE COSTS

Save Maintenance Costs as well as initial investment by using "Martin Steel Buildings" which are furnished complete with all doors, sash, glass, etc.

Buildings are assembled from standardized units, thus assuring detail perfection and greater service with no engineering cost.

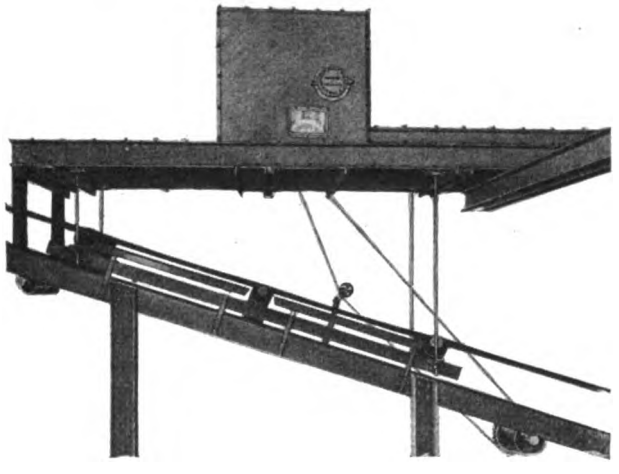
Before you build your next factory, warehouse, boiler room, foundry, garage or machine shop let us show you how serviceable and economical it can be supplied with a Martin Building.

Are shipped punched, formed and completely fabricated ready to be erected. We will gladly quote you on complete building ready for your own men to erect or we will quote you an erected price in a given number of days.

Write for descriptive folder. If you will suggest size and details we will give you a preliminary estimate of your building cost.

We are proud of our building.
You will be proud of yours.

THE MARTIN STEEL PRODUCTS CO.
MANSFIELD, OHIO



Make Your Conveyors Move and Weigh—

Do two things at once; combine two operations, and thus save time and money. By doing so you will give yourself a fair break on the materials you receive and ship. Know how much is being moved.

The Merrick Weightometer attached to your conveyors will accurately record the weights of loose and bulk materials, as they move along. You need not depend on the bills of lading or "guess" weights.

Write for "Merrick Circulars" now; stop relying on uncertainties—know how much you're handling.

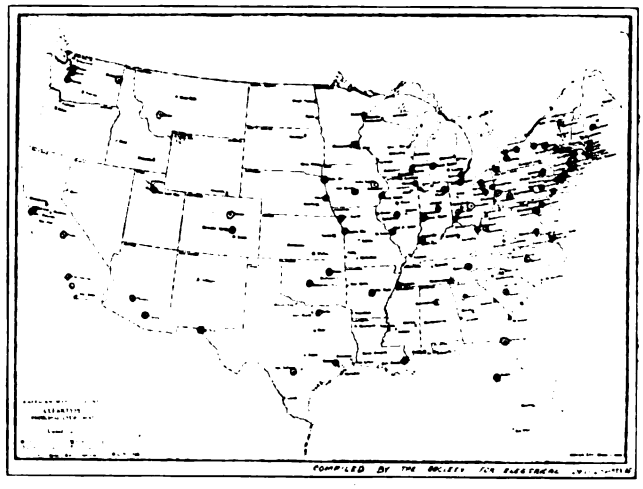
MERRICK SCALE MFG. CO.
180 AUTUMN STREET PASSAIC, N. J.

Nation Wide Service Facilities Afforded Electric Truck Users

SERVICE facilities for users of storage battery propelled street trucks and industrial trucks and tractors are now maintained specifically in 117 cities. At the 95 points indicated on the accompanying map, prepared by The Society for Electrical Development, complete battery, motor and charging equipment service is available. At twenty-two other points in close proximity to those shown, representatives of storage battery electric motor and charging equipment manufacturers are coöperating with electric truck dealers in servicing electric truck users.

Actually service is provided from coast to coast. Working out from the cities indicated, field men are available at a moment's notice to cover any city in the country where they are needed. In this way it is possible to give users of storage battery transportation equipment every assistance in maintaining efficient operation at all times.

For example, one battery manufacturer advises, "While our branch offices are located in the above mentioned cities, our sales staff covers every prominent city and town in the United States. In many instances our salesmen live in a prominent city in the central part of their territory. Upon receiving a trouble call or call from



an electric truck dealer our service men go anywhere in the United States and we follow our batteries with battery service regularly and periodically." Another battery manufacturer reports, "The salesmen and service men working out of the above mentioned offices cover the entire United States."

A charging equipment manufacturer reports, "In a general way our service men cover practically any territory in the United States." Similarly a motor manufacturer states, "The whole country is divided up so that any section comes under the jurisdiction of one of our offices. In most of these offices there are representatives of our engineering department who are available to give service to any electric truck dealers or users."

With the number of electric street truck and industrial truck fleet users rapidly increasing it is felt by the manufacturers, from whom the data graphically shown above were obtained, that users should be given the best in follow-up service. Although the number of electric trucks in operation is still limited, no less an authority than the late Dr. Charles P. Steinmetz estimated that eventually electric trucks will be operated on seventy-five per cent. of all city delivery routes.

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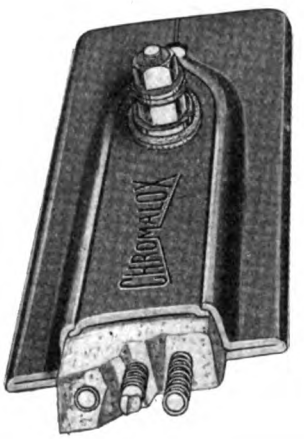


The Railway Utility Company of Chicago is the sole distributor of Chromalax Strip Heaters for use in heating of railroad and street cars in United States and Canada.

Section showing the triple resistance coil imbedded in a refractory material. This construction gives uniform distribution of heat.

CHROMALOX

The trade mark that stands for supreme quality and value. Look for it on your new space heater.



Does Quality Count?

It must or we would be using carbon lamps for general illumination today—

FOR the same reason you should demand quality heating units—Chromalox Units have earned that qualification from past performance.

Hundreds of users today refuse a substitute.

Many applications never before thought possible have been accomplished due to the exceptional ability of these units to perform under severe conditions and the wide line of units available.

CHROMALOX

Trade Mark Reg. U. S. Pat. Off.

SPACE HEATERS

SH—2150, 2 ft. 500 watts, 110 volts
SH—2250, 2 ft. 500 watts, 220 volts
SH—2255, 2 ft. 500 watts, 250 volts

$1.75 each
In Small Quantities

The Chromalox Space Heater is only one of a number of units that we can supply to accomplish that heating problem of yours. It is true the space heater has many possibilities but the Chromalox line has unlimited possibiliteis. Write us regarding your problem.

Edwin L. Wiegand Co.

422 First Avenue, Pittsburgh, Pa.

Use the Coupon ➤➤➤

Try this new Space Heater and let us prove our claim

EDWIN L. WIEGAND CO., 422 First Ave., Pittsburgh, Pa.
Please send me copy of Bulletin C-105 on Chromalox Heating Units.
Company.....
Address.....
State.....
Attention.....
I. I.

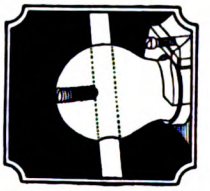
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Your Fingers Are Safe



No, sir! The Parker Vise handle won't slip through and pinch fingers. Why? Because the *exclusive* feature of the spring and set screw (see cut) keeps the handle just where it is put. This means no lost time from avoidable accidents and satisfied workmen. It will pay you to use Parker Vises.


Handle Stays Put

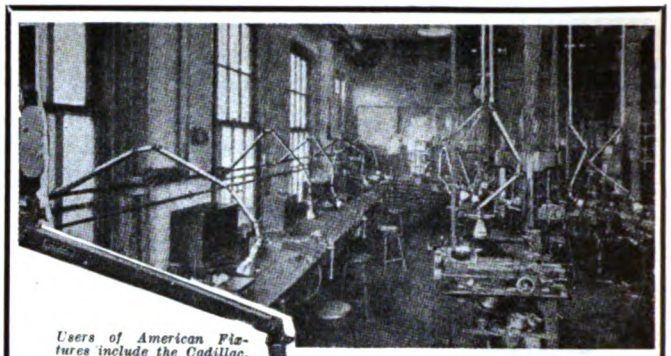
A Quick Action Machinists Vise

If you want quick action in a vise you have it in the Parker. The exclusive feature of the set screw in the ball of the handle makes this possible. Just set the screw up tight with the handle in the center so that it may be spun rapidly with the hand. Put oil and graphite on the main screw. Give the handle a whirl and watch the ease and smoothness with which it spins around. A great many plants requiring a quick action vise use their Parkers in this manner.

Six other strong features described in the handy sized catalog. Write to W. R. B. for a copy.

THE CHARLES PARKER CO.
Master Vise Makers
Meriden, Conn.

PARKER VISES
GRIP LIKE A GRIZZLY



Users of American Fixtures include the Cadillac, Dodge, Chevrolet and Packard Motor Car companies.

Increase Production 20% to 60% with
AMERICAN FIXTURES


American patented full universal joints used on all connections in the arm.

Better lighting has been an important factor in speeding production.

American Fixtures — concentrated lighting — have helped to increase production 20 to 60%. They throw the light where the worker wants it and help to relieve eyestrain and lessen fatigue.

Let us tell you more about the advantages of American Fixtures in your own plant. Write for all the details.

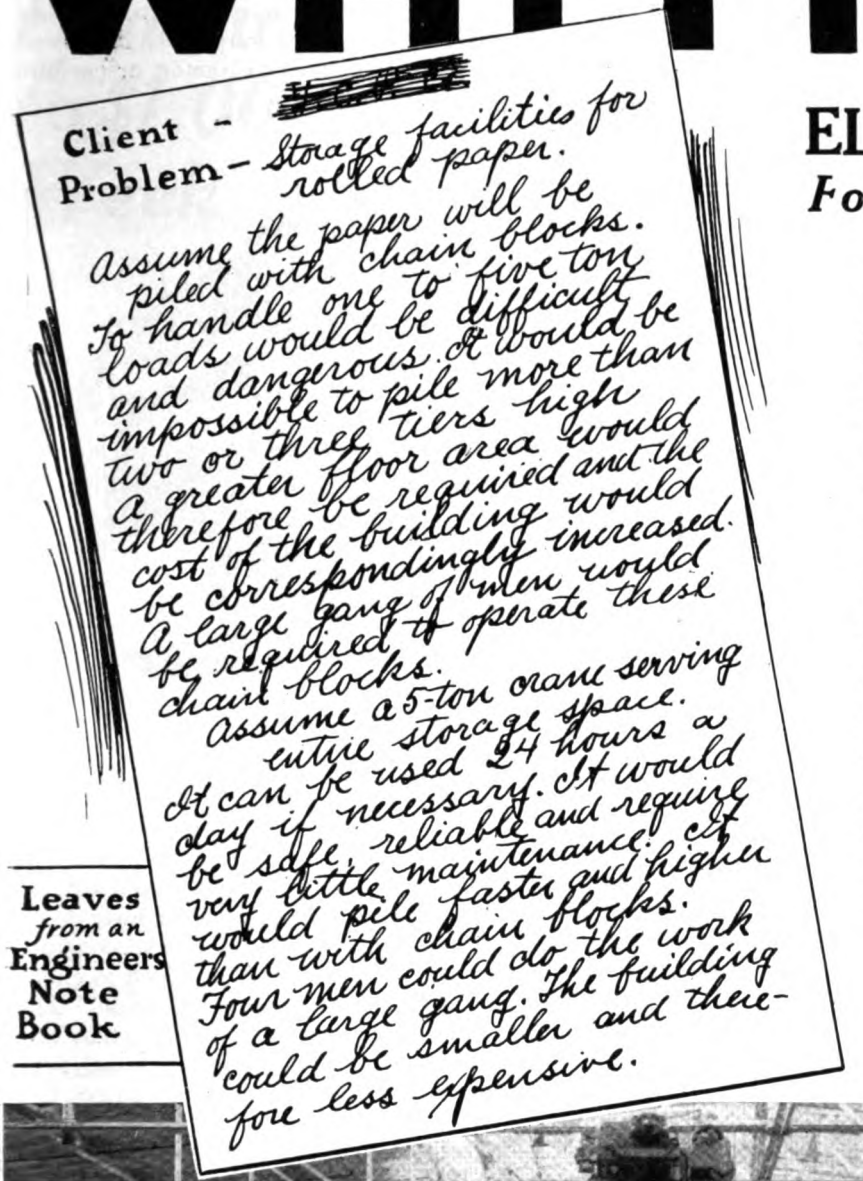
American Fixture Company
230 W. Water Street Milwaukee, Wis



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WHITING



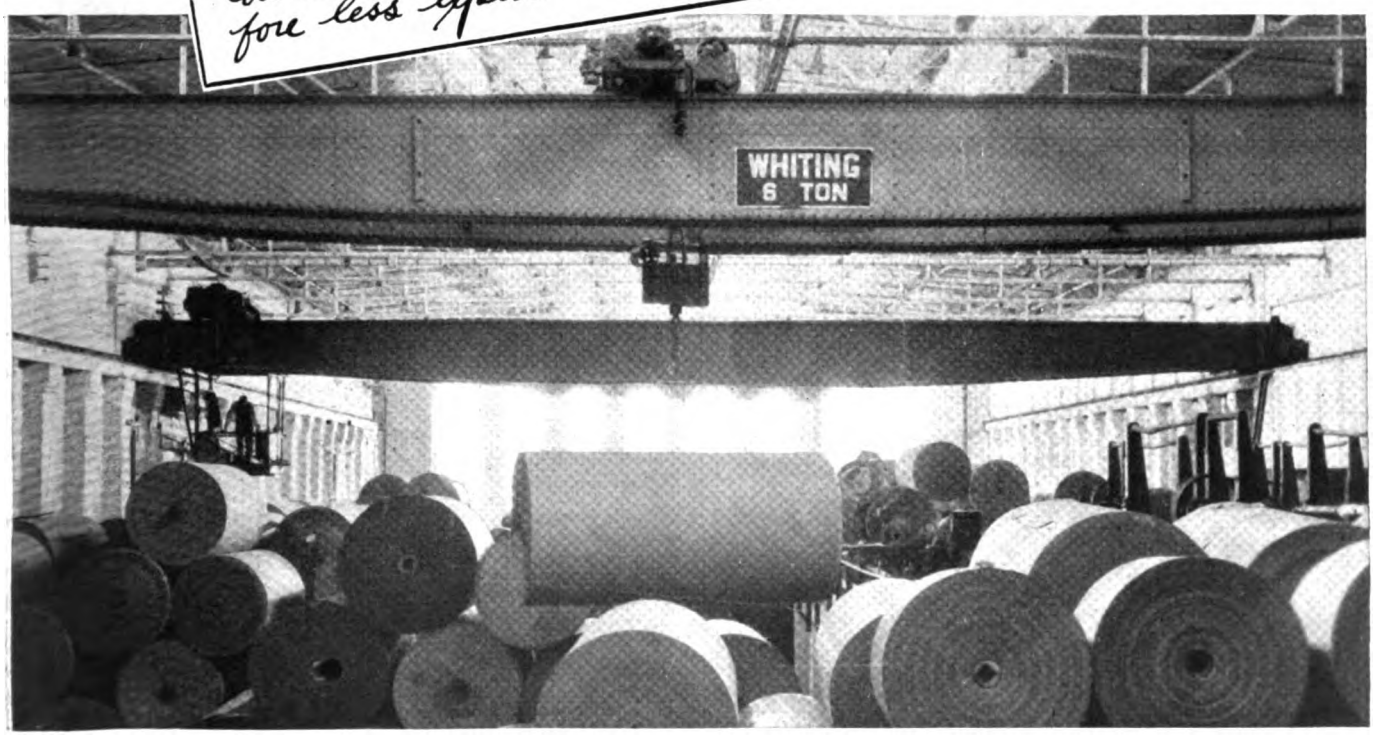
ELECTRIC CRANES
For Handling Paper Rolls

One paper manufacturer writes us that he "can see no other way" of economically handling his rolls of paper than with an overhead traveling crane. One of his Whiting Cranes has now been in service four years and has demonstrated its safety, reliability and low maintenance cost.

You may not be so sure that a crane is "the only way" to solve your material handling problem. Why not have a competent engineer, either in or out of your organization, study the matter from every angle and report to you? The results are sure to be more satisfactory, whatever equipment you buy.

All we ask is a chance to prove the merits of a Whiting Crane where conditions make it a logical choice. Our new Catalog No. 200 on request.

WHITING CORP.
15651 Lathrop Avenue
HARVEY, ILLINOIS (Chicago Suburb)



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Motoco Industrial Thermometer

Putting the Westinghouse OK on the

MOTOCO

INDUSTRIAL THERMOMETER

When any instrument receives the O. K. of Westinghouse Electric & Mfg. Co.'s engineers, you can depend upon it that that product *will make good for you!*

The Westinghouse Electric & Mfg. Co. put the Motoco Thermometer to the "acid test," with the result that we received their order for 12,000 instruments, followed by a letter reading in part as follows:

"There are many thousands of these indicators in use at the present time and they are giving entire satisfaction."

Big firms like Westinghouse, who have at their command some of the most able engineers in the country, *know* what they're doing *before* they make a move. And when they say that thousands of Motoco Thermometers are giving entire satisfaction, isn't it a pretty safe guide for *you* to follow?

The Motoco Dial Thermometer (and that means easy-to-read thermometer) sells at the price of a high-grade glass tube thermometer.

Furnished with capillary tubing or with straight or angle stem, for temperatures between minus 40° and plus 750° F.

Write for our Catalog No. 10

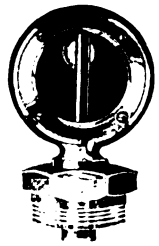
***The* MOTO METER CO., Inc.**

Industrial Thermometer Division

10 Wilbur Avenue

LONG ISLAND CITY, N. Y

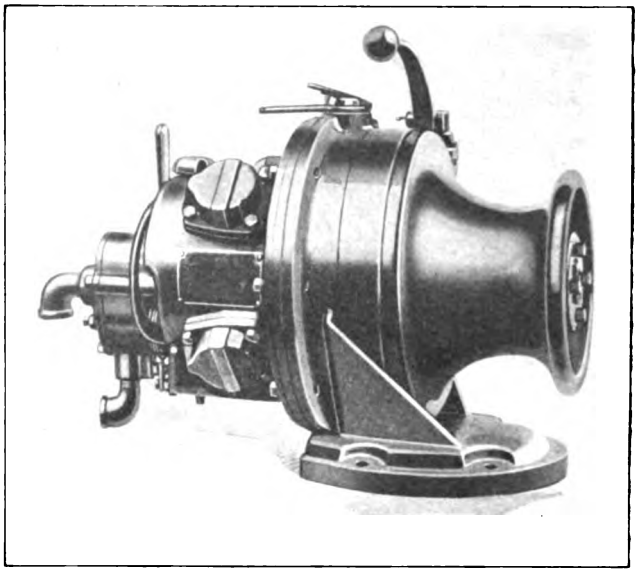
Manufacturers of Industrial Thermometers and Boyce Moto-Meters exclusively



Boyce Moto-Meter

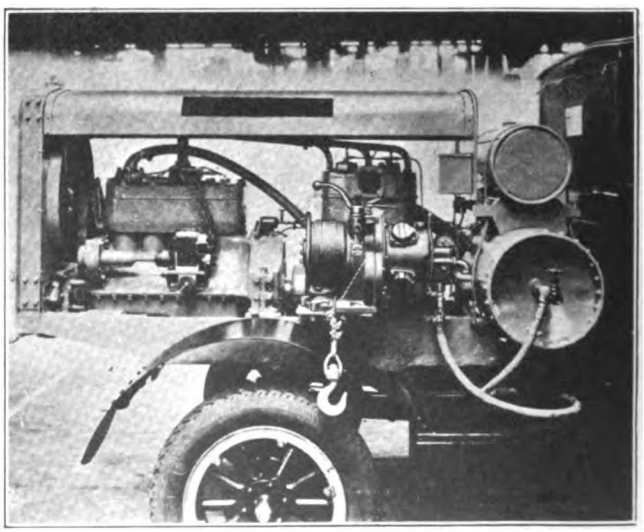
"Utility" Air Motor Hoist

THE Ingersoll-Rand Company, of 11 Broadway, New York City, announce a new ½-ton utility air hoist. This may be attached to building members, roof trusses, tractors or in any way to suit the purpose to be served, although it is particularly adapted to tractor, or portable compressor mounting.



The clutch is here plainly shown. This feature permits easy control of the cable.

The "Utility" Hoist is equipped with a clutch so that the cable can be easily played out by hand or by a down grade load without turning over the motor and consuming air. A hand brake on the drum is provided to check the unwinding and stop it in any desired position. The throttle control is very sturdy and so sensitive that any speed of rope travel can be obtained—from the very slightest movement up to a maximum speed of 65 feet per minute, although carrying full load of 1,000 pounds at an air pressure of 80 pounds per square inch.



The hoist, as installed on a motor truck for general utility work.

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Reduce Your Coal Handling Costs to $1.00 per Week



Price $490.00

An adjustable wheelframe, ball bearing, three-phase motor including conductor cord plugs and receptacle or 3 H.P. gasoline engine with clutch.

No Belts to Wear out

Lasts 10 Years and More

It does seem low, but that is just what a Chicago Automatic will actually cost you in round figures.

The price is $490.00. It will last at least 10 years; that is only $49.00 per year or less than $1.00 per week.

Can any other method or equipment bring down your handling cost to such a low cost?

Why not send for one to-day, or let one of our engineers help solve your problem? No obligation, of course.

Made in scraper, belt and bucket types.



Chicago Automatic Conveyor Co.
982 Old Colony Bldg., Chicago, Ill.

As "an army fights on its Stomach"



So—"an electric truck battery lives on its charging plant."

Whatever the job—it takes juice!
No truck is too poor to have a good battery.
No battery is too old not to be properly charged.
The popularity of

HERTNER CHARGING EQUIPMENT

is due to the way in which it always keeps in action Electric Truck Equipment—a rare engineering feat in which economy of operation and absolute reliability are combined.

Hertner Charging Equipment

is superior in many ways. It is endorsed by every leading truck and tractor manufacturer.
Our Bulletins—and they are yours free—tell you why. Send for them.

COUPON

Mail us your new Bulletins on Battery Charging Equipment

Firm .....

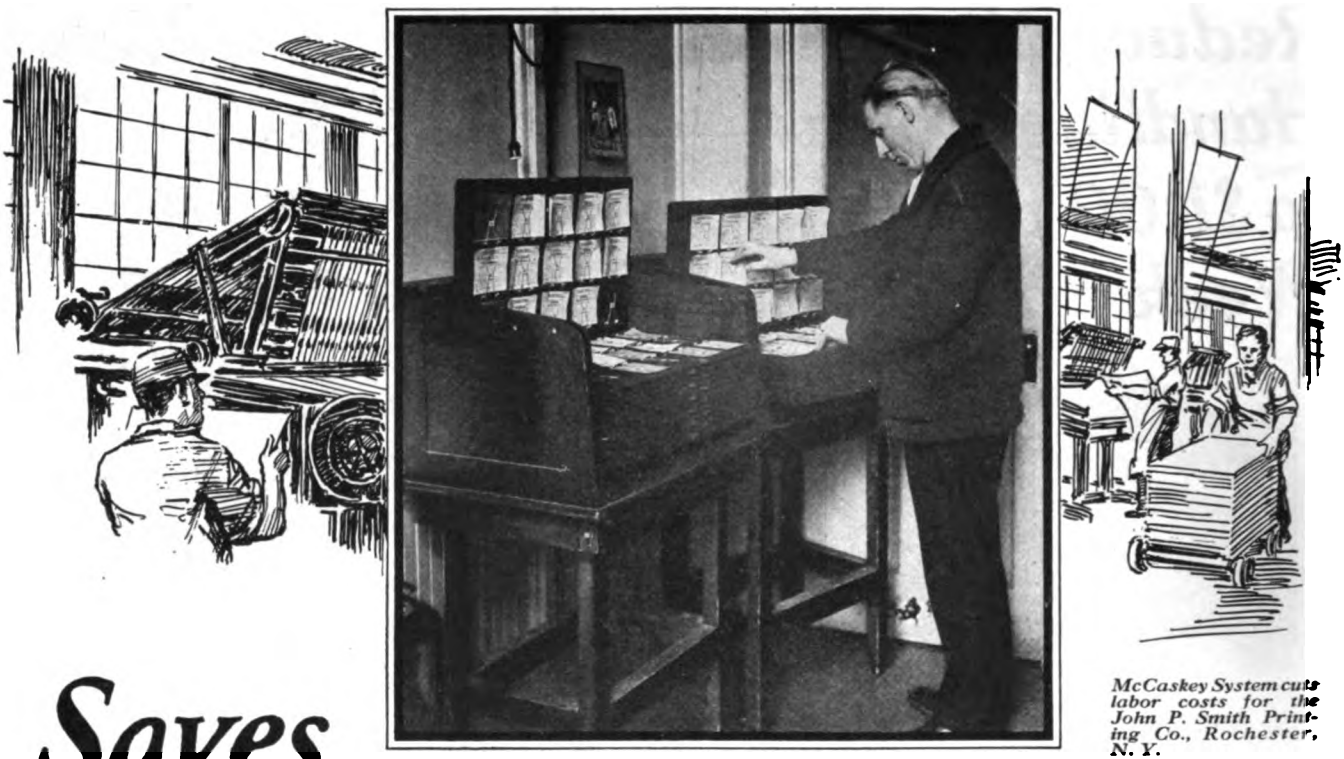
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The HERTNER ELECTRIC COMPANY
W. 112 th. Street Cleveland, O. U.S.A.

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McCaskey System cuts labor costs for the John P. Smith Printing Co., Rochester, N. Y.

Saves $2,500 a Year in Cost Accounting

By Using the McCaskey System

AT the plant of John P. Smith Printing Company, Rochester, N. Y., a very substantial saving was made by the use of two McCaskey Registers in the segregating and distributing of labor costs on time tickets. Mr. Frank J. Smith, President, says:

"Job time records from our various departments are handled by 2 McCaskey Registers, in the cost and production departments.

"An issue ticket is made out in duplicate on each job, and a copy filed in each cabinet under a job number. On these tickets is recorded the sending out and return of proofs.

"Each man who works on that job records his name, job number, and time on a McCaskey ticket, made out in duplicate. These time tickets for each job are collected as the work progresses, and when the job is completed all the costs are entered on the job summary sheet for our accounting records.

"Formerly each man had a large daily sheet on which he entered his time on each job. As he might work on many jobs in a single day, this system involved a great deal of work segregating items and distributing labor costs. It also offered many opportunities for error. Our present system, besides promoting accuracy, saves over $2500 a year in cost accounting labor.

"From the duplicate time ticket we get by 10 o'clock each morning a complete production report on the previous day's work. This has been a vital factor in materially increasing efficiency in all departments, and would alone pay the initial and maintenance costs of the McCaskey equipment many times each year.

"We find we can buy the McCaskey carbon backed forms at much lower cost than we can print them ourselves."

Mail the Coupon

Why Not Let a McCaskey System Cut Your Labor Costs?

There's a McCaskey System for every stock, cost or production record.

No matter what the job, McCaskey will save you money. Write for complete information and evidence of savings in your particular line.

The McCaskey Register Co.,
Industrial Division 236
Alliance, Ohio

Please send more information about the McCaskey System showing how firms have applied your methods.

NAME .....

TITLE .....

FIRM .....

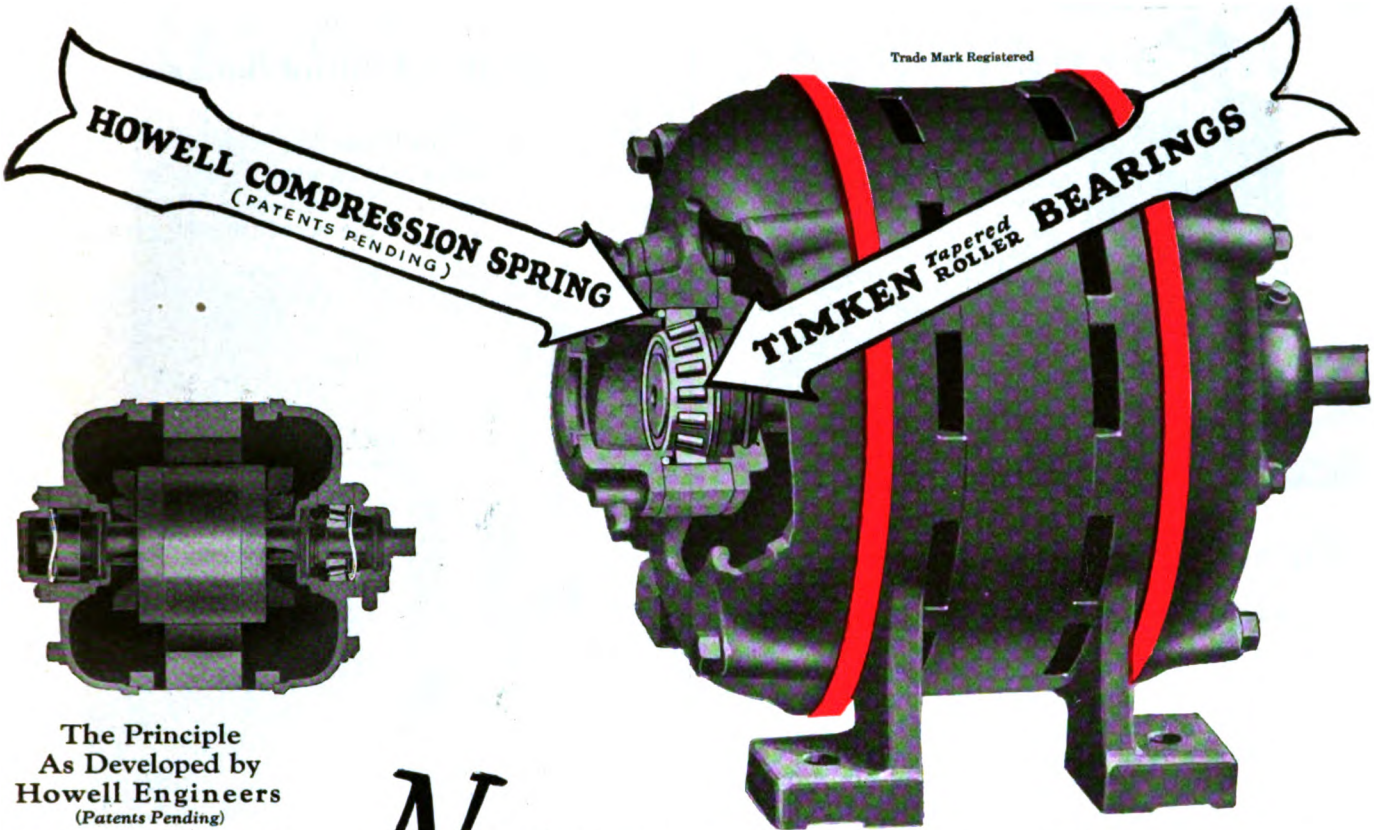
ADDRESS .....

McCASKEY ONE WRITING SYSTEMS

THE McCASKEY REGISTER CO.
INDUSTRIAL DIVISION 236 · ALLIANCE, OHIO.
GALT, CANADA

For products not advertised in this issue write Industry Illustrated

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The Principle As Developed by Howell Engineers
(Patents Pending)

The outer race or cup of The Timken Tapered Roller Bearing is fitted into the housing of the motor end bell with a sucking fit which allows creeping of the outer race. The bearing is shimmed with a compression spring which is held tight against the outer cup of the bearing by a grease cap. The action of the spring pushes the cup tightly against the rollers thereby keeping the bearings tight at all times—automatically taking up wear and eliminating noise, and removing practically all chances of bearing trouble.

Now-Timken Roller Bearings, *plus*-an Automatic take-up!

The new Howell method of roller bearing application (illustrated above) is the last word in electric motor construction. It practically eliminates all bearing trouble (and 95% of all electric motor trouble can be traced to bearing failure). It insures a continuous uniform air gap in which any looseness in the bearing caused by wear or otherwise is instantly and automatically taken up. It automatically keeps the rotor centered at all times and allows for any lateral expansion of the shaft which might occur due to heat. Now Howell Red Band motors always known for their ability to master hard jobs—are even more dependable—more staunch than ever.

Howell Red Band Motors with Timken tapered roller bearings are offered in all sizes and types in addition to the regular motors with re-centering sleeve bearings. Get in touch with the Howell representative in your locality or write direct to the factory for complete information.

Give **Red Bands** *your hard jobs*

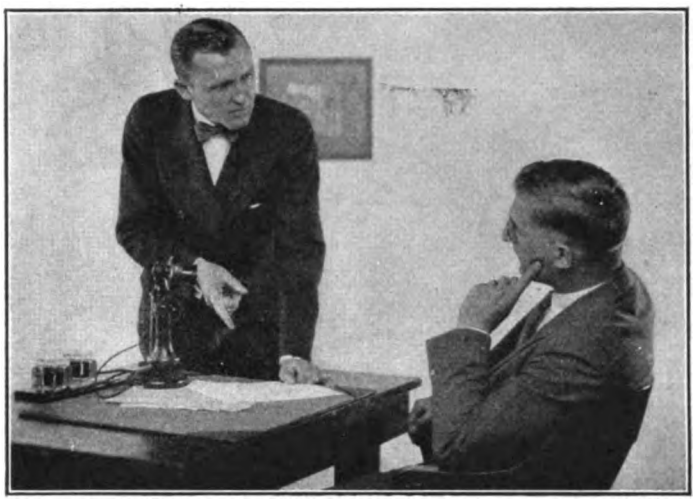
Howell Electric Motors Company
Howell, Michigan

Howell RED BAND ELECTRIC Motors

Make Good on the Hard Jobs

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"Two-thirds less cost and it does the same work?"

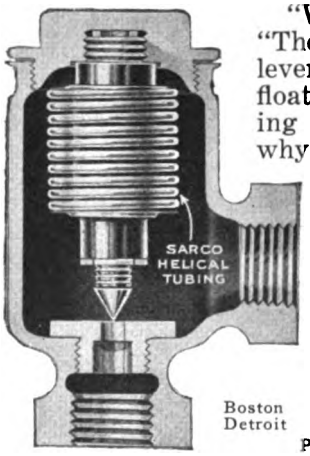
"Do you mean to tell me, Frank, that those Sarco Steam Traps you installed some time ago cost only *one-third* as much as our big traps and that they are doing the same work?" queried Simmons, the V. P.

"Yes," replied the engineer, "and in addition we saved considerable money by screwing the Sarco Traps right into the pipe-line instead of having to build an expensive platform as we did for the old traps"

"Have any trouble adjusting them?"

"Didn't have to adjust 'em . . . . they're self-adjusting for all pressures from 0 to 100 lbs."

"Have they given any trouble or shown any wear?"



"Wear?" blurted Frank. "There's nothing to wear—no levers, gauges, stuffing boxes, float or bucket—only one moving part. And as for trouble, why I'd almost forgotten about them — haven't had to touch those traps since we put them in."

Let us send you a Sarco on 30 days free trial. You, too, will find them the best trap investment you have ever made. Simply mail the coupon.

SARCO CO., INC.
236 Broadway, New York City

Boston Buffalo Chicago
Detroit Cleveland Philadelphia
Peacock Bros., Ltd., Montreal

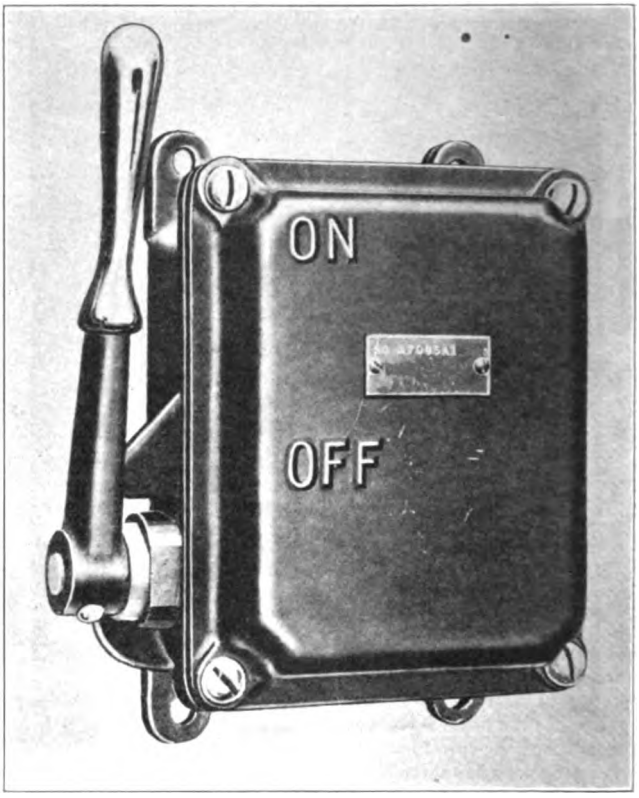
SARCO STEAM TRAP

FREE TRIAL
SARCO CO., INC.
236 Broadway, New York.
Send one Sarco Steam Trap on 30 days' free trial, as follows:
☐ Size.....for pressure of.....lbs.
☐ Send Booklet R-263.

Firm .....
Street .....
City..... State.....

A New Watertight, Acid-Resisting, Remote Control Station

QUITE frequently it is necessary to protect electrical apparatus against moisture, acid fumes, etc. To meet the requirements for this work The Cutler-Hammer Mfg. Co., Milwaukee, Wisconsin, have brought out the control station shown on the accompanying photograph.



The mechanism is enclosed in a cast iron case, and has a cover fitted with a gasket, which excludes all moisture and fumes. A stuffing gland fitted to the shaft provides a tight joint, and the thick wall of the cast iron body allows enough threads for a tight conduit or pipe connection.

This station was first installed in a rubber factory, where chemical fumes attacked the ordinary station and control mechanism, necessitating frequent repairs. Since this new type station has been installed this difficulty has been overcome entirely.

IN formulating credit and selling policies, the business manager should have in mind not only immediate selling possibilities but also the probable trend of business for six to nine months in advance. At a time when the outlook is for a steady expansion in business, the manufacturer can afford to stock his dealers up fairly heavily, and extend credit more liberally than at other times. At a time when business is active, but the outlook is for receding sales, however, the manufacturer will do well not to urge goods upon his dealers, since at such a time dealers will usually tend to buy in sufficiently large quantity of their own account and many need counsel to avoid overstocking. If the producer permits or causes overstocking of the dealer, he may have trouble in collecting his money later.—*Alexander Hamilton Institute.*

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ARMINGTON T-RAIL CARRIER



27 Foot Crane Operated by 1 Man

Send for the Armington Book which shows how handling costs can be substantially reduced.

T-Rail Cranes Use Every Inch of Floor Space

T-Rail Cranes with the efficient Armington T-Rail Carrier will help you in moving stock-in-process instead of having material and parts kept in permanent rows.

T-Rail Cranes enable you to use more floor space. For that alone the investment is worth while.

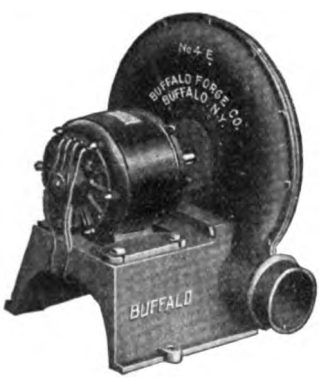
Armington T-Rail Carriers can be installed anywhere and like the ordinary I-Beam the track can be obtained from any steel warehouse.

THE ARMINGTON ENGINEERING CO.

EUCLID, OHIO

Hand Cranes—Overhead Trolley Systems

Production costs can be lowered this way





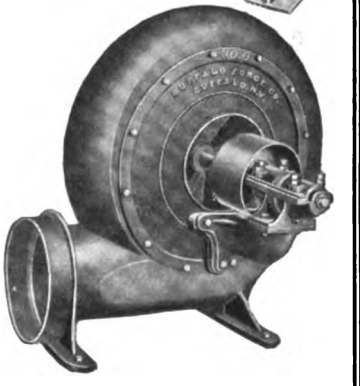
In striving for lower production costs, do you take into consideration the economies that can be effected in the operation of "non-productive" equipment?

Have you checked up on the cost of operating blowers and exhausters in your plant, and do you know whether or not you're paying an exorbitant price for their service? Are you entirely familiar with what can be done with air in your plant, if it is properly harnessed?

Many large concerns find that undreamed of economies follow the overhauling of their exhaust systems. By installing efficient reliable



"Buffalo" **fans and blowers**



they move materials quickly and effectively at low cost.

Our experience in adapting fans to the requirements of thousands of users is yours for the asking. Just a line stating your particular problem and we'll gladly make recommendations and quotations on the necessary equipment. If you are interested in our entire line of fans and blowers ask for catalog No. 860.

BUFFALO FORGE COMPANY

440 Broadway, Buffalo, N. Y.

In Canada—Canadian Blower & Forge Co., Ltd. Kitchener, Ontario

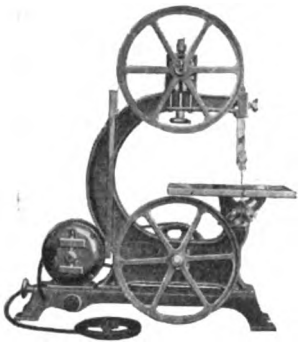
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Handy Portable Machines

that have a hundred uses in your plant

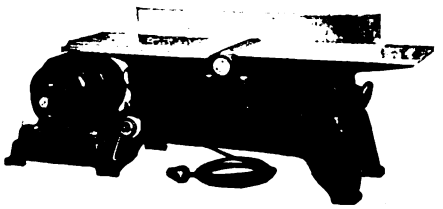


In pattern shop, foundry, machine shops, storage rooms and shipping rooms, H & A Portable Bench Saws and Jointers will save hours of time and labor costs on the many woodworking jobs that come up during the day.

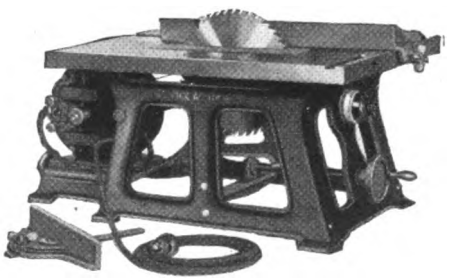


Each is a self contained unit. Easy to handle and ready to start to work when you hook it up to any lamp socket. And the cost is so low that you cannot afford to be without one.

Write for prices and complete descriptions of each type.



H & A
Portable Electric
Saws and Jointers

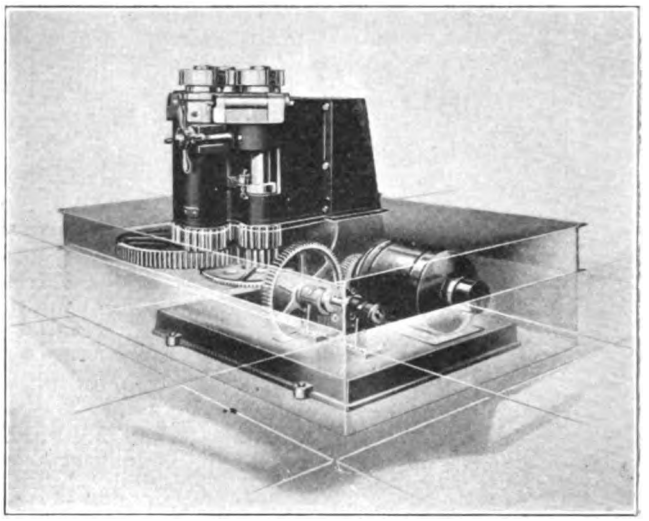


HESTON & ANDERSON
613 W. DEPOT AVE.
Fairfield, Iowa

New Bending Roll With Vertical Spindles

THIS machine was built by the Buffalo Forge Company, Buffalo, N. Y., to meet the special requirements of the General Electric Company. While the General Electric Company plans to use the machine on one job only, bending flat bars on edge—in various diameters, the same rolls that are used on other Buffalo Benders can be furnished for this machine.

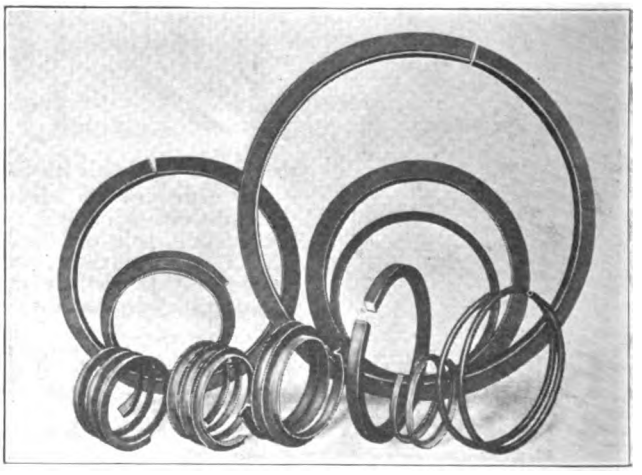
The rolls on the Buffalo No. 1 Horizontal Bending Roll, as the new machine has been designated, are arranged vertically, so that the material worked on is in a horizontal plane.



The entire machine is mounted on a cast iron base plate at the bottom of a pit 16½" deep by 75" long by 64" wide. Ten-inch channel irons placed on the floor, support a ⅜" checkered steel plate which surrounds the machine. This makes the checkered plate, or machine platform, 10 inches above the floor line, while the rolls proper are 36" above the floor line.

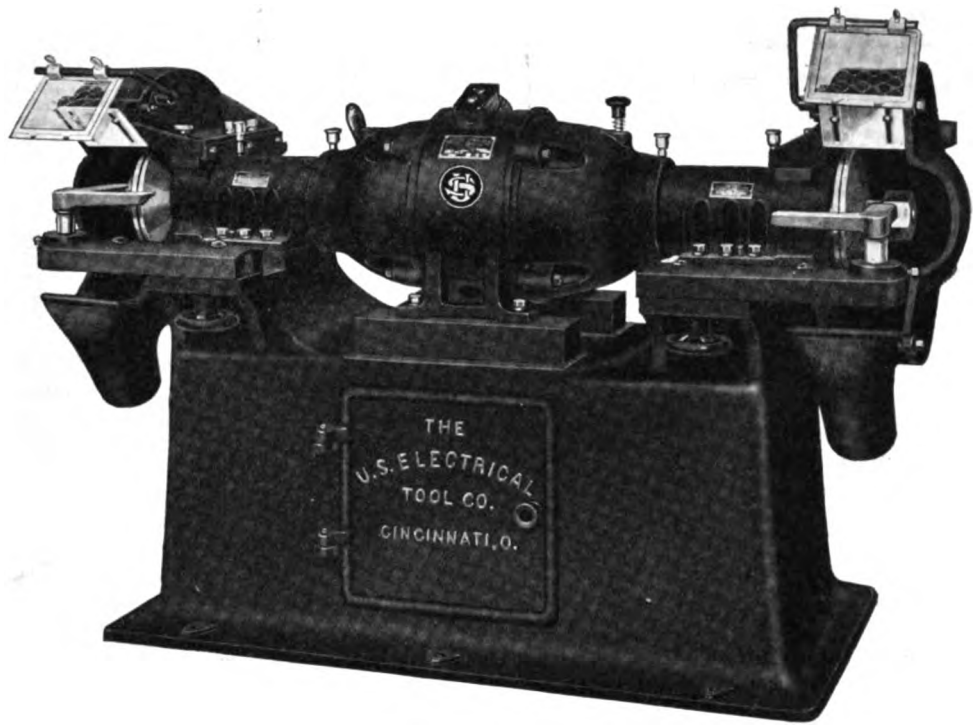
By using additional rolls, it is possible to bend angles, leg in or out, tees, leg out, squares, across flats or corners, round or twisted bars, flats across or edgewise, rails, copper tubes, 12 or 16 ga., extra heavy steel pipe, heavy steel pipe, standard steel pipe, I-beams or web or flanges, and channels, flange-in or out.

Some idea of the flexibility and simplicity of this machine may be gained from the fact that in testing at the factory, 2" x ⅝" flats were bent into circles, edgewise, in which the inside diameter was 13½".



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"U.S." Adjustable Speed Grinders
Save their Cost in One Year



IN addition to having the same general specifications that have made "U. S." heavy duty grinders renowned in their fields, this adjustable speed unit automatically increases the peripheral speed in exact ratio to the wheel's wear.

Three economies are yours in this machine: (1) Constant production from wheels throughout their lives. (2) Satisfied operators doing piece-work. (3) An approximate cut of 50% in wheel costs.



Consider the durability and dependability of a grinder with these features and you will see the value of the "U. S." Adjustable Speed to your plant: 40 degree entirely enclosed motor; four SKF Ball bearings; automatic push button control; exhaust connection wheel guards equipped with hinged doors to permit easy and rapid wheel replacement; adjustable eye shields and spark-breakers; shaft locking device to insure quick removal of old wheels. A product of the oldest makers of electrical drills and grinders in the world.

Write for Catalog "E"

U.S. Portable Electric Drills Grinders–Polishers

The United States Electrical Tool Company
Cincinnati, Ohio, U. S. A.

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TIME

~the greatest element in modern production!

IN these days of keen competition, automatic machinery and special material handling equipment are profit-making necessities. They save TIME—and time saved increases profits.

But the maximum benefit of special machines and conveyors comes only when they operate at their highest efficiency every hour in the day. They must be *flexible*—capable of running at many different speeds. For the most efficient operating speed of any machine is different for every different job.

The experiences of thousands of manufacturers in every industry have proved that there is only one truly *accurate* method of scheduling production and controlling the speed of their machines and conveyors—the REEVES Variable Speed Transmission.

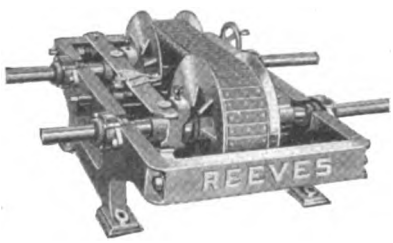
With this simple, inexpensive device, they can get *any* speed on any machine at *any* time. Their machines and conveyors operate *always* at highest efficiency.

Write today for catalog L57 and full information about the REEVES in your industry. TIME is the greatest element in modern production, and you should get the maximum results from your time-saving equipment.

REEVES PULLEY COMPANY
Established 1887
Columbus, Indiana

REEVES
Variable Speed Transmission

The REEVES Transmission is a simple, compact mechanical device which receives power at a constant speed and delivers it at any speed desired to any machine or group. It will maintain one speed indefinitely, or may be changed instantly.



Wall Made of Worn Out Grindstones

Can You Think of Another Use for Them?

GRINDSTONES are the unusual material used in building a wall several blocks long around two sides of the 65-acre tract in Philadelphia occupied by the plant of Henry Disston & Sons, Inc. Along a third side which fronts on the Delaware River, is a massive retaining wall also constructed of grindstones. Then, just for good measure, still more grindstones were used to build the Tacony Baptist Church, nearby.

All these stones were worn out in grinding saws and other tools in the Disston plant. More than 2,500 of them were used in building the church alone. No record was kept of how many thousands went into the wall around the plant and the retaining wall on the river front, but the total was many times as great as the number used in the church.



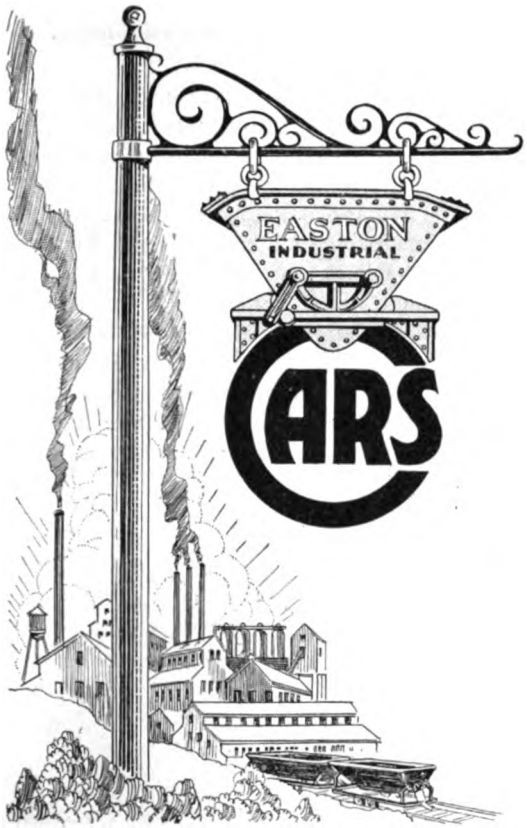
In constructing the retaining wall the grindstones were used just as they were discarded from the factory, but for the wall around the plant and for building the church the stones were carefully squared and no one looking at church or wall ever would imagine that they were built of grindstones.

In addition to these walls, grindstones serve as the foundation for roads within the area occupied by the 68 factory buildings that compose the Disston works. At present there are several thousand worn grindstones piled up in the factory yard waiting for some new use to be found for them.

Erratum Notice

IN the February issue of INDUSTRY ILLUSTRATED on Page 22, in an article entitled "Saving 13% of Your Coal Bill," the statement was made that the Vogt Bent Tube Water Tube Boiler delivers saturated steam only. We are advised by the manufacturers that their boilers guarantee to deliver steam superheated not less than fifteen degrees.

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EASTON

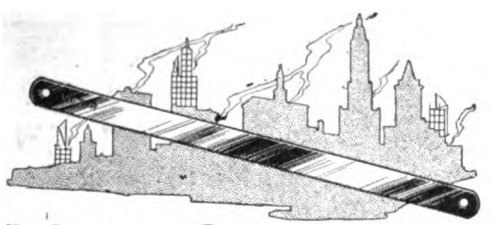
Did you ever hear of

Annealing Cars
Barney Cars
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Cradle Cars
Gable Cars
Ground Hog Cars
News Print Cars
Phoenix Cars
Scoop Cars
Tipple Cars
Transformer Cars
"V" Dump Cars
Won Way Cars

We make 85 other kinds of industrial cars, portable track, switches and turntables.

EASTON CAR & CONSTRUCTION COMPANY
211 Scarritt Arcade, Kansas City, Mo.
Hilton St., Easton, Pa.

FOR EVERY INDUSTRIAL PURPOSE



Industries Grow with Victor

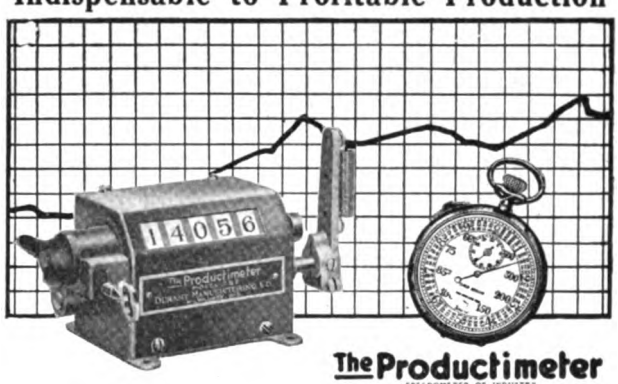
Victor Blades have always taken a prominent part in the development and growth of the metal working industry.

As the metal industry grows the Victor Blade will be doing its part as a reliable cutting tool.

Let us send you free samples of this Wonder Blade

VICTOR SAW WORKS, Inc.
MIDDLETOWN, N. Y.

Indispensable to Profitable Production



The Productimeter
SPEEDOMETER OF INDUSTRY

Clipping fractions of seconds from the many operations that go into your product may effect savings in cost that will give you a decided sales lead over competition.

The accurate, immediate records of production furnished by Productimeters speed up cost accounting, time study, and the compilation of significant production data. They can be applied to your important production machines with surprisingly profitable results.

Let us give you the complete facts; use the coupon below.

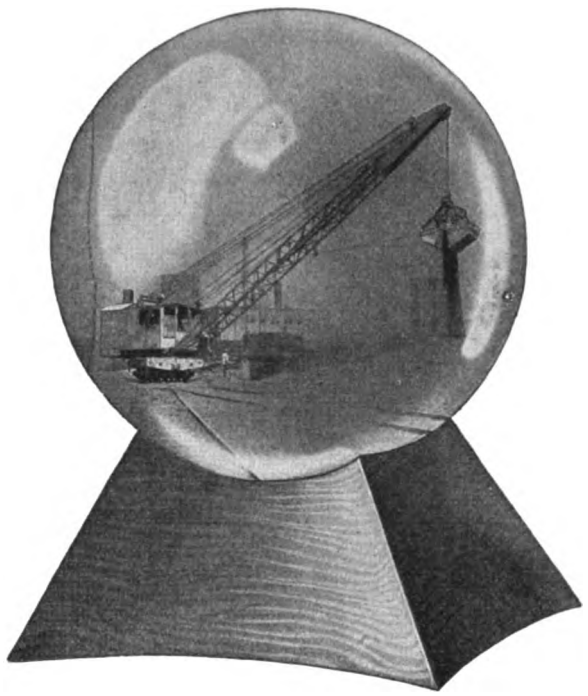
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Durant Mfg. Co., 608 Buffum St., Milwaukee, Wis.
Send me complete information on Productimeters. I am interested in a Productimeter for.....

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LOOKING INTO THE PAST AND FUTURE OF COST CUTTING



Recent surveys show that the sharp reduction in operating costs effected during the last five years has been due primarily to improved material-handling methods.

This progress is only the initial step. Every executive is searching for further means of conserving man-power through material-handling equipment.

Cranes furnish numberless possibilities for speeding up work in the yards. Equipped with bucket, magnet and fall-block a crane is able to tremendously multiply man-power by performing practically every heavy handling operation.

Has your company joined the increased number of manufacturing plants that realize the economy in this equipment?

Gas Shovels • Locomotive Cranes
Clam-shell Buckets • Pile Drivers

C-5-14

McMyler-Interstate

New York • Chicago Cleveland Buffalo • Philadelphia
Pittsburgh • Detroit • San Francisco • Los Angeles

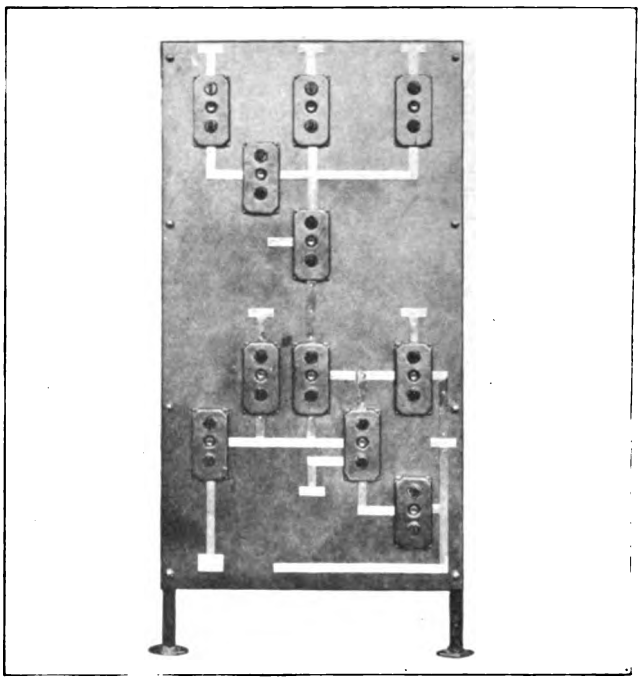
Novel Steam Line Control

A Board, Made Up in Approved Electrical Style, for Push-Button Control of Steam Valves

THE accompanying photograph illustrates a new and interesting "twist" in the remote control of steam lines. This panel was designed by the General Electric Company for use by the Chapman Valve Company.

The mimic busses and nameplates shown on the black panel are of polished copper. The busses represent steam lines and the nameplates are engraved with the size of pipe to a particular boiler, size of pipe to a particular turbine unit or the location of valves.

The pushbutton stations are used only to close valves, each being in parallel with the closing buttons of another pushbutton station remote from the panel. The "open" control is located at the remote pushbutton station.



The apparently white lines on this board are in reality polished copper, in imitation of switchboard busses, and represent steam lines. The lines are identified by engraved nameplates which show the size of pipe and location of valves.

Each group of pushbottons has three buttons. The topmost button controls the valve which feeds a high pressure steam line to a unit, the lowest button controls the valve feeding low pressure steam to the same unit and the middle button is a master by means of which each of the two valves can be closed. As the two valves in question are on steam lines of different pressure, both cannot be open at the same time, one always being closed. The master pushbutton, when depressed, will close the open valve, no matter which one it may be.

By noting the red indicating lamps which are lit it is possible, with this panel, to trace any open steam line from the boiler to the turbine unit.

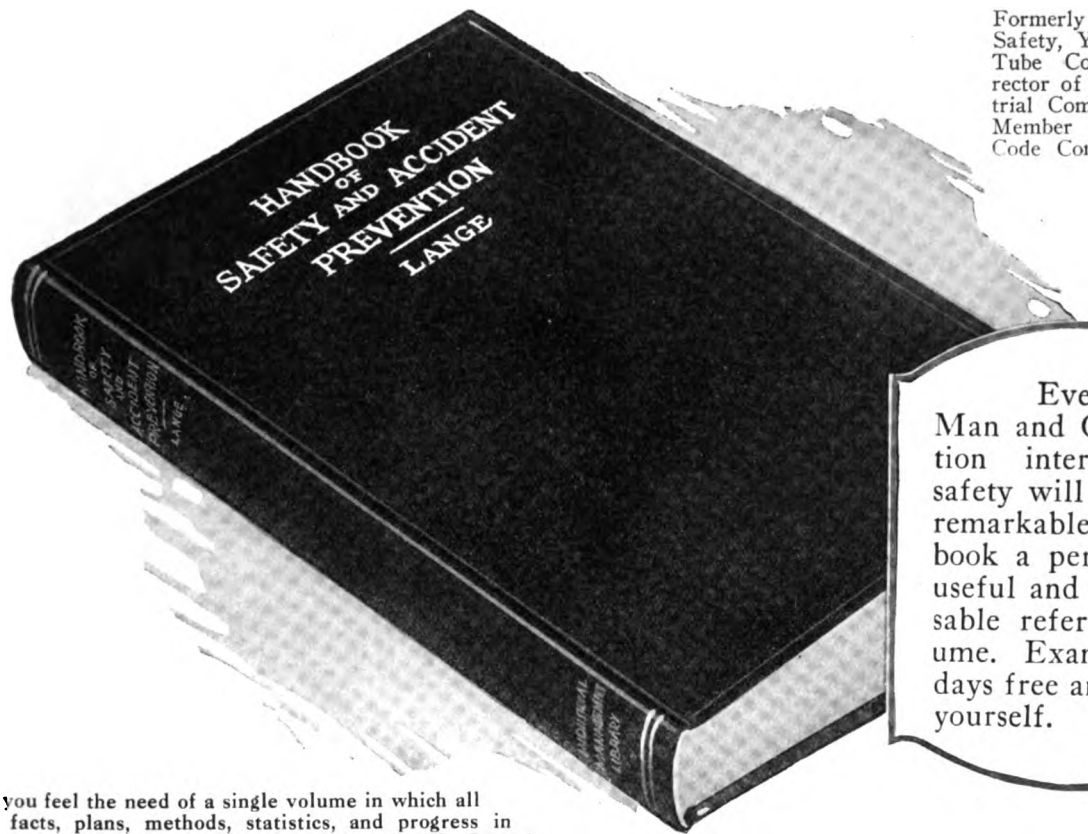
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OF
SAFETY AND ACCIDENT PREVENTION

Written by Fred G. Lange

Formerly Assistant Director of Safety, Youngstown Sheet and Tube Company; former Director of Safety for the Industrial Commission of Ohio and Member of National Safety Code Committee.



Every Man and Organization interested in safety will find this remarkable 512-page book a permanently useful and indispensable reference volume. Examine it 10 days free and see for yourself.

Do you feel the need of a single volume in which all **the** facts, plans, methods, statistics, and progress in **safety and accident prevention work are given? Lange's Handbook, just published, will answer your requirements —completely, thoroughly, and authoritatively.**

The Only Complete Up-to-date Book on Safety

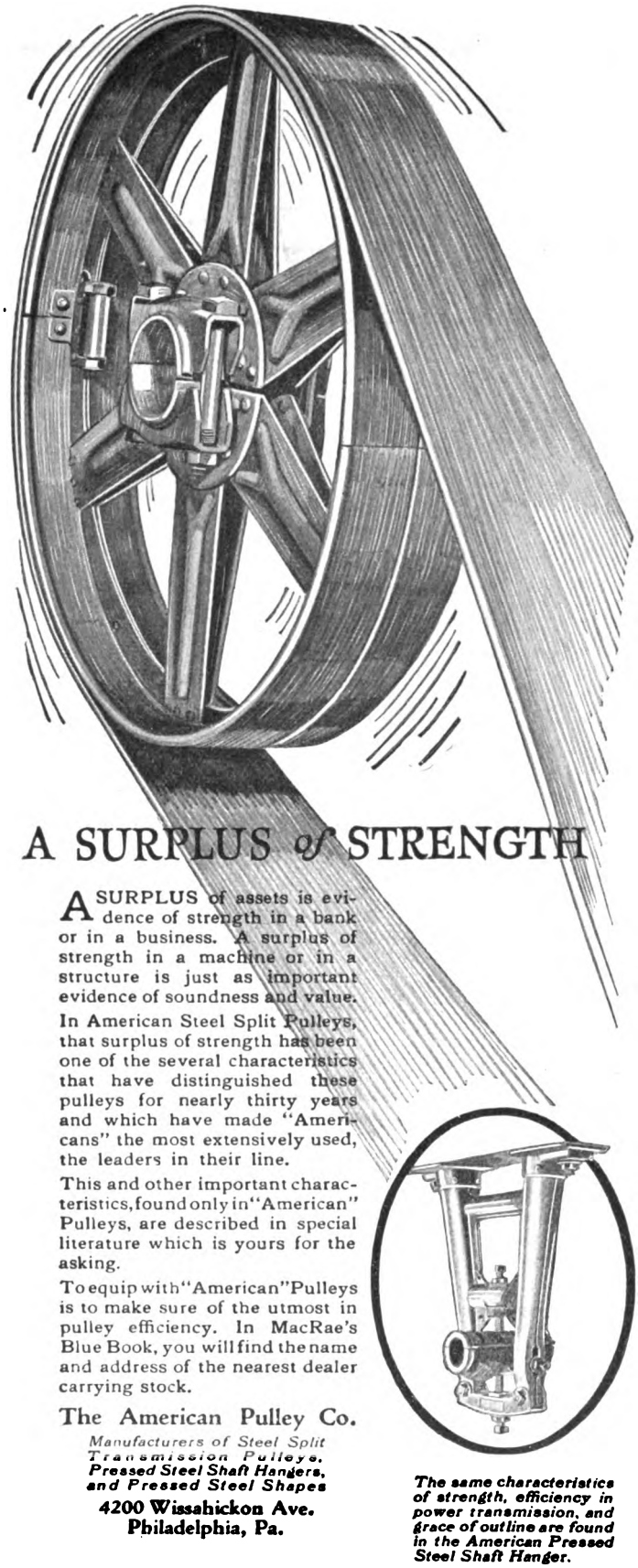
HERE at last is a book that thousands actively engaged in safety work or interested in its development have long awaited. The author with years of actual practice in safety behind him, has gathered together all the essential facts and data on safety and compressed the whole absorbing story within the pages of his book. That he has admirably fulfilled his purpose in preparing a real handbook on this all-important subject has already been acknowledged by all who have read his work. Unquestionably it will go down as a notable contribution to the safety literature of the day. The matured safety engineer will find this volume a ready and convenient reference to otherwise scattered material. Foremen, safety committee men, superintendents, and factory managers can readily learn from it all the essential elements of effective safety work. The engineer can gain from it a clear insight into accident hazards and sources which will enable him to design structures in which safety is inherent. In short, this handbook will prove invaluable to every industrial plant, whether it be a plant which has already made marked progress in safety measures or whether it be one in which little or nothing has been done in this direction. The cost of the book, $5 postpaid, cannot be considered an expense. Rather it is an investment which may easily pay incalculable dividends now and in the years to come.

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A SURPLUS of assets is evidence of strength in a bank or in a business. A surplus of strength in a machine or in a structure is just as important evidence of soundness and value.

In American Steel Split Pulleys, that surplus of strength has been one of the several characteristics that have distinguished these pulleys for nearly thirty years and which have made "Americans" the most extensively used, the leaders in their line.

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To equip with "American" Pulleys is to make sure of the utmost in pulley efficiency. In MacRae's Blue Book, you will find the name and address of the nearest dealer carrying stock.

The American Pulley Co.

Manufacturers of Steel Split Transmission Pulleys, Pressed Steel Shaft Hangers, and Pressed Steel Shapes

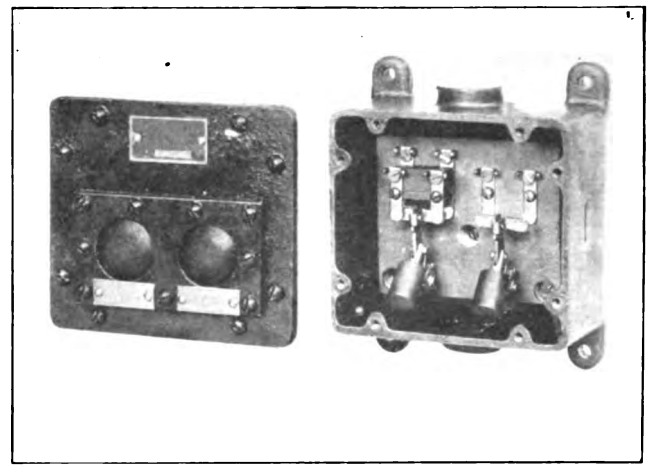
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The same characteristics of strength, efficiency in power transmission, and grace of outline are found in the American Pressed Steel Shaft Hanger.

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PRESSED STEEL HANGERS | STEEL SPLIT PULLEYS
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Dust-Tight Push Buttons

WHERE dust-tight, enclosed, magnetic-starting switches are used on alternating current circuits, a specially designed pushbotton station is often employed. The device shown in the accompanying photograph was originally designed by the General Electric Company for marine use, the pushbutton being mounted under partial cover on deck where it would occasionally be subjected to a spray of water. To obtain the necessary protection, a



pushbutton using a cast iron case with a flexible leather gasket over the buttons was provided.

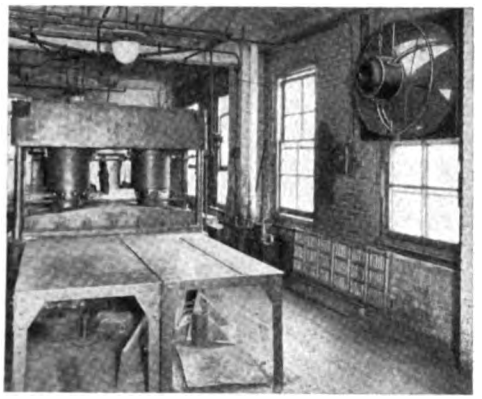
Each button is operated by pressing on the leather directly over it. The leather is very flexible and may be kept in that condition by occasional applications of neatsfoot oil.

The pushbutton station can be mounted either vertically or horizontally and, in either position, is dust-tight.

THE flexibility of production and its control are basic causes of the present relative stability in the prices of industrial commodities. There is neither a scarcity of goods as an incitement to higher prices, nor an overstocking of the market which breaks down prices. Consequently, the curve of business conditions, which in the past has shown extreme peaks and valleys, now tends more and more to flatten out. In so doing, it sets at naught, for the present, the short-time cycle theory of sharp changes in business conditions over brief periods of time.

The cycle theory in general is founded on the belief that history repeats itself. Both logic and experience seem to confirm this belief when applied to long periods of time, but not necessarily to those brief periods in which new and unexpected factors often produce striking results. One such new factor at present is widespread hand-to-mouth buying, which is one of the principal conditions to which the business world now seeks to adjust its ways and methods.—*La Salle Extension University.*

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Diehl Exhaust Fans are quiet in operation, very economical in current consumption, move a large volume of air and are very easy to install.

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BUILDERS OF FANS AND MOTORS SINCE 1888

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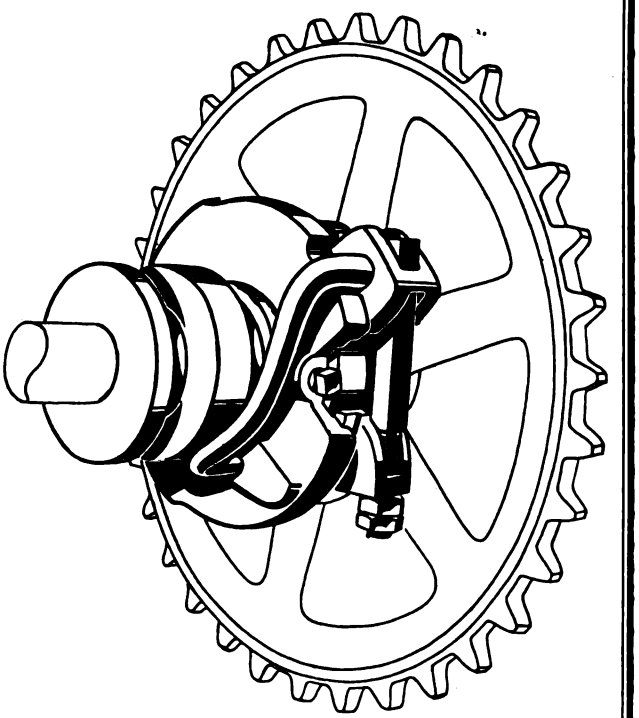
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THE full floating Friction Band of the Conway Clutch compels, complete peripheral contact.

Its easy engagement, quick release, drag free idling, one point adjustment and interchangeable parts—offer an organized defense against the troubles of starting and stopping through friction clutches.

Conway Clutches are simple, capable, dependable, and durable. Put one on your machine just for experiment's sake, you'll be delighted with its performance.

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The Protection Your Plant Needs

An Industrial Fire Fighter

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A necessity for industrial plants, power houses, oil, paint, grease, chemical plants, warehouses, etc.

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So efficient in all tests made by many large concerns who have used it, that we will ship one of these extinguishers to any responsible company for a thirty-day test, with privilege of returning, if not found to give thorough satisfaction.

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From Dishpan Salesman to Consulting Engineer

Homer J. Blowhard's Rise as an Efficiency Expert Reads Like an Odyssey of the Modern Business World

By Edmund J. Kiefer

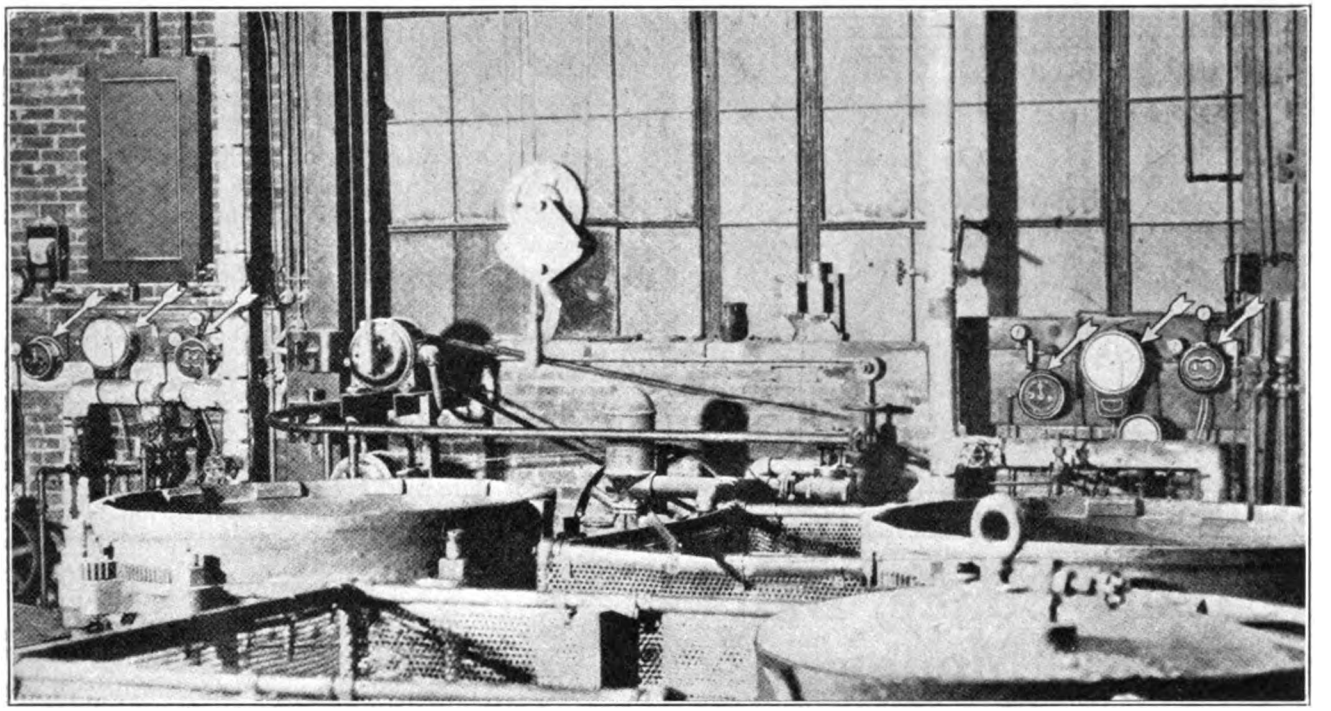
IF you found yourself after fifteen years of dishpan selling, still selling dishpans while the men over you were making money, what would you do? Some men would have let it go at that, but not Homer J. Blowhard, of New York, Chicago, Topeka, St. Louis and wherever the wind blows. To him the situation was a challenge, a call to battle, a scent of something doing in the nostrils of an old war horse.

He took stock of himself. It didn't take him long and part of the time was spent looking in the mirror. Why sell dishpans—or wash boilers, for that matter? Why not sell yourself? Right then and there, a little idea was born in the brain of Homer J. Blowhard. He decided to become a consulting sales engineer. He gave his company just two weeks to replace him—and, after their time was up, he packed his grip and swung off this time for new territory, Palm Beach, to hobnob with corporation presidents and incidentally sell himself, Homer J. (the J. standing for Jay) Blowhard.

Destiny steered him straight to the wicker chair of Darius S. Pincushion, founder and president of Pincushion Trucks, Inc. Poor old Pincushion! The doctor had sent him to Palm Beach to shake off business cares and here he was, worrying himself to a mere shadow of his former self about his business. If you had bet him two cents that it was headed straight for the outstretched hands of a receiver, he wouldn't have had the nerve to take your bet. Palm Beach had brought out the worst in him. Enter Homer J. Blowhard with a great line of patter and much pep. Before the scene ends, our hero has Pincushion licked into believing that he—Homer J. Blowhard—is heaven-ordained to make Pincushion Trucks look up. All it will cost is a hundred dollars a day and, of course, expenses. Give him six months and he will go around to the various branch offices and see just what is the matter. No petty details for him—just room. Exit Darius S. Pincushion saying yes and feeling good enough to take up golf again.

Homer's working hours, on his business hegira all over creation, were strictly from ten-thirty or a quarter of eleven till twelve-thirty or one, if his appetite could stand the gaff that long. Afternoons he spent at the local athletic club, on the branch manager's sesame. These branch managers treated Homer white. The boys who wanted to stand in with President Pincushion, were especially cordial. The pluggers who had been thinking this little matter of Pincushion Trucks for years, but never had a chance to whisper their stuff into Pincushion's ears or where it would do the most good, rapidly unburdened themselves to Blowhard as freely as a condemned man to his father confessor, in the hope of yet making the grade to advancement and power. The other boys—and strangely enough there were some—who didn't give Homer credit for the big man he was, at least were not nasty about it, and so Homer got along.

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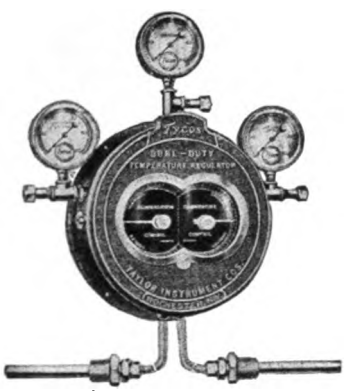


Tycos Temperature Control

Saves $10,000 Yearly in Wages



Tycos Recording Thermometer



Tycos Dubl-Duty Regulator

And mind you this has been going on for eight years.

Here is the actual record made in the plant of a large tire and rubber company.

Prior to 1917, this company used hand regulated steam controls on their curing heaters, where rubber for making tires is cured by steam. Hand control was given up because the temperature could not be controlled closely enough and a variation of 1½ to 2 degrees from the correct temperature was practically certain to spoil the Dubl-Duty temperature and time recorders—temperature of the curing heaters never varies more than one degree—hence spoilage has been practically eliminated.

But how about the $10,000 yearly saving?

Here permit us to quote an authority from the Steam Engineering Department of this same Company.

"But we were able to make even more savings, for the use of these instruments have enabled us to do away with 10 men. Formerly one man could only watch 4 heaters at the most. Now he can watch 10 if necessary. Here our savings amount to $10,000 in wages. All men have to do is fill the heaters and turn on the steam. The Taylor instruments automatically regulate the temperature and the timing device shuts off the steam at the right time. Besides the Dubl-Duty instruments, we have standardized on and are using several thousands Taylor industrial thermometers and a number of time recorders. We have always found Taylor Instruments to be thoroughly dependable."

What we have done for this company and hundreds of others, we can do for you. And one of the advantages of dealing with Tycos is the convenience of our service. We have a representative in every large industrial center—one near you. Consult with the office nearest you. Catalogs sent free on request.

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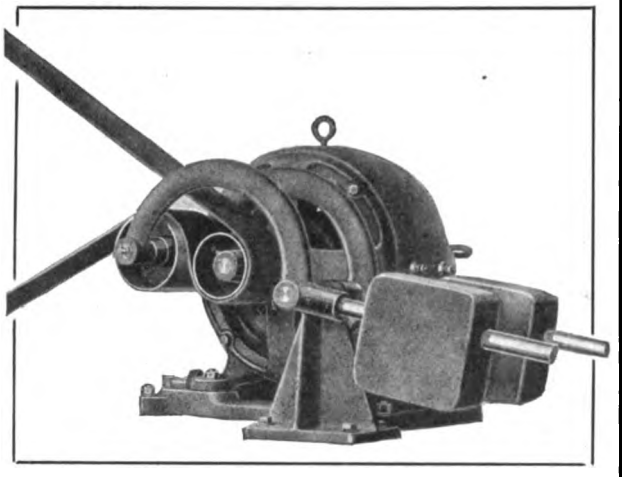
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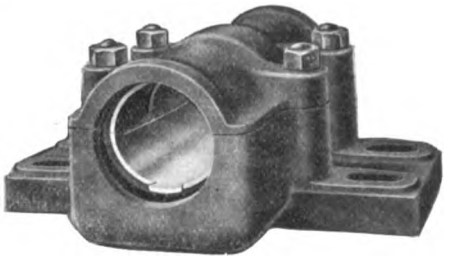
Here's a sturdy little power transmission unit that has great economical features. It saves Belts, Bearings, Floor Space, Motors, Power —and trouble.

It automatically wraps the belt around the pulley, increasing the arc of contact as load increases, thus giving more power.

The U. G. Automatic Belt Contactor is potent with possibilities of savings and increased production efficiency in your plant. We'd be glad to send you a circular describing this profit making appliance.

For 69 years T. B. Wood's Sons Company has been manufacturing a complete line of quality products for the mechanical transmission of power. Each and every one of them is of that durable, long wearing quality that makes for economy.

When you next consider power transmission appliances consult the Wood's Dealer.



T. B. WOOD'S SONS COMPANY

Makers of Power Transmission Machinery since 1857

Chambersburg, Penn.

New England Branch, Cambridge, Mass.

Southern Office
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Flexible Couplings, Motor Pulleys, Speed Reducers, Cast Iron Pulleys and Hangers, U. G. Automatic Belt Contactor for Short Center Drives.

It was a simple matter to dictate the revelations of the confiding boys to their stenographers and have it all nice and neat and waiting for him at the next place where Homer was to cast his weary frame into the best chair. In less than six months, he had enough reports together to serve as a cornerstone for a thirty-story main office for Pincushion Trucks, and these he brought in a taxi and had borne in by several office underlings to the mahogany headquarters of the rejuvenated Darius, who welcomed him like a king his favorite warrior.

But stay—he was off again "to fresh woods and pastures new." Much as he would like to, he—Homer J.—could not be with the president another day to go over the reports. Other presidents were clamoring for his help like derelict ships in the night. His work was done here—office men, less pressed for time, could attend to the insignificant minor details that remained.

And so Homer J. Blowhard went faring forth again on the path of duty and on the trail of trusting corporation presidents.

At forty-three we find him a successful consulting sales engineer highly spoken of by presidents he has taken in everywhere—for executives don't tell.

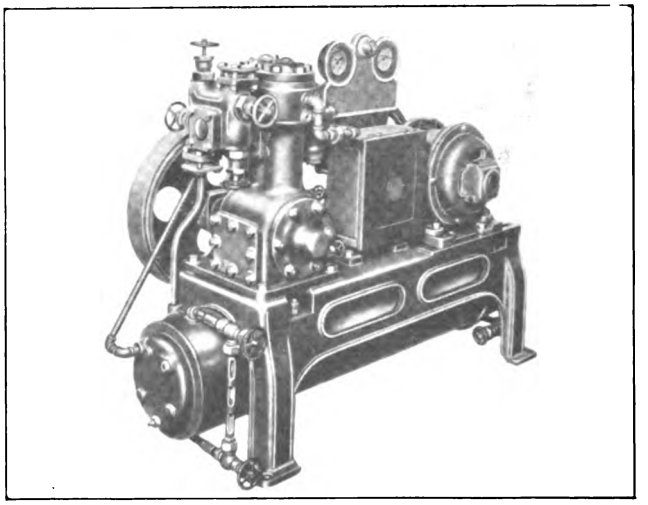
It all goes to show what an ordinary man with something to sell—however insignificant the article—can achieve with the aid of a little lung power, self-confidence, and a fool's own luck in the way of soft pickings.

New Refrigerating Unit

THE American Engineering Co., of Philadelphia, manufacturers of Juruick refrigerating machines, announces an improved, self-contained refrigerating unit as an addition to the Juruick line. This unit, which is especially designed for automatic operation, includes a motor, compressor, condenser and ammonia storage tank compactly mounted on one base and provided with all necessary controls.

The unit is of 2-ton capacity. It will go through an ordinary door and can be located on any reasonably level floor without special foundations. Overall dimensions are: length, 68 inches; width, 24½ inches; height, 45½ inches. It weighs about 1,550 pounds.

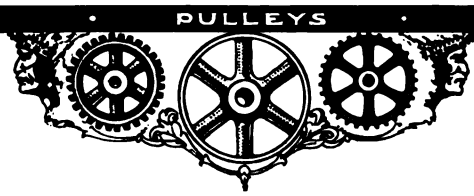
A three to five hp. A. C. or D. C. motor is used according to conditions. This motor drives the compresser by a belt running over an idler mounted on roller bearings. The condenser is of the shell tube type and is arranged so that it can be easily cleaned of scale and sediment.



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Other brooms may resemble them, but from the standpoint of first and final economy, the product of the Lay factories continues to excel.

No matter what the sweeping job is, Lay Metal Case Brooms give unusually long and efficient service. Note the stapled metal case at top, the metal reinforcing band and the heavy flax twine sewings—the reason why Lay Brooms have been the standard since '76.

A Lay Broom means cleaner, quicker sweeping, longer wear, less frequent replacement. Make comparisons in your own plant. Write for Price List.

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Standardize on Hughes Furniture and Equipment for Greater Production

Hundreds of large factories in every industry have now adopted Hughes Chairs, Stools, Tables, Bench Legs and Factory Trucks.

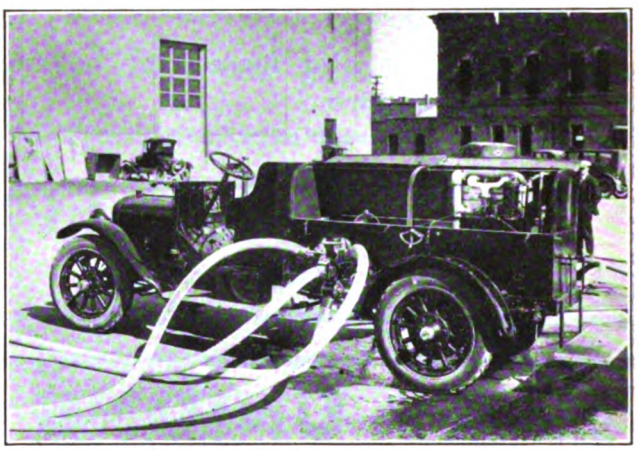
Frames of all-steel securely riveted together, they are guaranteed for long life and dependability. Hughes Shop Furniture are made to meet modern requirements and aid in giving better working conditions—thus assuring greater production. ¶ Write for illustrated catalog.

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Allegan, Michigan

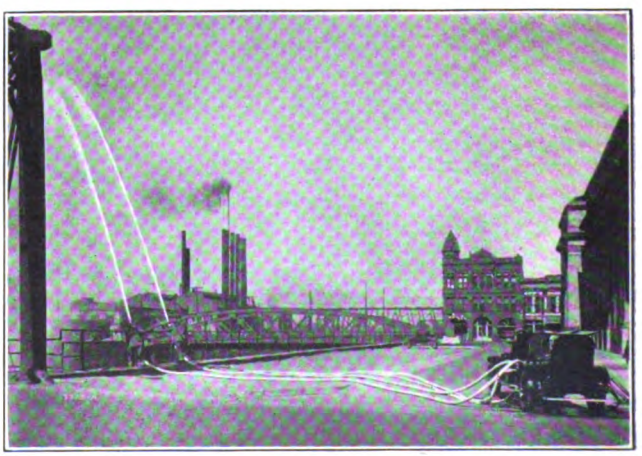
Chairs Stools Trucks
Tables Bench legs

An Inexpensive Motorized Booster Pump

THE usual motor pumper is a highly expensive piece of apparatus, due in part to the special chassis employed and in part to the use of a multistage centrifugal or rotary pump, as required to match ordinary automobile engine speeds. A single stage pump, however, weighs less and is more simple in construction and for that reason more reliable, and both the Associated Factory Mutual Fire Insurance Companies and the Underwriter's Laboratories of Chicago have approved the single stage centrifugal pump as built by the De Laval Steam Turbine Co. for fire service. A single stage pump of the capacity required for fire streams can easily develop 100 lbs. pressure when driven by a standard gasoline engine of the sturdy marine type. The unit shown in the accompanying photographs is designed to deliver 600 gal. per min., against 100 lb. per sq. in. when driven at 1,750 r.p.m., that is, where water is taken from



the mains under pressure, 100 lbs. is added to the pressure in the mains. The pump has a large overload capacity and has pumped as much as 1,250 g.p.m. The unit consists of a De Laval five-inch single stage pump with gasoline engine mounted upon a one-ton truck chassis. The two 1⅜-in. fire nozzles are discharging under a total pressure of 130 lbs. This particular unit was assembled by Chief Christy, of the Pueblo, Colorado, Fire Department, for use in outlying sections of the city, and was built for approximately half the cost of a regular pumper.



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Bound in Red Cloth

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Inexpensive
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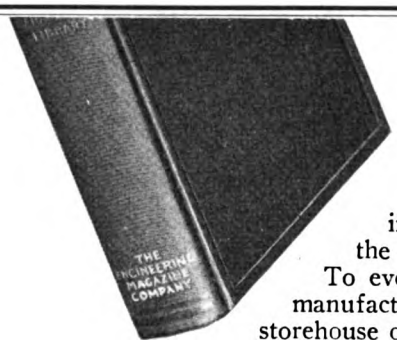
EXAMINE IT 10 DAYS
AT OUR EXPENSE

An Up-to-Date and Practical Book Devoted Solely to Gaging

CONTENTS

Chapter

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IV. Work Gages.
V. Inspection Gages.
VI. Gaging of Screw Threads.
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Albert A. Dowd and Frank W. Curtis, the authors, have written "Modern Gaging Practice" out of their own extensive experience and practice in gaging plus a personal investigation they made of gaging practice in the shops of the best plants in the United States, large and small alike. Here then is a book that is authoritative, reliable, and practical. It will do three things for you. First, it will give you a better conception of every detail of modern gaging; second, it will bring you a wealth of new ideas on more effective gaging methods which you can apply to your own work; third, it will serve you as a permanent and dependable reference guide.

Only Standard Practice Arrived at Through Practical Experience Described and Recommended

You don't want theory. You do want to know how other companies handle their gaging problems provided their methods, beyond a question of doubt, have proved successful. Which is exactly what you get in "Modern Gaging Practice." Reading this book is just like making a personal tour among numerous plants in different industries all of which have developed highly effective and economical systems of gaging. Dowd and Curtis have made just such an investigation for you and the results are given in detail in their new book, just published. Practical engineers—they knew in advance what you wanted and needed. And in clear, concise, non-technical language they have presented it to you. Here's a chance for you to obtain in one volume all the worth while information on gaging, brought right up to date, that you need in order to handle more advantageously every detail of the whole gaging process. The practical benefits you will get out of this book would throw its cost, even thought it were five times as great, out of all consideration in your mind. We cannot urge you too strongly to look it over and see for yourself.

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The Room of a Million Details!

WHEN you purchase or use a Cle-Forge High Speed Drill, a "Peerless" Reamer, or an Ezy-Out Screw Extractor, think of the part this Mechanical Engineering Department played in its production.

For in this room are brought together a million details—vitally important details—involving the production of twist drills, reamers and other "CLEVELAND" products. Here measurements are figured, intricate charts made for the guidance of other departments, and new tools and new equipment designed.

Our Mechanical Engineering Department is an exceptionally large one—unequalled, we believe, in this industry. Without it, it would be difficult, if not impossible, to maintain that high standard of excellence and accuracy for which "CLEVELAND" twist drills and reamers are noted.

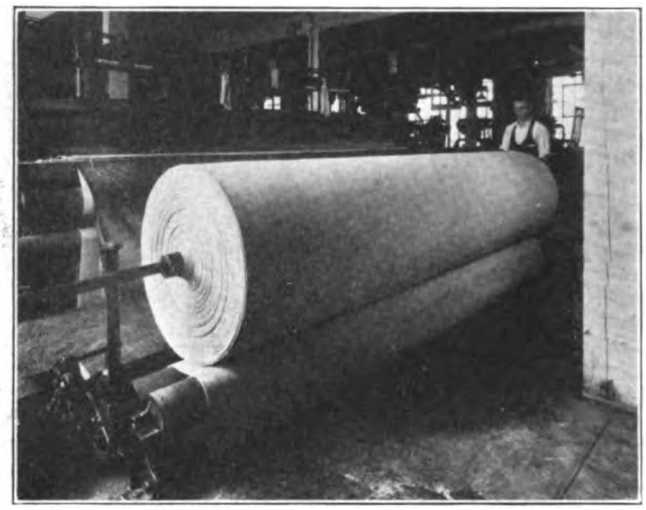
If it happens that you are asked to pay slightly more for "CLEVELAND" tools, it is because this *hidden* department is helping to make them better—and, therefore, worth more.

The CLEVELAND TWIST DRILL COMPANY CLEVELAND

Manufacturers of Carbon and Cle-Forge High Speed Drills for every purpose; "Mezzo" Super-Carbon Drills; Hand, Jobbers' and Shell Reamers; "Peerless" High Speed Reamers; "Paradox" Adjustable Reamers; "Quick-Set" Reamers; "Spirex" Machine Taper Pin Reamers; Chucking Reamers for Turret Lathes; Counterbores; Countersinks; Sockets; End Mills; and the "Ezy-Out" Screw Extractor.

Six of These Would Cover an Acre

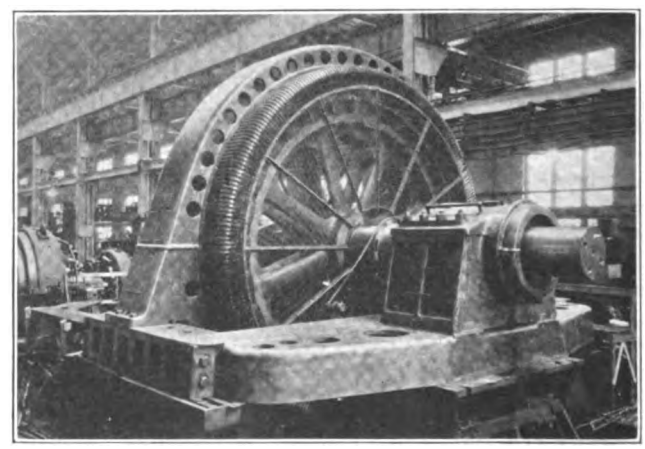
THIS roll of beavercloth made by L. H. Gilmer Co., is 650 feet long, 128 inches wide and weighs 1,850 pounds. The cloth in six of these rolls would cover an acre. Because of the width of this cloth it was necessary



to design a special loom on which to weave it. Beavercloth is used for making the aprons that carry the work through flatwork ironers used by laundries.

World's Largest Industrial Motor

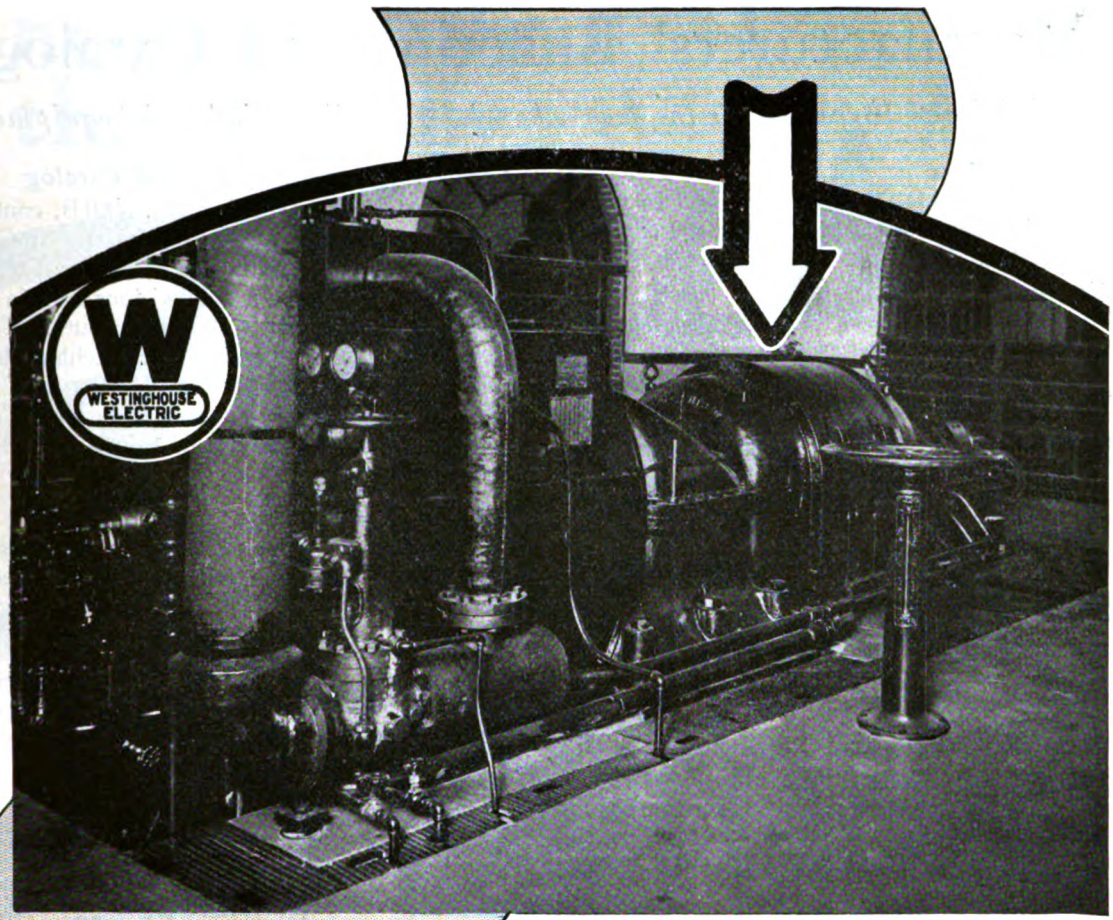
THIS 9,000-horsepower synchronous motor has the highest continuous horsepower rating of any industrial motor in the world. It is shown in the shops of the General Electric Company preparatory to shipping to the McKinney Steel Company's River Furnace plant



at Cleveland where it will be direct connected to a Morgan continuous billet mill soon to be placed in operation.

The mill will have ten stands of rolls and will be the first large steel rolling mill in the world to be driven by a synchronous motor, the usual practice having been to use an induction motor.

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A penny was balanced on this Westinghouse Turbine-Generator while the photograph was being taken. You may not be able to see it, but it is there. The turbine was operating at normal load and speed.

An Operator's Reply—

Replying to a letter of inquiry regarding the new design Westinghouse Turbine-Generator, an operator states:

"I have never seen a machine that runs as smoothly and as quietly as this new 1000 kv. Westinghouse turbine."

This perfect balance, which remains constant thruout the life of the turbine, is assured by using a short, solid rotor, made from one steel forging with no elements to shift due to stresses of rotation or changes in temperature.

This is an exclusive Westinghouse feature.

Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.

Westinghouse

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Manufacturers' Bulletins and Catalogs

Helpful new literature for the man who selects and directs industrial equipment

Cored and Solid Bars

Sumet Bronze Bearing Metal is described in a small booklet which has been issued by the Sumet Corp., 1543 Fillmore Ave., Buffalo, N. Y.

Diesel Engines

Bulletin No. 1020, entitled "Comparison of Diesel Engine Principles," contains 24 pages of illustrations and description of this product manufactured by Fairbanks, Morse & Co., of Chicago, Ill.

Unit Pulverizer

Bulletin No. 7, describing and illustrating the Grindle Unit Pulverizer for firing boilers, furnaces, ovens, etc., has been issued by the Grindle Fuel Equipment Co., of Harvey, Ill.

Water Level Gauges

Bristol-Derr Water Level Gauges for steam boilers are described and illustrated in a 12-page bulletin which has been issued by the Bristol Co., Waterbury, Conn.

Engines

A series of illustrated bulletins, giving full specifications and information concerning the K and T series types of four cylinder engines, and the Model R4U and R6U covering the four and six-cylinder types of engines, respectively, have been issued by the Climax Engineering Co., of Clinton, Iowa.

"Cold Weather Mortar"

is the title of a bulletin which has been issued by the National Lime Association, of Washington, D. C.

Draft Gauges and Mercurial Barometers

Bulletins Nos. 26 and 35, illustrating and describing the Defender Draft Gauges and the Standard Fortine Type Mercurial Barometer, respectively, have been issued by the Defender Automatic Regulator Co., 308 South 8th St., St. Louis, Mo.

Air Washers

"Sirocco" Air Washers are illustrated and described in a 32-page bulletin, No. 1923, which has been issued by the American Blower Co., of Detroit, Mich. Bulletin No. 1608, also issued, illustrates and describes "ABC" Pressure Blowers and Exhausters, Type P.

Watthour Meters

Bulletin No. 70, which illustrates and describes, in its 24 pages, the Sangamo Type H Single and Polyphase Watthour Meters, has been issued by the Sangamo Electric Co., of Springfield, Ill.

Forged Steel Flanges

An illustrated folder describing Taylor Forged Steel Flanges and tubular products has been issued by the American Spiral Pipe Works, of Chicago, Ill.

Air Filters

Bulletin 254, which illustrates and describes Tangldust Air Filters for general ventilation of offices, public buildings, etc., has been issued by The Cooling Tower Co., Inc., 15 John St., New York.

Juruick Refrigeration

Juruick Ammonia Compressors are illustrated and described in a 20-page catalog which has been issued by the American Engineering Co., of Philadelphia, Pa.

Electrical Apparatus General Catalog

General Electric Catalog No. 6001B, containing 1,104 pages of illustrations and descriptions of G-E products, has been issued by the General Electric Co., of Schenectady, N. Y. Principal subdivisions in this book are on Generation, Wire and Cable, Distribution Transformers, Arresters, Voltage Regulators, Switchboards and Accessories, Switchboard Devices, Meters and Instruments, Motors, Motor Applications, Industrial Control, Railway, Lighting, Industrial Heating, Miscellaneous, and also a Subject Index.

Electric Chain Hoists

An illustrated folder illustrating and describing Yale Ball Bearing Electric Chain Hoists, has been issued by the Yale and Towne Mfg. Co., of Stamford, Conn.

"How to Isolate Machine Vibrations"

is the title of a 12-page illustrated booklet, which describes Korfund, the isolator for all types of machines. This booklet has been issued by the Korfund Co., Inc., 11 Waverly Place, New York.

Chains and Sprockets

Catalog No. 57, containing 84 pages of illustrations and description of Diamond Roller Chains and Sprockets, in addition to engineering data of interest to the designer and user of power transmission equipment, has been issued by the Diamond Chain and Mfg. Co., of Indianapolis, Ind.

Unit Heater

Bulletin A, which illustrates and describes the Modine Unit Heater for steam or hot water heating systems, has been issued by the Modine Mfg. Co., of Racine, Wis.

Jacklifts, Stackers and Steel Leg Platforms

A 32-page booklet illustrating and describing Lewis-Shepard Equipment for handling materials has been issued by the Lewis-Shepard Co., of Boston, Mass. A price list is included in this booklet, which has been assembled in a patented tab cover for filing in any letter file.

Vent Condensers

Bulletin No. 666, illustrating and describing Vent Condensers and their uses, has been issued by the Cochrane Corp., of Philadelphia, Pa.

Steel Stringers

An illustrated folder describing Midwest Steel Stringers, a method of supporting overhead equipment, has been issued by the Midwest Steel & Supply Co., Inc., 100 East 45th St., New York.

Power Presses

Niagara Inclinable Power Presses for sheet metal working are illustrated and described in a folder which has been issued by the Niagara Machine & Tool Works, Buffalo, N. Y.

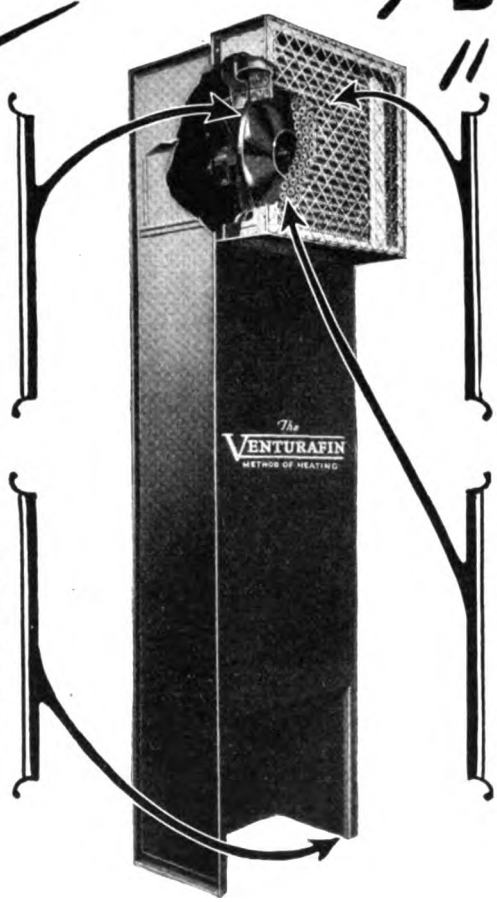
Indicating Calipers

An illustrated folder describing Indicating Calipers and which incorporates features of outside calipers, a rule, magnifier, and indicator, has been issued by the Indicating Calipers Co., 506 East 19th St., New York.

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...a heating method that actually *Forces* HEAT all over your BUILDING

A Ventura fan driven by a fully enclosed industrial type electric motor insures a definite positive air circulation through the heater—enables the amount of heat to be regulated and actually forces the heat over a wide area in the direction desired.



Heat is forced over the highly efficient Aerofin heating coils (described below) into the areas to be heated and not in one corner of the room or against the wall. This feature in itself is worth the price of the Venturafin Method of Heating—it reduces heat loss to a minimum, enables the Venturafin Method to heat up more quickly at any time—makes it possible to keep even temperatures over large areas—and aids ventilation.

A recirculating box completes the Venturafin unit—it takes the air off the floor and feeds it to the fan whence it is forced over the heating coils and back into circulation. The complete unit represents the most scientific method of industrial heating. It is based on sound, proven principles and can be used with either steam or hot water.

The Aerofin heating coil is made of tubes of copper end brass, each tube helically wound with a continuous fin. By this construction, which is patented, the heat transmitting surface of the tubes are made nearly five times greater which not only gives you greater heating efficiency, but also reduces fuel costs materially and enables a light compact unit to do the work of an otherwise large and bulky unit.

And this sound, proven method of heating can be purchased cheaper than ordinary heating equipment and the installation and maintenance costs are lower.

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CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

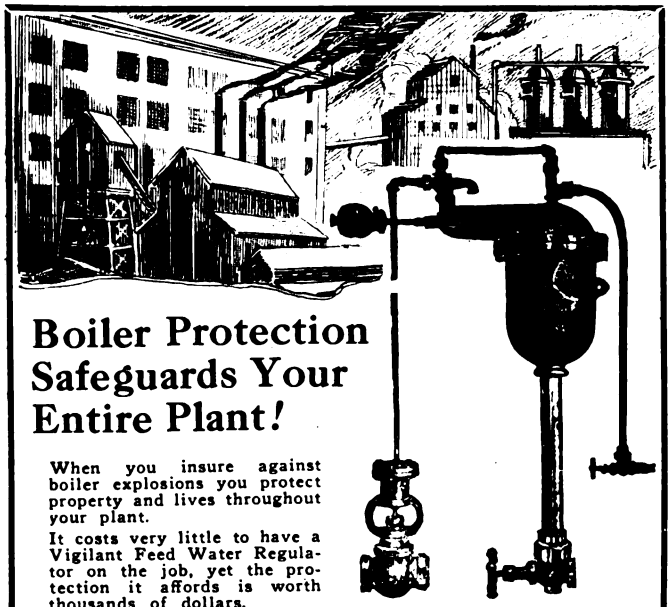
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Manufacturers of all Types of Air-Handling Equipment — Since 1881

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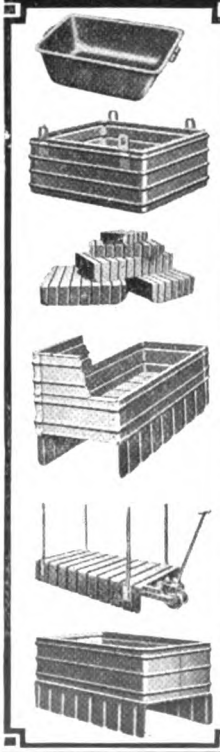
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Handling Delays Upset Production Schedules

MODERN material handling equipment keeps production at full speed all along the line and prevents those annoying congestions that upset delivery schedules.

You can also effect big economies in production and overhead costs that will result in greater dividends.

Literature and Prices upon request

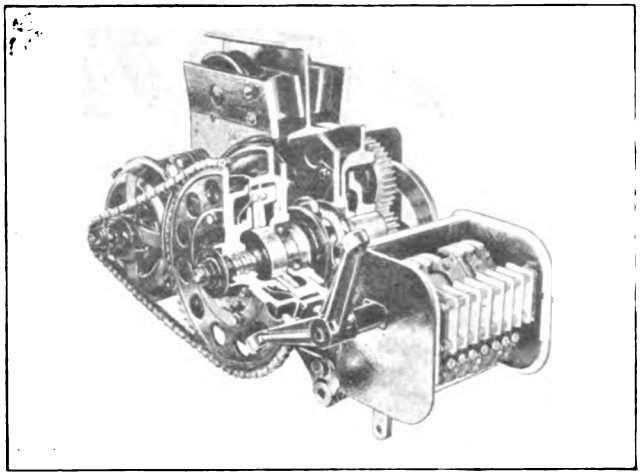
The **POWELL**
PRESSED STEEL CO.
HUBBARD, OHIO
Suburb of Youngstown

New Ball Bearing Electric Chain Hoist

THE Yale & Towne Mfg. Co., of Stamford, Conn., has recently developed a new Ball-bearing Electric Chain Hoist known as Model 20B.

The Yale Model 20B can be quickly adapted to any overhead system. The side plates of the trolley carriage can be spaced on steel bars to fit the desired beam flange.

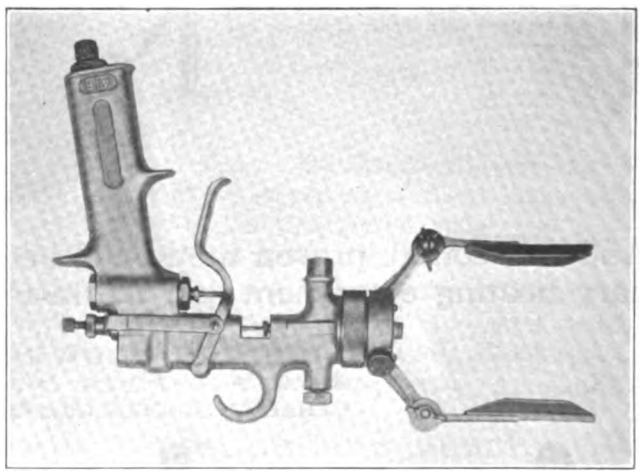
The mechanism is fully enclosed in oil-tight chambers and is compact and easily accessible for inspection without expert service. The ball-bearing load sheave, the latest Yale development, adds a big factor for low-current consumption and general all-around hoisting efficiency.



Steel chain containers can be furnished to hold any length of slack chain up to 60 ft. for ¼, ½ and 1-ton hoists and 30 ft. for the 2-ton hoist. These containers are secured to the under frame of the hoist and do not affect the headroom.

Lobster Claw Attachment for Paint Spray Gun

THE Spray Painting and Finishing Equipment Sales Co., of Boston, Mass., have recently announced the marketing of the attachment shown, which is known as the "Lobster Claw."

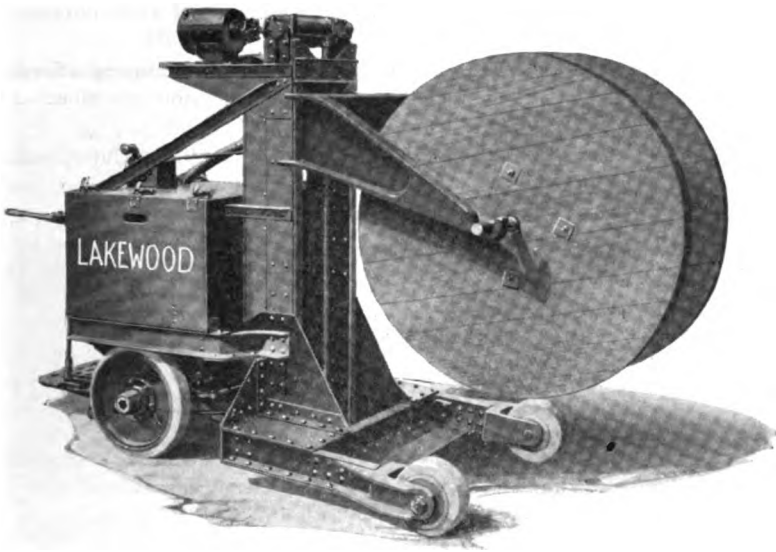


This device confines the paint spray to a band of predetermined width, enabling the "cutting in" of trim, windows, doors, mouldings, etc.

For products not advertised in this issue write Industry Illustrated

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A Lakewood Tier-Lift for every purpose

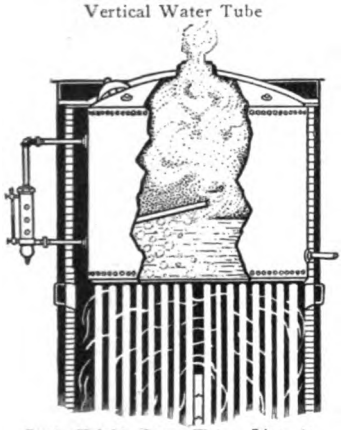


This truck handles reels of wire, up to and including 54″ in diameter.

Write Lakewood first for special purpose trucks.

The LAKEWOOD ENGINEERING COMPANY
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Originators and Patentees of the Tier-Lift Truck

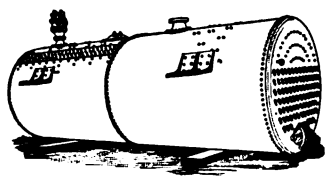
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WICKES Steam Boilers

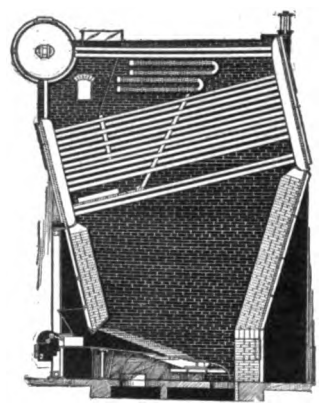
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Readers' Guide to Profitable Equipment

Practical Helps for Mill and Factory Managers

Bulletin No. CE719 Describes a Steel Belt Lacing that is quickly joined. See page 61. The Bristol Co.

A Solution to Industrial Lighting Problems solved by the Reelite. See page 78. Appleton Electric Co.

Interchangeability of Parts is a new idea in motor manufacturing by the Master Electric Co. See page 115.

The Quick Installation Feature of the Split Lineshaft Roller Bearing is illustrated on page 12. Hyatt Roller Bearing Co.

Bulletins on Metal Partitions that cut overhead and maintenance costs. See pages 68-69. The Sanymetal Products Co.

The Latest System in Watchclocks. Literature describing this system is offered by Detex Watchclock Corp. See page 113.

The Productimeter Catalog describes counting machines which aid in speeding up production. For a copy see page 93. Durant Manufacturing Co.

A Big Reduction in Price is being announced by the Osborn Manufacturing Company on all their brushes for industrial use. See page 10.

Information on Stopping the Losses Resulting From Human and Mechanical Errors in the measurement of material is offered by The Toledo Scale Co. See page 120.

A 62-Page Catalog Describing the Various Types of Scales, that indicate weights, while material is on the move, is offered by The American Kron Scale Co. See page 111.

"Hitting the High Spots" is the title of a book which shows ways to cut grinding costs. For a copy see page 65. Wisconsin Electric Co.

A Booklet Describing the New Ruboid Wheel that gives more resiliency to industrial trucks is offered by the Bassick Company. See page 55.

Sliding Door Problems for Industrial Plants. See page 33. Richards-Wilcox Mfg. Co.

Information on Lighting Fixtures, adjustable for any operation, is given in the catalog offered by the American Fixture Company. See page 82.

Illustrations Describing the Economical Handling of Materials are shown on page 51. The Jeffrey Manufacturing Co.

The New Steam Trap that Has Eliminated Five Steam Trap Weaknesses is shown on page 62. See 90 day free test offer. Armstrong Machine Works.

"15 Points of Exide-Ironclad" is the title of a booklet on Storage Battery Information. See page 6. The Electric Storage Battery Co., Philadelphia.

Why It Pays to Make Your Own Blue Prints is very convincingly explained on page 53. C. F. Pease Co.

A 30-Day Test Is Offered on an Industrial Fire Fighter. See page 98. The Oil Conservation Engineering Co.

Sample Blades are Offered by Victor Saw Works. See page 93.

Catalog on Boiler Feed Water Regulators. See page 108. Chaplin-Fulton Co.

Standardized Shop Furniture that Spells Economical Production. See page 7. The New Britain Machine Co.

Catalog Describing Steam Specialties used in a great many large industrial plants is offered on page 73. Davis Engineering Corp.

The Solution to Your Paint Problem. See page 59. American Asphalt Paint Co.

Information on Electric Hoists for All Industrial Departments. Roeper Crane & Hoist Works, Inc. See page 72.

Descriptive Circulars Illustrating Steel Fabricated Buildings for every industrial requirement can be obtained from the Martin Steel Products Co. See page 80.

Catalog 43 Issued by the Medart Company affords a simple method of concentrating transmission machinery purchases. See page 60.

A Book Showing How the T-Rail Has Cut Handling Costs. Offered by the Armington Engineering Co. See page 89.

Five Very Interesting Bulletins on Boiler Room Economies are offered by the Wickes Boiler Co. See page 109.

A Free Trial Offer on Five Gallons of Skybryte and a Skybryte Brush. For coupon see page 70. The Skybryte Company.

Descriptive Bulletins on Industrial Paints can be had by writing to the Nitrose Company. See page 113.

Details of the Ettco Keyless Drill Chuck can be seen on page 66. Eastern Tube and Tool Company, Inc.

Catalog No. 10 Describes the Dial Thermometer, easily readable at a distance of 20 feet. The Motometer Co. Page 84.

"Quality Facts About Belting" contains 50 pages of belting economy. See page 57. Chas. A. Schieren Co.

Coatings that Cut Down Upkeep on Roofs, Floors and Walls. Choice of samples offered by L. Sonneborn Sons, Inc. See page 79.

A Vise and Machine Hammer for the Hard Work are shown on page 56. Prentiss Vise Co.

Catalog No. 860 Illustrates and Describes Applications of Fans and Blowers for every kind of work. See page 89. Buffalo Forge Company.

Illustrated Folder and Prices on steel platforms, boxes, etc., is offered by The Powell Pressed Steel Co. See page 108.

Fire-Proof Oily Waste Cans are illustrated and described on page 54. The Witt Cornice Company.

Descriptive Bulletin on Electric Motors for Industrial Use is offered by the Diehl Mfg. Co. See page 97.

Catalog and Price Lists on Steam Unions that prevent loss of steam, can be obtained from the E. M. Dart Mfg. Company. See page 101.

Sheet Metal Stamping. The service offered by The Breese Bros. Co. See page 73.

A Lift Truck Platform that Results in 50% Speedier Handling is described on page 42. Barrett-Cravens Company.

The Losses Resulting From Friction are very interestingly described on page 4 by the Skayef Ball Bearing Co.

Grinding Machines for Internal, External, Surface, Thread and Extra-deep-hole Grinding. J. E. Gilbert Grinder Company. Page 72.

A Photograph of the U-RE-LITE Circuit Breaker is shown on page 8. The Cutter Co.

High Speed Drills for high speed production. See page 104. The Cleveland Twist Drill Co.

An Illustrated Booklet, "More Light" on the use of factory paint is offered by the U. S. Gutta Percha Paint Co. See page 9.

A Handy Size Catalog which describes six features of the quick action vise. See page 82. The Charles Parker Co.

Illustrated Catalog on Positive Feed Lubricator used on all types of machinery. See page 13. Malcolm H. Smith Co., Inc.

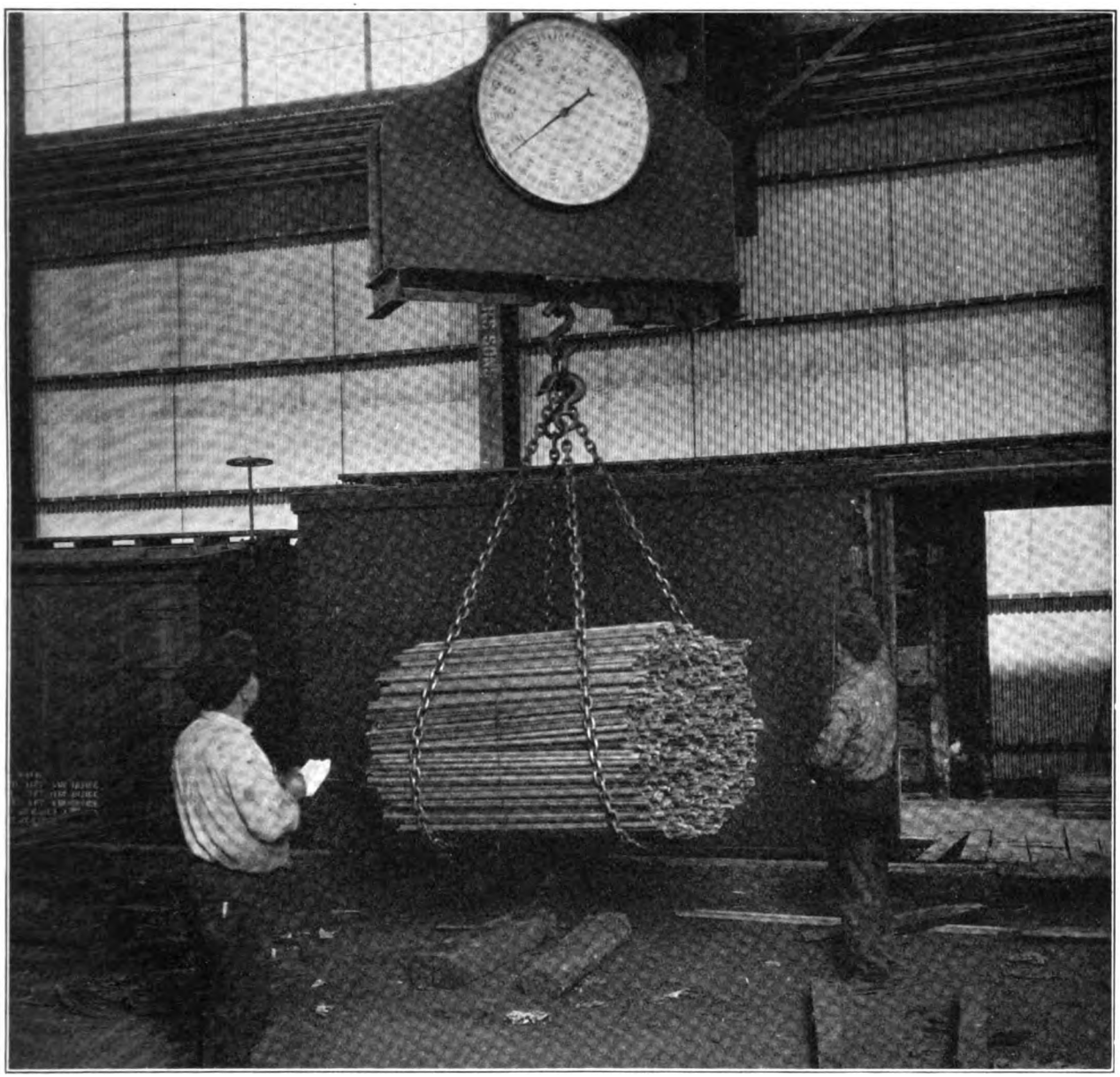
The Advantages of Buying Mechanical Rubber Goods from a concern that controls every factor in their production from

Lubrication as a Means to Reduce Production Costs is explained in a book entitled "Lubricators for Industrial Machinery." For a copy see page 35 McCord Radiator and Manufacturing Co.

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the tree to the finished product is described on page 71. The U. S. Rubber Manufacturing Co.

Catalog Offered on Metal Cutting Band Saw Blades that shows how to improve cutting results and reduce blade expense. Simonds Saw and Steel Co. See page 40.

Surplus Strength on Transmission Equipment. A means of obtaining this is described on page 96. The American Pulley Co.

The "Merrick Catalog" shows how bulk materials can be weighed while conveyor handled. The Merrick Scale Co., page 80.

Catalog "E" very interestingly describes an adjustable speed grinder that saves its cost in one year. See page 91. The U. S. Electrical Tool Co.

A Bulletin Showing a Clutch which is adaptable and standardized for many various machines. See page 97, Conway Clutch Co.

Form 8 Hoist Catalog shows the application of their unit for elevator service. Shepard Electric Crane & Hoist Co. See Back Cover.

Bulletin Describing the Portable Bench Saws and Jointers, electrically driven, is offered by Heston & Anderson, page 90.

Bulletin 26 shows graphically the wide adaptability and economical operation of industrial tractors and trucks. See page 113. The Baker-Rauling Co.

C-105 Is a Descriptive Booklet Offered by the Edwin L. Wiegand Company and describes heating strips for every industrial purpose. See page 81.

Full Particulars about Portable Loaders can be obtained from the Link Belt Company. For nearest office see page 67.

Information on Chrome Vanadium Wrenches. Bonney Forge & Tool Works. Inside Front Cover.

Write for Prices on carefully machine heat treated machine screws. The Ferry Cap & Set Screw Co. See page 73.

Looking Into the Future of Low Cost Materials Handling. See page 94. McMyler Interstate.

Complete Details and Quotations on the wood footed end-grain platforms. Standard Pressed Steel Co. Page 15.

Technical Information Regarding Tapered Roller Bearings, sizes, mountings, etc., on page 5. Timken Roller Bearing Co.

Thin Lead Colored Pencils for charts and plans in 12 different colors. See page 97. American Lead Pencil Co.

Steel Lockers that Save Valuable Floor Space are shown on page 61 by the Durand Steel Locker Co., Inc.

The Strength and Low Maintenance Cost of the Electric Lift Truck is shown on page 49. The Yale & Towne Mfg. Co.

An Interesting Book on Steel Tools. Page 82. Ludlum Steel Co.

For Details on Leak-proof and Waste-proof Oil Storage Equipment. Write to Dept. 35. S. F. Bowser & Company, Inc. See page 41.

Chucks for Every Drilling Purpose. See page 119. The Jacobs Manufacturing Company.

Pyott Red Face Pulleys are illustrated and described on page 101. Pyott Foundry Co.

Industrial Railway Cars for Every Purpose also portable track, switches and turntables are sold by the Easton Car and Construction Co. See page 93.

Complete Information on the Overhead Equipment necessary to put a plant on an efficient basis to handle material. See page 64. Reading Chain and Block Corp.

The Daily Output of 4,000,000 Belt Hooks is the record established by the Clipper Belt Lacer Co. See pages 74-75.

A Handy Pipe Threading Machine easily portable and which will prove very useful in any industrial plant is described on page 14. The Oster Manufacturing Co.

A Paint Made Expressly for Galvanized Iron and also

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A Lesson In Handling Economy

2 shifts—48 men—were required for transfering merchandise at Fisher Bros. Cleveland warehouse when hand trucks were used.

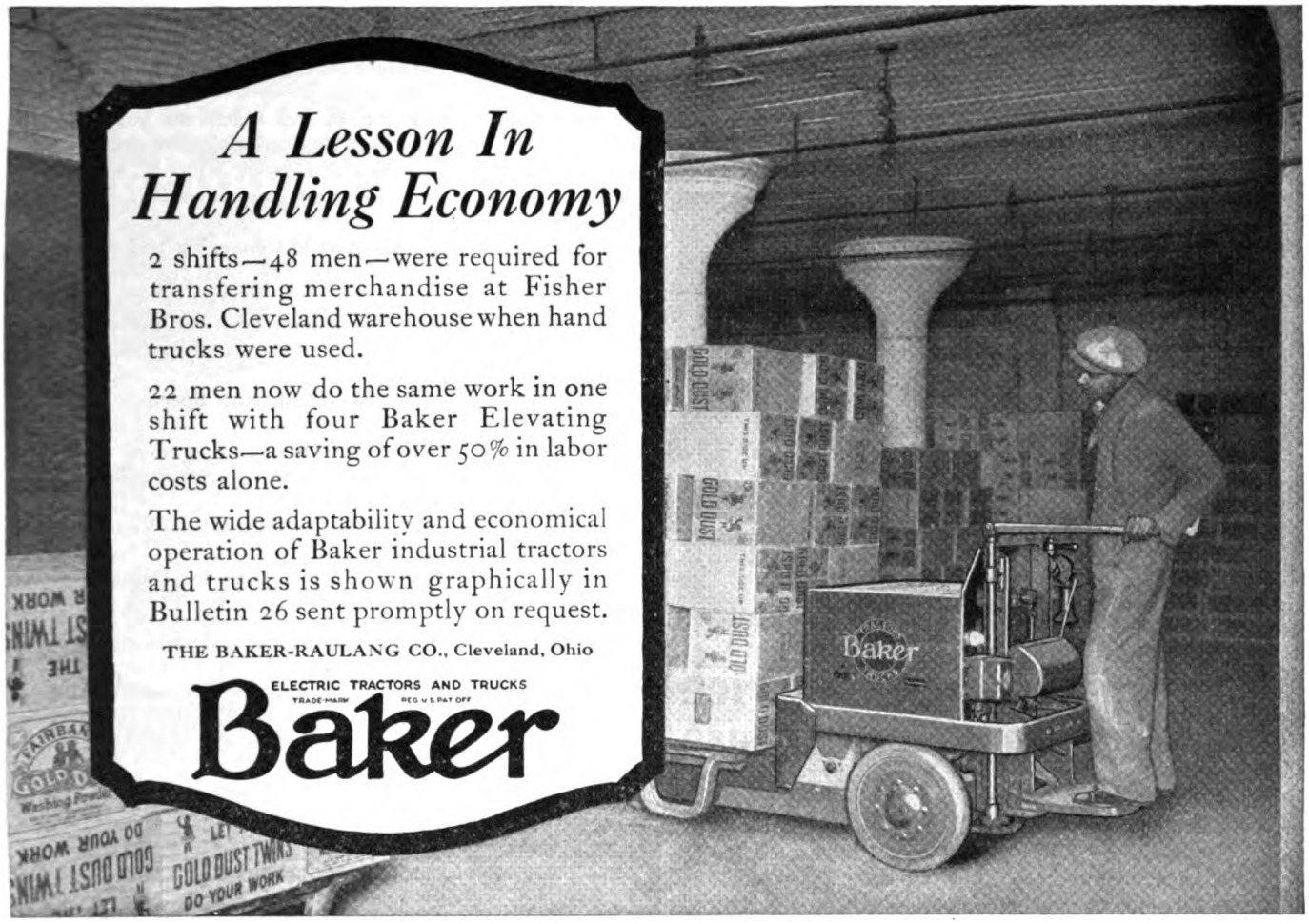
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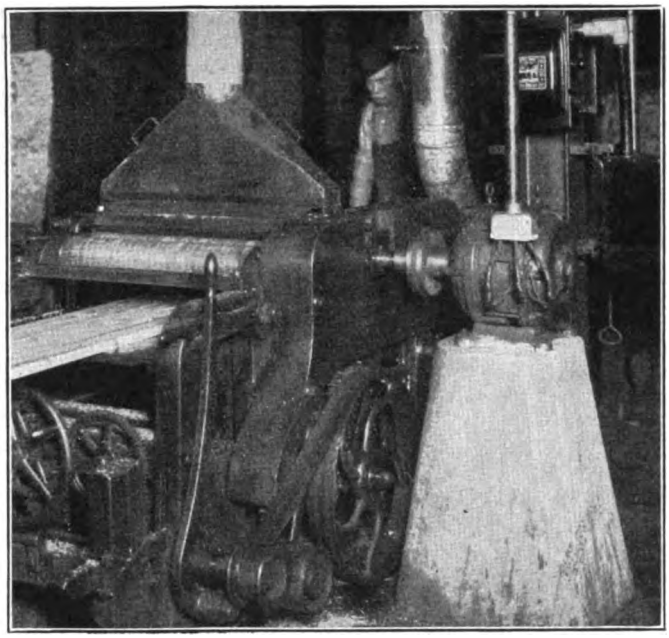
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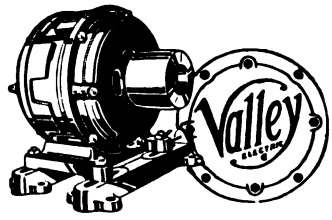
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paints for every industrial purpose, see Inside Back Cover. Goheen Corp. of N. J.

A Steam Trap on 30 Days' Free Trial offered by the Sarco Company, Inc. Page 88.

Information on Steel Boxes and Platforms built to your own specifications. See page 3. Truscon Steel Co.

A Sound, Proven Method of Heating which is a factor in reducing heating cost is described on page 107. American Blower Co.

Bulletins on Various Pneumatic Conveying and Dust Collecting Systems are offered by The Dust Recovering and Conveying Co. See page 37.

A Catalog on Flexible Shaftings for tool room, machine shop, pattern shop and foundry. See page 101. N. A. Strand & Co.

A Bulletin on Accurate Weighing with Speed is issued by the Fairbanks Co. See page 115.

The "Quickfix" Booklet gives the solution to an important problem in the repair of factory floors. See page 117. The Master Builders Company.

An Improved Oven for Cores is featured by Young Brothers Company on page 77.

A Bulletin on Special Purpose Trucks for Industrial Use. Handles skids 15 feet long, 6,000 lbs. capacity is shown on page 109. The Lakewood Engineering Co.

Sample Band or Hack Saw Blades sent on request. See page 61. The Henry G. Thompson & Son Company.

Ten Factors Which Help to Eliminate Dust and Dirt in Industrial Plants. See page 76. Invincible Vacuum Cleaner Co.

An Automatic Conveyor that Costs Less than One Dollar per week, is shown on page 85, by the Chicago Automatic Conveyor Co.

Another Example of the Efficiency in the use of Jennings Hytor Vacuum Pumps is described on page 16. Nash Engineering Co.

Brooms Expressly Built for Industrial Use are described on page 102. The Joseph Lay Co.

Another Installation Showing the Economy of Logan Conveyors. See page 1. Logan Co.

Illustrated Catalog Describing Compact, Sturdy, Steam Engine for many industrial purposes is offered by the Troy Engine & Machine Co. See page 63.

Descriptive Booklet Describing Valley Ball Bearing Motors can be obtained from the Valley Electric Company. Page 114.

Valuable Information on Charging Batteries used on Industrial trucks, tractors, etc. See page 85. The Hertner Electric Co.

Hundreds of Executives Now Realize the Economy of the "tractor-trailer method." See page 34. Mercury Manufacturing Co.

A Short Center Belt Unit Which Saves Belts, Bearings, Floor Space, Motors, Power and Trouble. See page 100. T. B. Wood's Sons Company.

Booklets Describing Temperature Control are offered by Taylor Instrument Companies. See page 99.

An Illustrated Catalog Full of Practical Belting Information is offered by I. B. Williams & Sons. See page 47.

A Feature of the Turbine Generator is described on page 105. Westinghouse Electric & Mfg. Co.

A New Bulletin Covering Roller Bearing, Steel and Wire Loose Pulleys is offered by the Dodge Manufacturing Company. See page 43.

Catalog No. 200 shows the solution to the handling problem by means of overhead traveling cranes. See page 83. Whiting Corp.

Information About a System that Saves $2500 a Year in Cost Accounting. See page 86. The McCaskey Register Co.

An Economical Method of Painting Plant Interiors and Exteriors is shown on page 44. The Vortex Manufacturing Co.

An Economical Means of Cleaning Parts is shown on page 2. Oakley Chemical Co.

Catalog MN-57 is a book on variable speed transmission. See page 92. Offered by the Reeves Pulley Co.

The New Principle Recently Added to the Howell Motor. See page 87. Howell Electric Motors Co.

Steel Furniture Means Better Working Conditions in Modern Industrial Plants. For a catalog describing high quality furniture of this kind. Hughes Steel Equipment Co. See P. 102.

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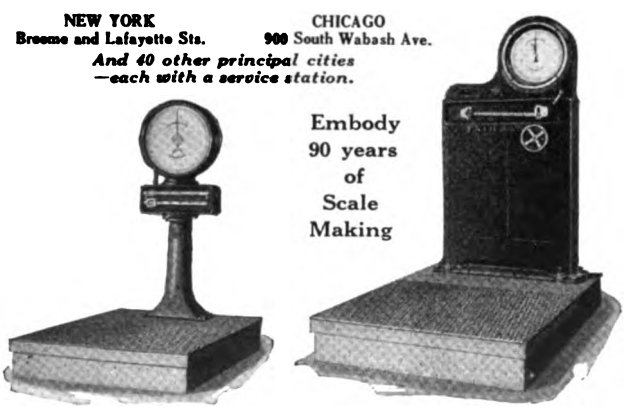
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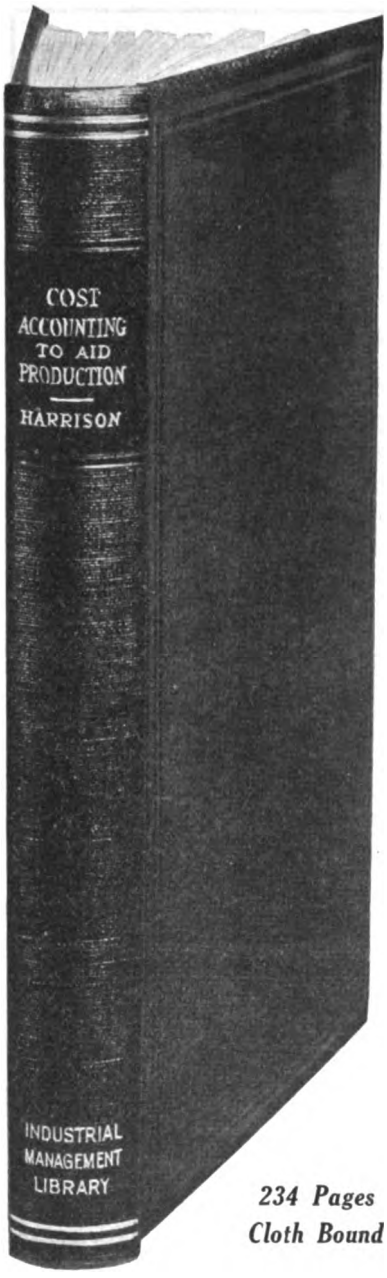
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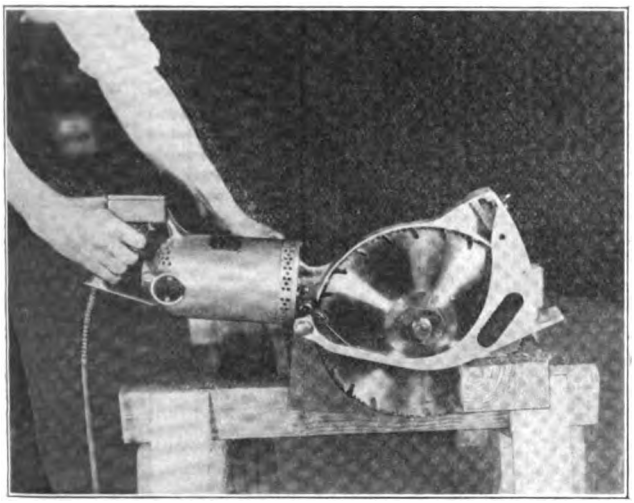
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New Portable Electric Hard Saw

THIS portable electric hard saw is made by the Crowe Manufacturing Corporation of Cincinnati, Ohio. It is made in three sizes. The smaller one, A-6 weighs 9 lbs. and will cut 1½" thick, A-8 weighs 15 lbs. and will cut 2½" thick, while A-12 weighs 30 lbs. and will cut 4¼" thick. Motors are universal and are supplied for



either 110 or 220 voltage. Each motor supplies more than the amount of power required.

One of the big features in this saw is the fact that the saw is guarded and safe at all times. It is impossible for the workman to remove the saw from the lumber without the guard covering the saw and locking itself so that it cannot be removed until it is again on the lumber in a position for sawing, where it is impossible for a workman to cut himself.

MANUFACTURERS of automobile tires enjoyed a prosperous year in 1925 notwithstanding the rise in crude rubber prices. They not only sold a record number of tires but received higher prices than in 1924. The outlook is for further improvement in 1926 but the gain will be more moderate than that made last year over 1924.

Sales of pneumatic casings which make up over half the value of all rubber products amounted to approximately $680,000,000 in 1925 as against $520,000,000 in 1924, an increase of 31 per cent.

Not all of this gain was offset by higher production costs. Manufacturers had a substantial supply of crude rubber bought at low prices early in the season last year. Consequently the increase in the cost of crude rubber per pound was less than indicated by the increase in the spot price. This explains why manufacturers were able to make more money last year although they advanced tire prices less than was justified by the increase in the price of crude rubber.

Manufacturers consumed more rubber in 1925 than in 1924, however, not only because they made more tires but because they used more per tire as the result of the larger demand for balloon tires.—*Alexander Hamilton Institute.*

Quickfix

Concrete Floor Patcher

The *Master Builders Method* of laying *patches that last.* Stop making temporary repairs. Relay that heavy-duty area for the last time with *Quickfix* concrete.

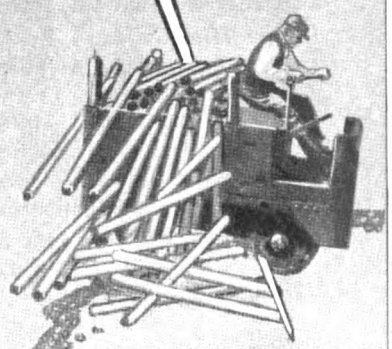
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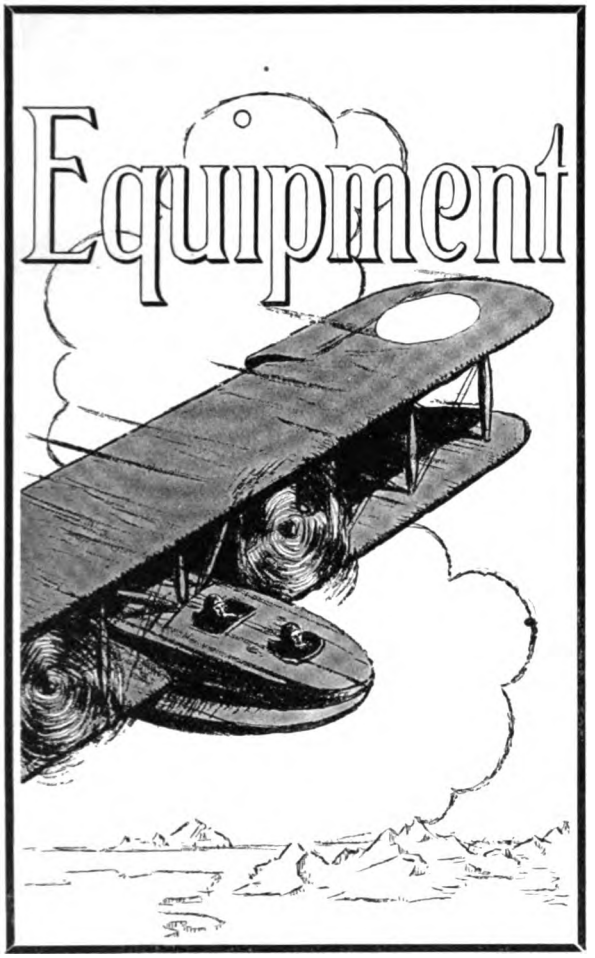
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A Jacobs Chuck for Every Purpose



CAN you imagine Amundsen "hopping off" to the Pole without having each plane completely equipped to the last detail? It was just this perfect mechanical equipment that made it possible for him to get home.

Yet we sometimes find one old, overworked chuck serving two or three different machines—first holding a hair sized drill on the sensitive Drill Press—then a boring bar on a heavy duty lathe. Such procedure makes for inaccurate work, many broken drills and loss of production time.

There's a Jacobs Chuck for every Drilling purpose, and every machine should be equipped with a chuck to meet its needs, just as an aeroplane is equipped to go to the North Pole, and get back.

Jacobs Chucks



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HARTFORD, CONNECTICUT

The World's Largest Producers of Drill Chucks

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Accurate Measurement Prevents Excessive Cost

THE first place to examine production cost is on the platform of the scale you use in the receiving department.

The most deadly and baffling losses result from human and mechanical errors in the measurement of materials received into the plant, and transferred from one department to another.

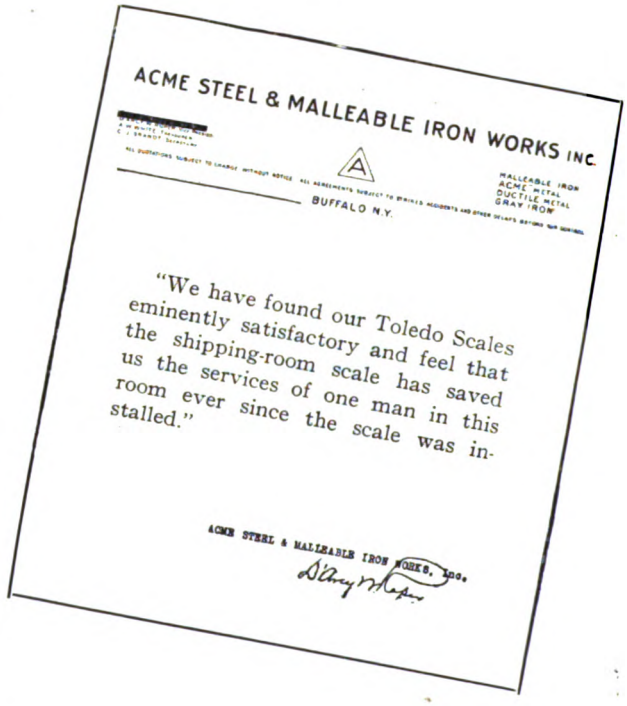
These errors are usually reflected in mysterious manufacturing losses, which mean excessive cost figures.

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BUFFALO N.Y.

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ACME STEEL & MALLEABLE IRON WORKS, Inc.

Toledo Scale Company, Toledo, Ohio

Canadian Toledo Scale Co., Limited, Windsor, Ont.

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PAINT CHART

A Standard Paint for Each Specific Purpose

Every Paint is an engineering product—a result of many years of test and experiment in laboratory and service. Each paint has been designed for use in a specific, well defined field of service, and has been perfected to give the best service in the use to which it is put. This chart will help you decide which Goheen Paint will serve you best.

Galvanum FOR GALVANIZED IRON	For Galvanized Iron under any conditions of service, Galvanum Paint is the only paint which can be applied directly to galvanized iron without acid wash, weathering or priming coat. It is a standard of comparison. Lasts seven to fifteen years, prevents all rusting and corrosion.
Carbonizing Coating — **For Iron and Steel**	For Iron and Steel, inhibitive as well as protective, this paint absolutely prevents corrosion of the metal.
Highway Red — **For Iron and Steel**	A chemically combined Red Lead Paint, with preservative qualities not possessed by straight Lead and Oil.
For Hot Surfaces	A heat-resisting paint for Smoke Stacks, Boilers, and all hot surfaces, manufactured especially to stand up under high heats, and to give positive results under varying temperatures.
Mill White — **Interior White**	For Wood, Steel, Concrete, Brick and Plaster, designed specifically to stand up under severe conditions, and can therefore be used as a standard paint for use throughout office and factory.
Concrete Tum Paint — **For Concrete Surfaces**	For Concrete, Stucco and Masonry surfaces, dampproofs and beautifies the surface, and is made both as an Interior and Exterior Wall Paint, as well as a Floor Enamel.
31-1 Honesty — **For Wood**	A chemically combined ready mixed paint for interior and exterior wood surfaces, compounded to resist the action of Sulphur Fumes, Acids, Gases and Moisture. It is an ideal paint for Industrial requirements.

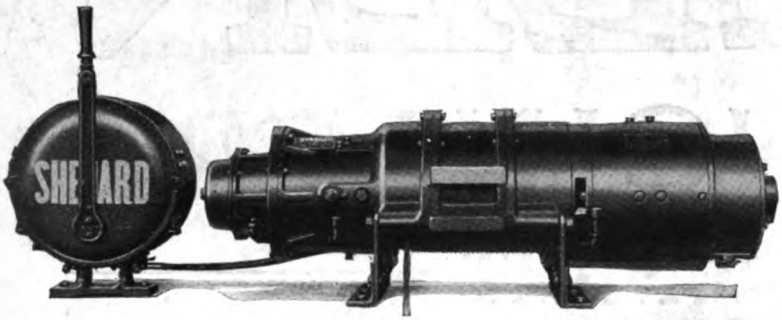
GOHEEN CORPORATION of N. J.

Paint Engineers Since 1888 — **Newark, N. J.**

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EILERT PRINTING COMPANY, INC.
318-326 W. 39TH ST., NEW YORK

To make an economical elevator



Shepard Form 8 Hoist

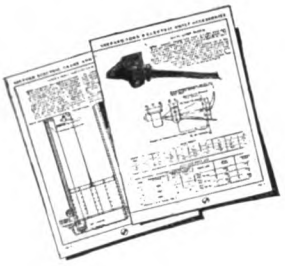
THE Shepard Form 8 Hoist is a proven unit for elevator service and saves considerable in installation cost.

It has a number of different applications, each in strict compliance with safety codes and Underwriters' requirements.

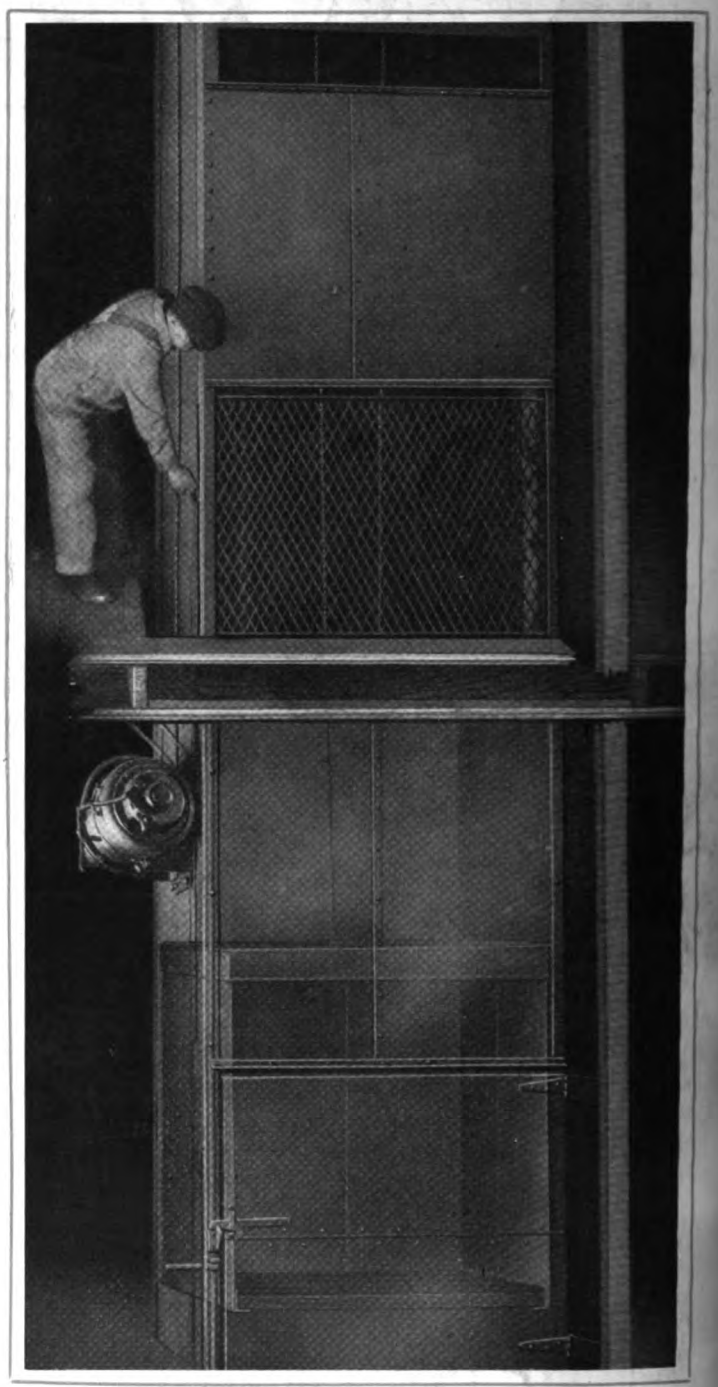
Installations may be made to include the Shepard Separately Mounted Limit Switch which is an additional safety feature.

The Form 8 unit is typically Shepard with a Balanced Drive, Enclosed Unit Construction, and Thorough Automatic Oil Bath Lubrication—a hoist designed in every respect to meet day in, day out service.

Our engineering department has assisted in applying the Form 8 hoist to various plant conditions, and shall be pleased to aid you in determining its application in your plant.



Write for
the Shepard Form 8 Hoist Catalog which shows the application of this unit to elevator service and other uses.



One method of applying the Form 8 Hoist. Hoisting Cable passes over sheaves at top of shaft.

SHEPARD ELECTRIC CRANE & HOIST CO.
420 Schuyler Ave., Montour Falls, N. Y.
Branches in Principal Cities

SHEPARD
ELECTRIC CRANES & HOISTS

Largest Manufacturer of Electric Hoists in America

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April, 1926

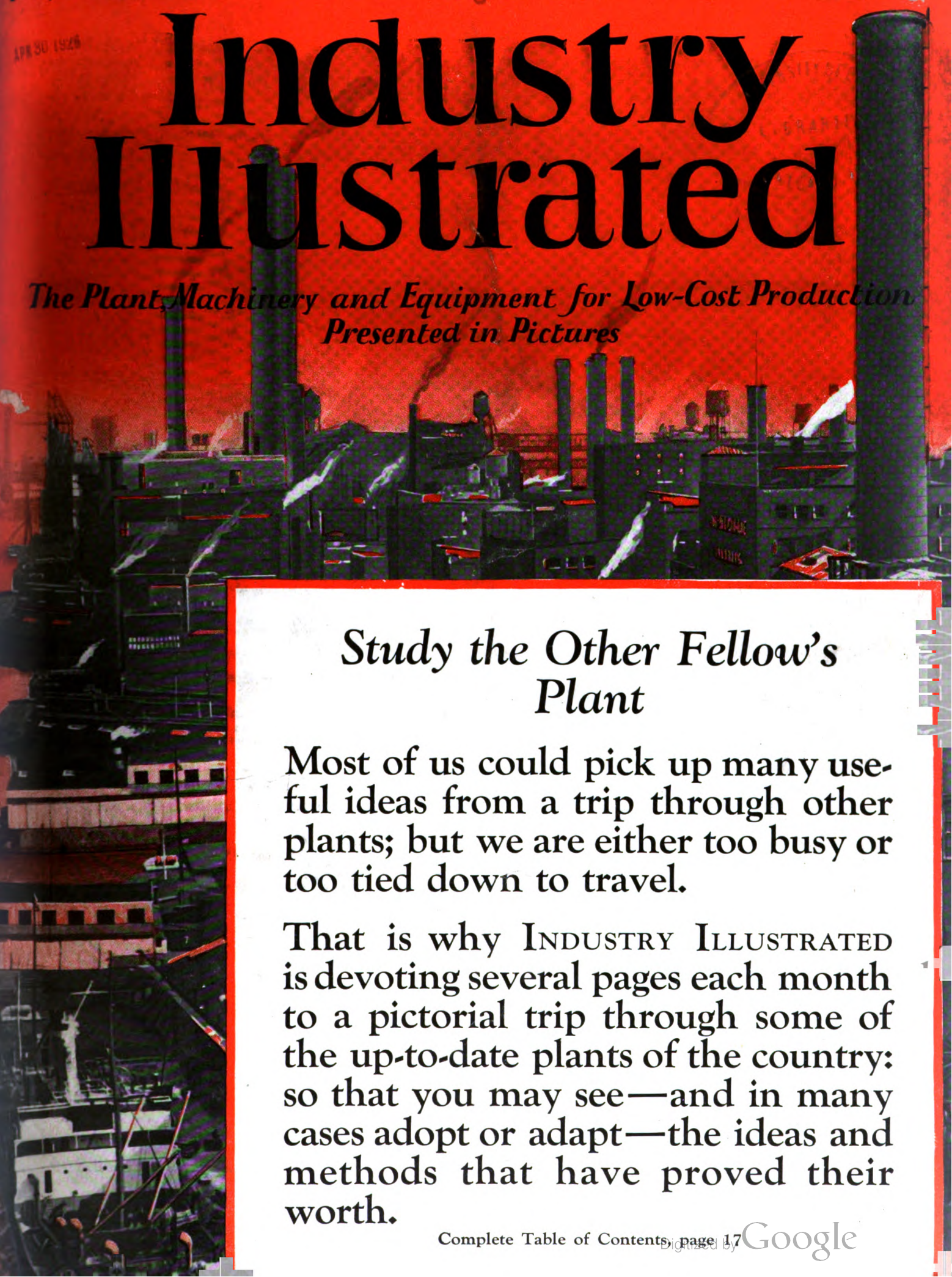
G. & A. R. R.

20 Cen

APR 30 1926

Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures



Study the Other Fellow's Plant

Most of us could pick up many useful ideas from a trip through other plants; but we are either too busy or too tied down to travel.

That is why INDUSTRY ILLUSTRATED is devoting several pages each month to a pictorial trip through some of the up-to-date plants of the country: so that you may see—and in many cases adopt or adapt—the ideas and methods that have proved their worth.

Complete Table of Contents, page 17

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BONNEY #25 ENGINEER'S KIT

*C.V. Chrome Vanadium Wrenches

BONNEY
"ONLY THE BEST"

$7.85



*CV is a Bonney trademark registered in the U.S. Patent Office.
Chrome Vanadium registered August 11, 1925.

Six Bonney *CV Chrome Vanadium double end Engineer's Wrenches, all neatly packed in attractive leatherette kit. These six wrenches will fit the following:

U.S. STANDARD NUTS	S. A. E. NUTS	HEX. CAP SCREWS
1/4", 5/16", 3/8", 7/16", 1/2".	1/4", 5/16", 3/8", 7/16", 1/2", 9/16", 5/8", 11/16".	3/16", 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", 3/4".

(In cardboard box without leatherette kit $6.85.)

You can secure from your jobber. Write for detailed information.

Bonney Forge & Tool Works
Dept. B, ALLENTOWN, PA.

Makers of Special Service Wrenches of Chrome Vanadium, Carbon Steel Drop Forged Wrenches, Stillson Wrenches, Vises and Drop Forgings and the Bonney Rim Tool.

BONNEY Chrome-"CV"-Vanadium WRENCHES

REG. U.S. PAT. OFF.

(Patents Pending)

Bonney Forge & Tool Works
Dept. B, ALLENTOWN, PA.

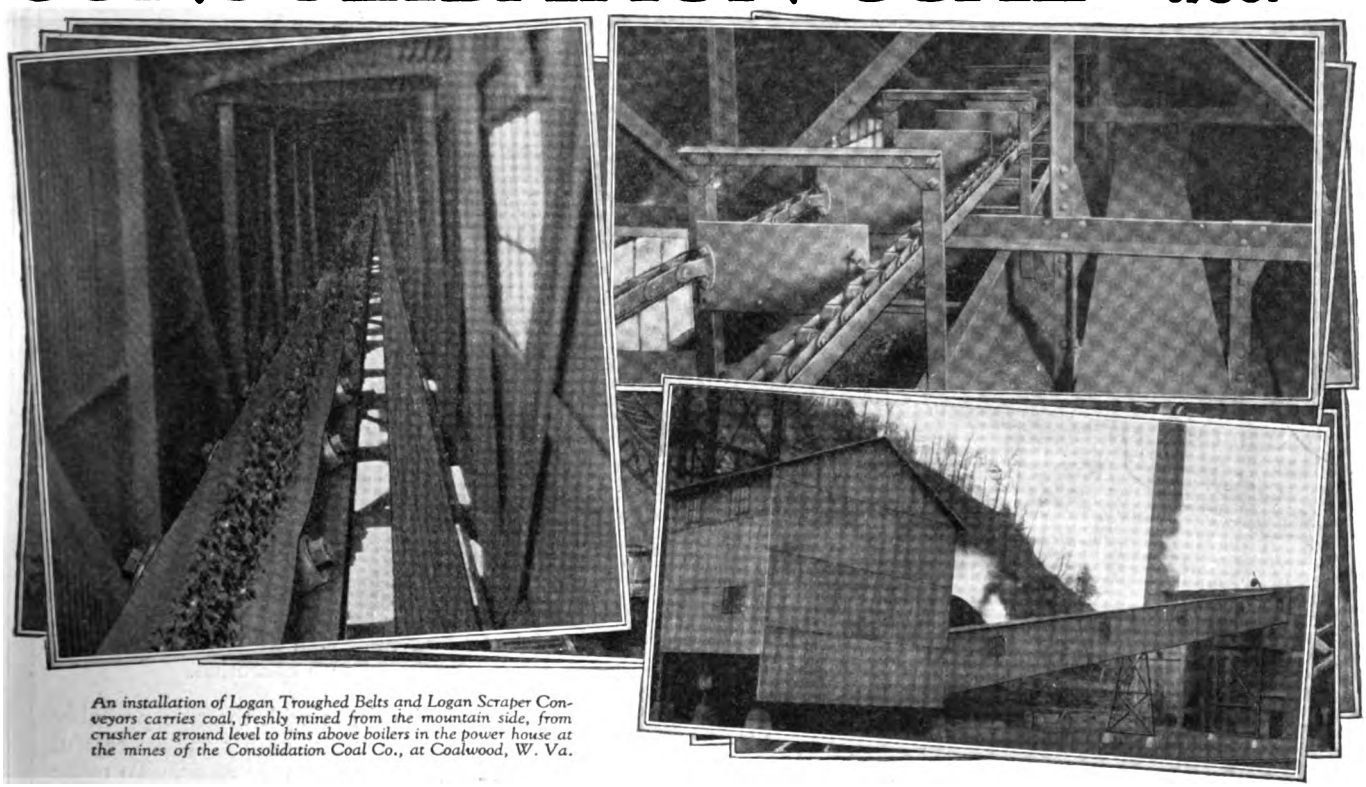
Please send me one of your No. 25 Engineer's Kits for which I am attaching remittance of $7.85.

Name _____

Address _____

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CONSOLIDATION COAL - another user



An installation of Logan Troughed Belts and Logan Scraper Conveyors carries coal, freshly mined from the mountain side, from crusher at ground level to bins above boilers in the power house at the mines of the Consolidation Coal Co., at Coalwood, W. Va.

COALING the universe! That, generally speaking, is the job of the Consolidation Coal Co. In fueling its own central power plant at the immense Coalwood mines in West Virginia, it is therefore essential that a fast, continuous, economical means of mechanical coal-handling be employed. So Logan Conveyors are insuring an uninterrupted supply of light, heat and power and bearing the burden of grinding, shifting weights dependably, day in and day out and with the maximum economy in time and labor. Adaptable to any industry and to the handling of bulk materials or packages, Logan Conveyors can in all probability expedite your production, reduce your handling costs and increase your profits. Write our nearest office.



Many of the thousands of industrial coal users who appreciate the far-reaching service of Consolidation Coal are themselves benefiting by the far-reaching economies of Logan Conveyors in cutting production costs and expediting distribution. Tons of coal or trays of candies, Logan Conveyors can move them faster, more safely and at less cost.

Logan Co.

Formerly THE DOW CO., *Louisville, Ky.*

New York Office, 50 Church St. — Chicago Office, 343 S. Dearborn St.
Detroit Office, 8855 Woodward Ave. — Rochester Office, 116 Saint Paul St.
Indianapolis Office, 425 Board of Trade Bldg. — Los Angeles Office, 1102 Van Nuys Bldg.
Kansas City Office, 3130 Washington St. — Pittsburgh Office, 405 Fulton Bldg.
Representatives in other principal cities

Logan Conveyors

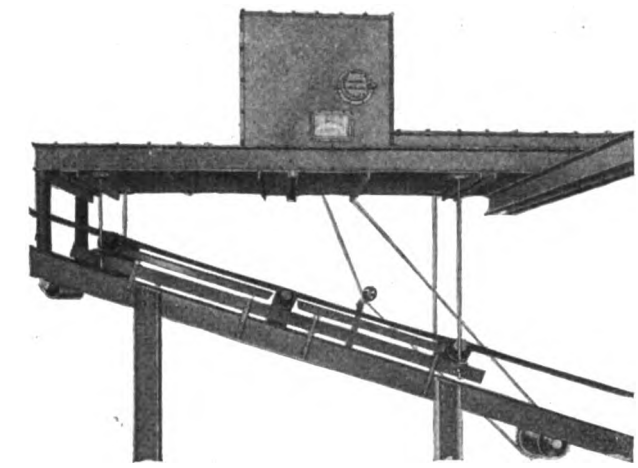
LOUISVILLE

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Eliminate this Unnecessary Step—

SHIPPING
WEIGHING
RECEIVING

by "Weighing as you Convey



OFTEN this step appears numerous times in the routing of your solid materials—coal, ore, rock, sand, gravel. Between the cars and the bins; between the bins and interplant operations; between shipping platforms and the cars. It's always there retarding movements and adding to your labor costs.

The installation of Merrick Weightometers on your conveyors would do for you what has been done for many other plants—reduce labor costs and save considerable time. By weighing the materials, *as they move*, you eliminate the unnecessary practice of stopping operations to secure weights. Just think how much time and labor—money—can be saved! The Merrick Weightometer records the weights of moving materials within 99% of accuracy. It enables you to check bills of lading, deliveries, interplant supplies, etc., without loss of time and with full protection.

Send for the "Merrick Catalog" and see how you can use them.

MERRICK SCALE MFG. CO.
180 AUTUMN AVENUE PASSAIC, N. J.



The Publisher's Column

What Do You Do With Good Ideas?

A GREAT philosopher once said that there is no such thing in the world today as a new idea; that all the things which we like to think were conceived in our own day, were already conceived in the brains of men who lived ages ago—but were never carried into execution.

The dreamer who drifts with the tide probably has as many valuable ideas as has the successful man. But ideas, in themselves are static. To make them dynamic, to make them produce, requires *action*.

The worth of any technical magazine, for example, lies in the practical ideas it contains; but its value *to you* is determined solely by the actual use you make of them.

How many of the ideas that come to you every month through the pages of INDUSTRY ILLUSTRATED are applicable to your own problems? Study those particular ideas expressed in both editorial and advertising pages, and—if you would profit—*act* on them. For, without *action*, the mightiest ideas are valueless.

Industry Illustrated

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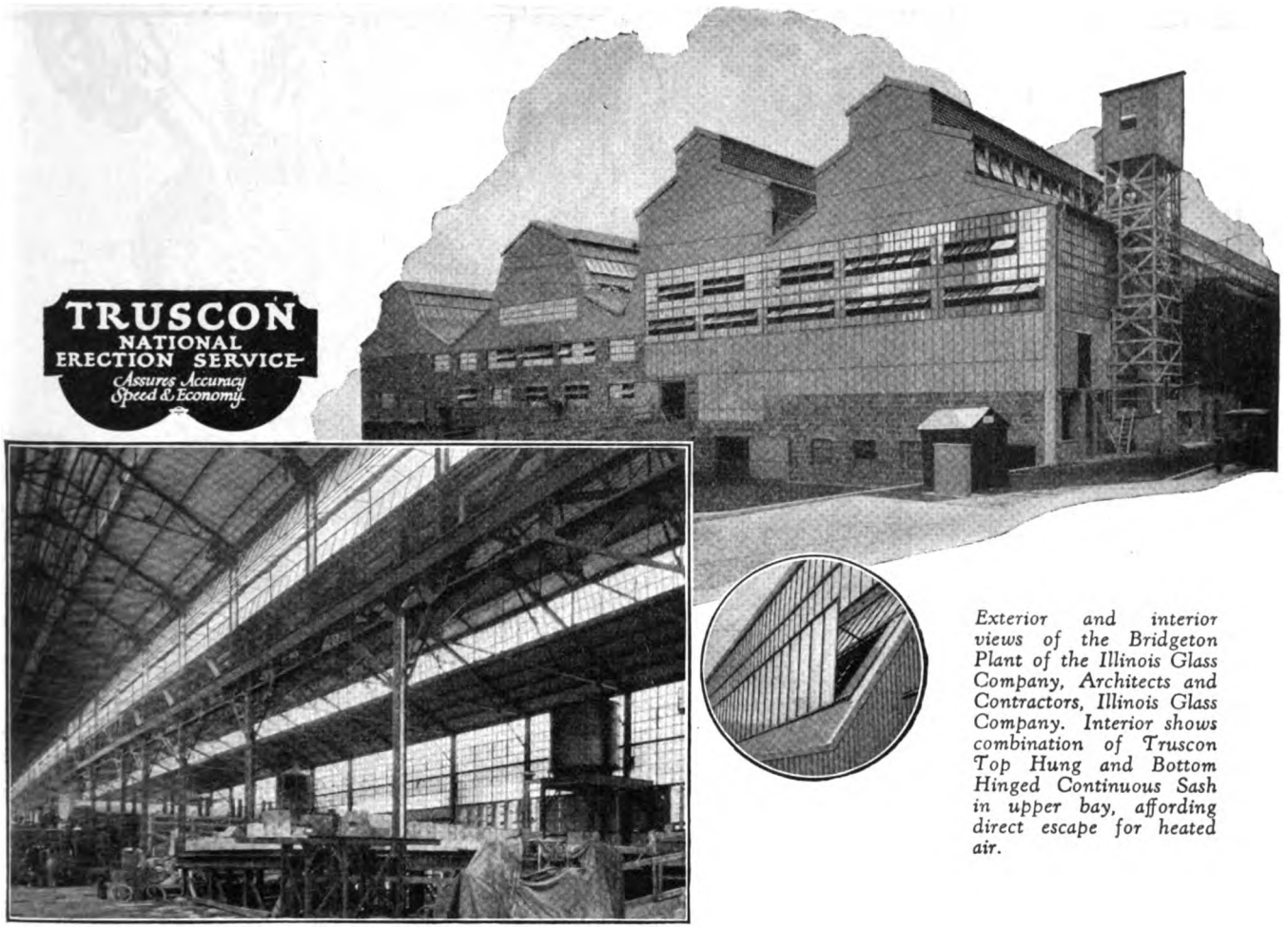
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Exterior and interior views of the Bridgeton Plant of the Illinois Glass Company, Architects and Contractors, Illinois Glass Company. Interior shows combination of Truscon Top Hung and Bottom Hinged Continuous Sash in upper bay, affording direct escape for heated air.

Another Ventilation Problem Solved

AT the Bridgeton Plant of the Illinois Glass Company, world's largest bottle manufacturers, the heat in the high monitor building where the leers and bottle machines are located is approximately 1700 degrees at the floor and 250 degrees at the truss line. The difficult problem of providing correct ventilation was solved with a combination of two rows of Truscon Continuous Sash: top hung sash swinging inward at the top and bottom hung sash swinging outward at the bottom. This arrangement provides a perfect flue for the escape of the heated air without obstruction. Contrast this with the friction and lost motion due to change of direction or air currents where ordinary top hung sash are used. This example is typical of the cooperation of Truscon Engineering Service in solving daylighting and ventilating problems.

Write for Catalog and Suggestions

TRUSCON STEEL COMPANY, Youngstown, Ohio

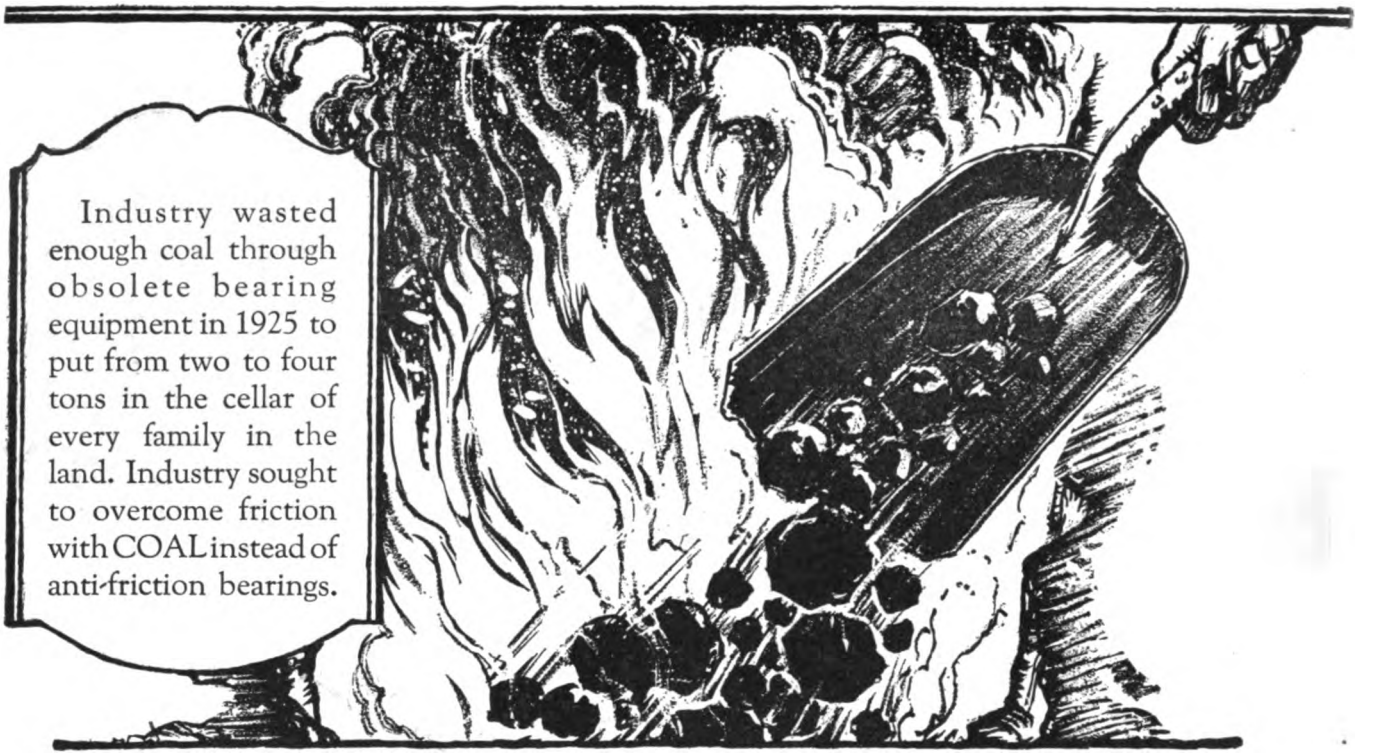
Warehouses and Offices in All Principal Cities.
Foreign Trade Division, New York.
The Truscon Laboratories, Detroit, Mich.
Trussed Concrete Steel Co. of Canada, Ltd., Walkerville, Ont.

TRUSCON

STEEL WINDOWS & MECHANICAL OPERATORS

*A complete line of Steel Buildings, Steel Windows, Metal Lath, Steel Joists, Steel Poles, Concrete Reinforcing for Buildings and Roads, Pressed Steel Specialties, Waterproofing & Technical Paints. Truscon maintains Engineering and Warehouse Organizations thruout the Country.

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Fifty to One Hundred Million Wasted Tons!

How Much Did You Contribute Toward This Waste Through Obsolete Bearing Equipment?

THERE are two ways to overcome bearing friction in line shafting. One is by means of the expensive coal pile. The other is by means of the comparatively inexpensive anti-friction equipment.

Just what percentage of America's enormous fuel waste is chargeable to obsolete hanger equipment may be judged from the experience of a middle-west manufacturer who substituted Skayef Self-Aligning Ball Bearing Hangers for the old plain bearing type and

SAVED EIGHT THOUSAND DOLLARS A YEAR IN POWER COSTS ALONE*

Why not allow Skayef engineers to demonstrate how Skayef Self-Aligning Ball Bearing Hangers can reduce your power costs? The average Skayef installation pays for itself in less than two years' time.

*A certified survey sent on request.

The SKAYEF BALL BEARING COMPANY, 165 Broadway, New York

1563

BALL BEARING

SKAYEF HANGERS

POST HANGERS, PILLOW BLOCKS SKF Puts the Right Bearing in the Right Place AND TRANSMISSION APPLIANCES

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As Usual

TIMKEN-EQUIPPED

POWER, belts and lubricant are saved by the use of Timken Tapered Roller Bearings in conveyors.

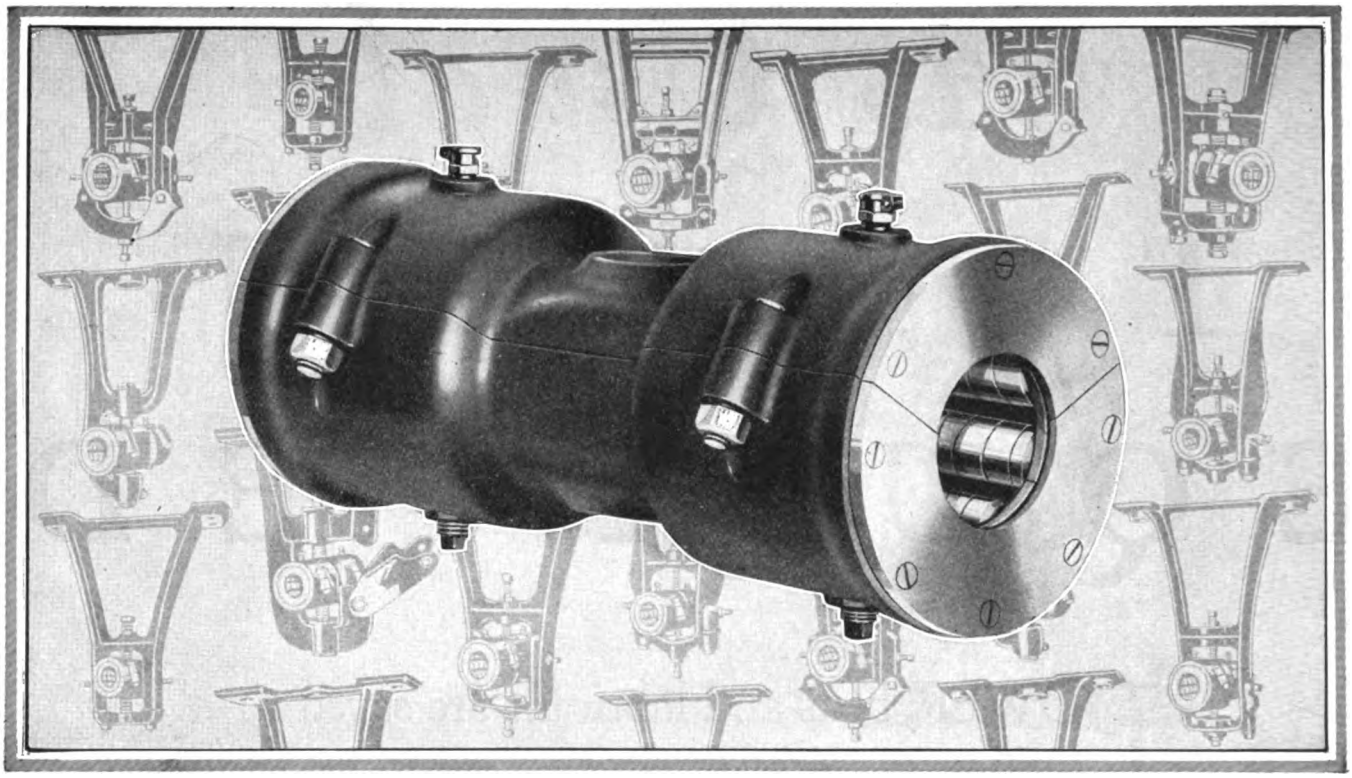
Flat spots, shutdowns, depreciation, are guarded against by Timken Bearings.

Widely used for these benefits, Timken Bearings are regularly specified throughout such modern installations as the conveyor system of the new Peerless Portland Cement plant in Detroit.

THE TIMKEN ROLLER BEARING CO.
C A N T O N O H I O

TIMKEN
Tapered
ROLLER BEARINGS

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Fits all Hangers—*Size for Size*

REGARDLESS of the type of hangers used in your plant—Hyatt Line Shaft Roller Bearings can be installed.

The new narrow center Hyatt Bearings fit into any frame that will hold a plain bearing.

Once installed—bearing expense and trouble ends. Addition of a small quantity of lubricant three or four times a year is the only attention required.

Balance this against present expenditures for plain bearing maintenance.

Thousands of Hyatt users are saving power cost on installations ranging from a few bearings up to 20,000.

Get the most from your group drives by joining the long list of satisfied users.

HYATT ROLLER BEARING COMPANY
NEWARK, N. J. SAN FRANCISCO, CAL.

Save 15% of Your Power Bill—Easily

Over 30 years of service in plants throughout the country have proved that Hyatt Line Shaft Bearings will save at least 15% on your total power bill. In some cases the percentage is as high as 27.

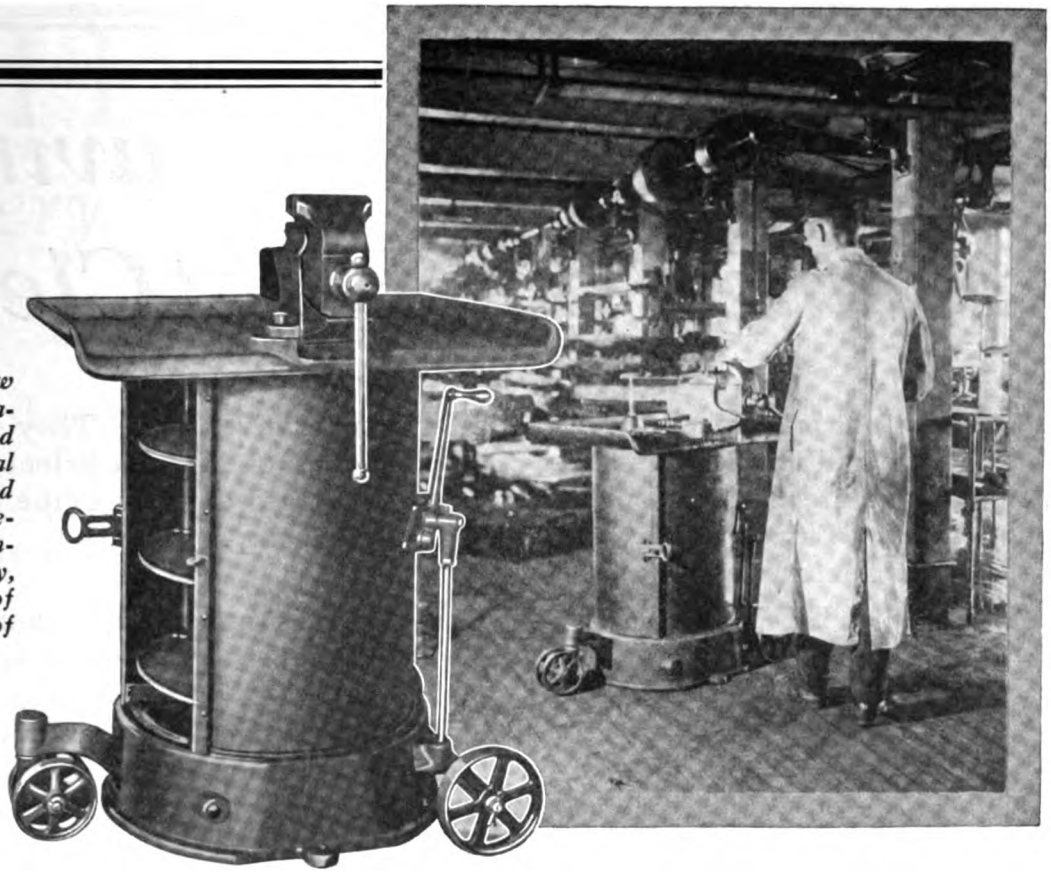
Installation is easy—a seven minute job—because the bearing is *completely* split. No pulleys or other shaft fittings to disturb. Phone your nearest mill supply dealer.

Dealers

A few desirable territories are still open. Write for details.

HYATT
ROLLER BEARINGS

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The New Britain Portable Vise Stand is cylindrical in form, and is the only design which insures rigidity, regardless of direction of load.

SHOP FURNITURE

That Saves Time and Speeds Production

IN a great many manufacturing plants there are numerous jobs where it is more economical to bring the vise stand and tools to the work than to route the work to stationary work benches.

The New Britain Portable Vise Stand is the product of a great deal of practical study and experience and fills the need for such a stand in a highly satisfactory manner.

It is of proper height to allow the workmen to assume a position resulting in minimum fatigue. The base is cut away to allow the operator standing room; it is equipped with three adjustable shelves for tools; the steel door slides easily in grooved jambs, and can be easily locked with hasp provided.

For transportation, a self-locking lever of proper design easily raises the stand regardless of load onto ample free running truck wheels and swivel casters.

Bulletin No. 1212 will bring to you complete details on the vise stand, or if you wish, a bulletin covering the entire New Britain Shop Furniture line will be sent you.

THE NEW BRITAIN MACHINE COMPANY

"Shop Furniture Originator" **New Britain, Conn., U. S. A.**

All-Steel Work Stand



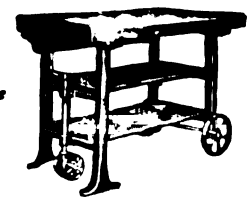
Heavy Duty Double Bench Leg



Heavy Duty Single Bench Leg



Heavy Duty Portable Work Bench



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You Can Make Big Savings by Keeping Your Plant Clean!

Dirt and dust not only take a heavy toll in damage and unsaleable goods —they increase fire hazards and insurance rates. Labor turnover—a big factor in factory management and costs—becomes more frequent in illy kept plants.

These direct sources of loss are not only unnecessary, but are easily eliminated. Remove them in the most economical way—through the employment of brooms that cover more floor space per hour.

Over 90% of the steel industry, 40% of the railroads and over 4,000 industrials prefer Lay Metal Case Brooms after comparative tests. They rely on them for long life and efficient service, and regard them as a true purchasing economy.

Differences in brooms may not be outwardly apparent, but they surely make themselves known in use. Ordinary brooms do not wear evenly, soon lose their shape and do unsatisfactory sweeping jobs, wasting your sweepers' time and the wages you pay them.

The Joseph Lay Company has been making brooms since 1876. Fifty continuous years have been devoted to the making of the best brooms money can buy. Each broom is made from selected fibres, metal bound, and reinforced. Sewing is of heavy flax thread.



Stapled Not Nailed

Lay Brooms are *stapled*. The fibres are held as in a vise till worn to the last stub. The extra broad sweeping tip is flexible, gets into corners and crevices—moves the dirt out.

Write for illustrated price list

THE JOSEPH LAY COMPANY PORTLAND INDIANA

Sales Offices:

New York City: 110 W. 34th St. Chicago: 133 W. Washington St. Cleveland: 9343 Gorman Ave.

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WHY PAINT . . .

every year or two?

Some of the greatest plants in American Industry avoid frequent repainting. Here are the facts. They may save you thousands of dollars.

LAST year more than twenty million dollars was spent on paint for industrial interiors. And a large part of it went to cover up soiled paint only a few months old!

Yet many of the greatest plants avoid frequent repainting—and are kept spotlessly clean and light for years—by painting their ceilings and walls with washable Barreled Sunlight.

The photographs at the right show how Barreled Sunlight is able to effect this great economy. Here is a paint finish so smooth it offers dirt no foothold, and can be washed like tile—and so durable that repeated washings will not wear it away.

Moreover, Barreled Sunlight *retains its lustrous whiteness.* Made by the exclusive Rice Process, it is actually guaranteed to remain white longer than any gloss paint or enamel, domestic or foreign, applied under the same conditions.

Barreled Sunlight cuts labor cost in painting jobs. It is an all-oil product, therefore flows freely and can be applied by brush or spray, *at the lowest cost per square foot of surface covered.* It is guaranteed not to flake or scale if properly applied.

Barreled Sunlight is sold in 55- and 30-gallon churn-equipped steel drums, and in cans from ½ pint to 5 gallons. Where more than one coat is required, use Barreled Sunlight Undercoat first.

Use the coupon to obtain interesting illustrated booklet and a painted sample of Barreled Sunlight.

U. S. GUTTA PERCHA PAINT CO.
Factory and Main Offices
5 Dudley Street, Providence, R. I.
New York—350 Madison Ave. Chicago—659 Washington Blvd.
San Francisco—156 Eddy Street
Distributors in all principal cities



Ceilings and walls painted with Barreled Sunlight can be washed like tile—instead of repainting!



Barreled Sunlight



Ordinary Flat Finish White Paint

THE MICROSCOPE SHOWS WHY BARRELED SUNLIGHT WASHES SO EASILY

The above photographs of white paint were taken through a powerful microscope. Each paint was magnified to the same high degree. The astonishing contrast shows why Barreled Sunlight is so easy to keep clean. Its surface is smooth, even and non-porous. It resists dirt and can be washed like tile.

Barreled Sunlight
Reg. U. S. Pat. Off.



THE RICE PROCESS WHITE

U. S. GUTTA PERCHA PAINT CO.
5 Dudley Street, Providence, R. I.

Please send us your booklet "More Light," and a painted sample of Barreled Sunlight.

Name .....

Street .....

City ..... State .....

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With Complete Confidence



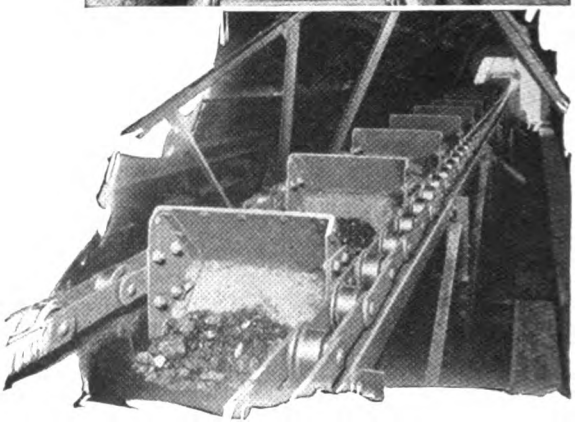
—you can put your Material Handling Difficulties up to Jeffrey Engineers

FOR almost half a century Jeffrey Engineers have been diagnosing and prescribing for the material handling needs of practically every industry, and have solved almost every conceivable problem. They can also do it correctly for you.

In the majority of cases the requirements can be met from our complete line of Standardized Elevating and Conveying Equipments, including a wide variety of types and sizes, representing unusual flexibility and adaptable to all sizes of plants.

A phone call, letter or write to the nearest Sales Office mentioned below will immediately bring to your assistance a competent Sales Engineer to co-operate with you in planning equipment that will save Time, Labor, and Money.





The Jeffrey Manufacturing Company
946-99 North Fourth St., Columbus, Ohio

New York	Scranton, Pa.	Chicago	Salt Lake City
Buffalo	Boston	Detroit	Los Angeles
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Philadelphia	Cleveland	St. Louis	Charlotte, N. C.
Pittsburgh	Charleston, W. Va.	Denver	Montreal

JEFFREY
MATERIAL HANDLING EQUIPMENT

JEFFREY PRODUCTS
Elevators
Conveyors
Portable Loaders
Coal and Ashes Handling Equipment
Skip Hoists
Chains and Attachments
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Crushers—Pulverizers
Sand and Gravel Handling Equipment
Locomotives
Coal Mine Equipment
Tipple Equipment
Ventilation Fans.

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News! Lower Prices!

—and two new-type reamers

WETMORE ADJUSTABLE REAMERS

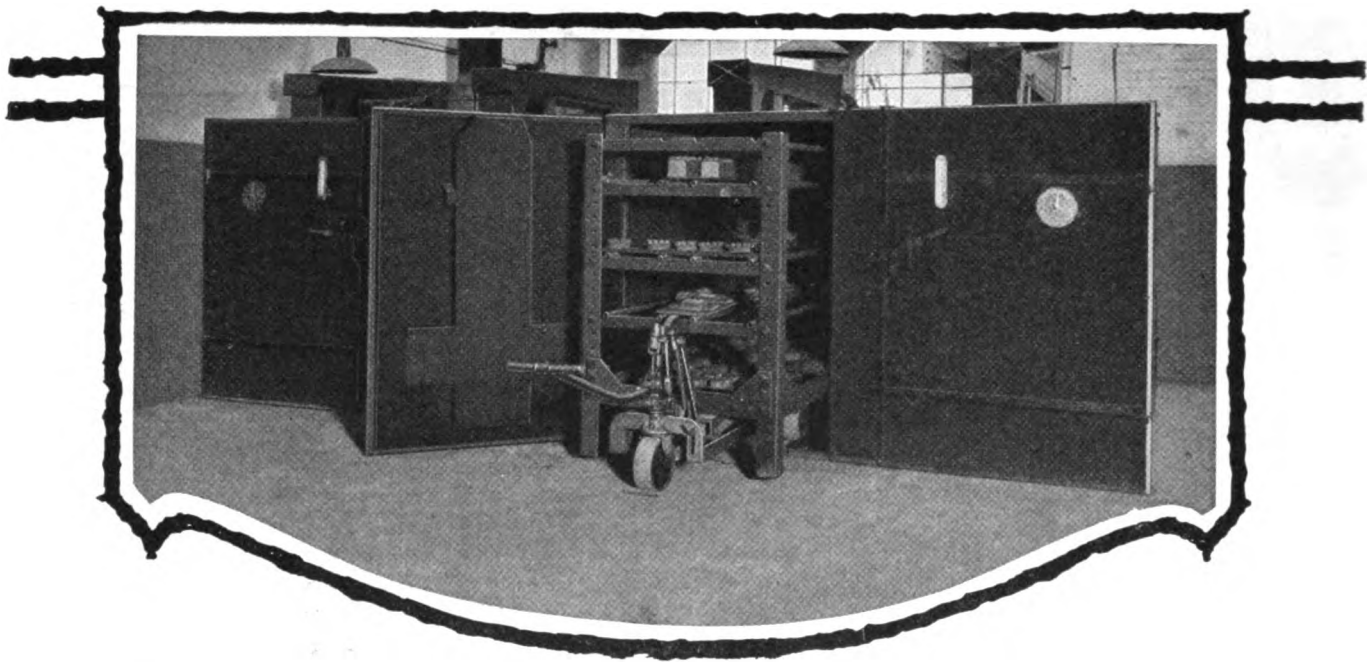
Just ask us for Catalog No. 26 now ready

WETMORE REAMER COMPANY
62 27th Street Milwaukee, Wis.

WETMORE
"The Better Reamer"

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YOUNG BROTHERS OVENS



CORE OVEN ERECTED 1917 AT BLAKE AND KNOWLES WORKS OF THE WORTHINGTON PUMP AND MACHINERY CORPORATION, DELIVERING 50 PER CENT IN EXCESS OF RATED CAPACITY.

About 30 years ago Young Brothers Company set out to lower industrial baking costs by means of the improved steel panel oven. Thirty years of gradual but constant progress since has given the foundry a line of ovens scientifically designed, carefully erected and thoroughly efficient—Ovens that once installed, stay on the job and deliver profits every working day of the year.

Ask for Catalog No. 26

YOUNG BROS. COMPANY

6509 Mack Avenue, Detroit, Michigan

District Sales Offices:

52 Vanderbilt Ave., New York
1424 Guarantee Title Bldg., Cleveland
410 Granite Bldg., St. Louis
419 Call Bldg., San Francisco
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20 E. Jackson Blvd., Chicago
807 San Fernando Bldg., Los Angeles
248 Central Bldg., Seattle, Wash.

YOUNG BROS. CO. OVENS — OUR BOLTLESS JOINT — DETROIT

OVENS FOR:

Core and mould baking.
Low temperature heat treating.
Drying.
Japanning and enameling.
Electrical appliance baking.
Adapted to all methods of heating

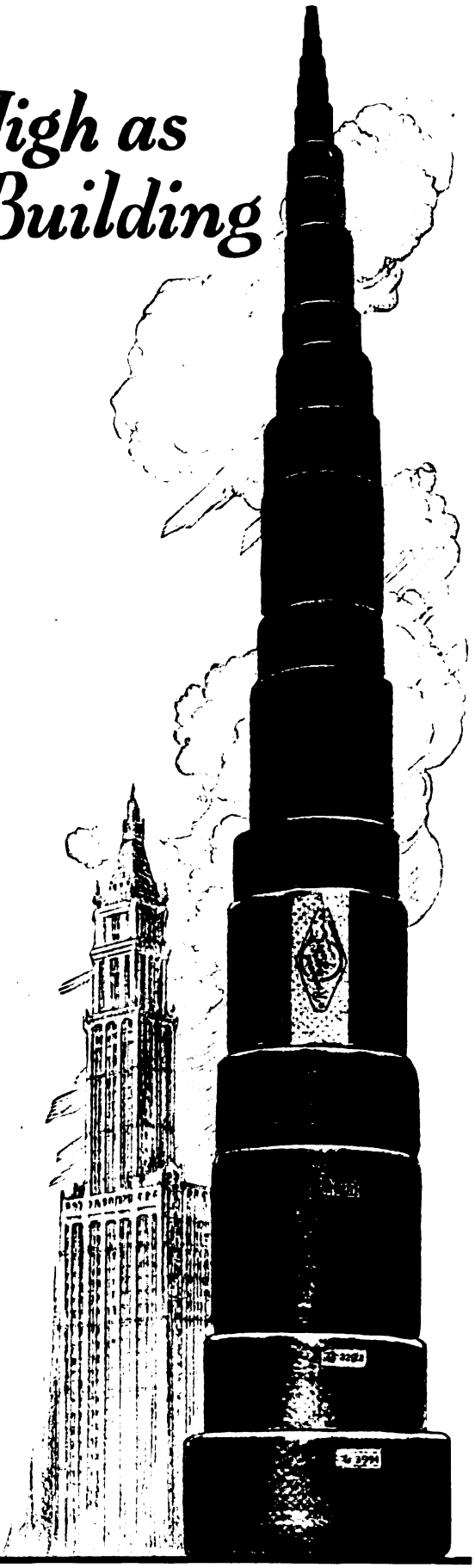
INDUSTRIAL OVENS

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Stacked Twice as High as the Woolworth Building

and Every Pulley a Different Size



IF YOU could stack one pulley on top of another—the 2194 *different* sizes of Rockwood Paper Pulleys in service stocks from coast to coast—you would have a pile twice as high as the Woolworth Building. An enormous number of sizes—and every one a finished pulley, and ready to use.

But why so many sizes? Because—from forty years of experience, Rockwood found that every one of these sizes is needed to give complete pulley service. So he manufactured these pulleys in quantity. Then he established a chain of Rockwood service stocks from coast to coast—located so that every section of the country could be served *quickly*—inaugurating the first and only *complete* and *instant* pulley service throughout the United States.

Now, you or your dealer, may get from a nearby Rockwood service stock any one of the 2194 different sizes (1½ to 14-inch diameters) within a few minutes or a few hours time. The pulley of the right size is waiting—wrapped ready for delivery. Delay and uncertainty are ended and prices reduced. Rockwood—the pulley that grips the belt hardest and slips least—the pulley that is standard factory equipment on 90 percent of all belted electric motors—is placed almost at your door.

Order from the nearest Rockwood Paper Pulley service stock, giving diameter of pulley wanted, width of belt to be used, size of shaft and dimensions of keyway in shaft.

ROCKWOOD PAPER PULLEY STORES, Inc.

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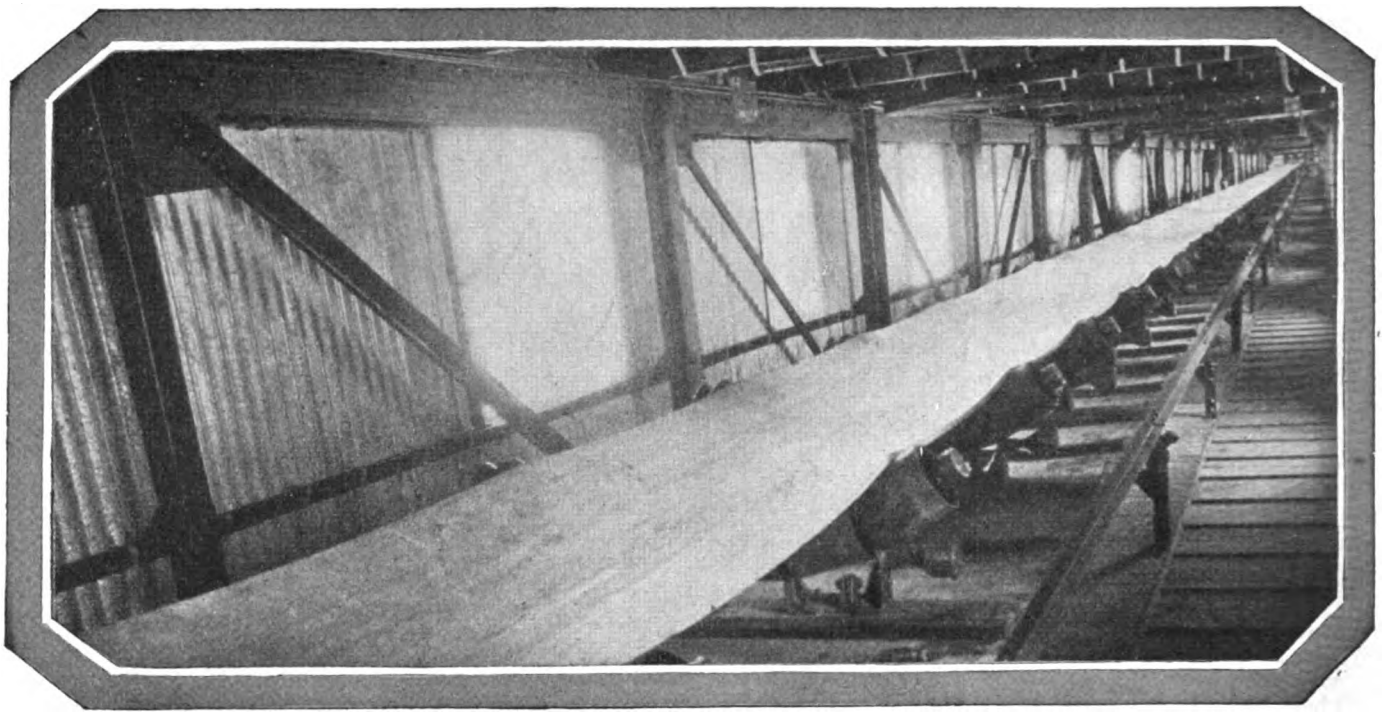
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2000 tons of hot quenched coke carried daily by "U.S." Coke Conveyor Belt

This story of a belt conveyor used in one of the great steel mills of the Middle West to handle hot coke carries a message for everyone interested in coke handling.

The conveyor is at coke wharf No. 1 at this plant, and material is loaded directly on the belt from the coke wharf by gates. Previous to 1922 the average tonnage handled by a belt on this conveyor was about 700,000 tons.

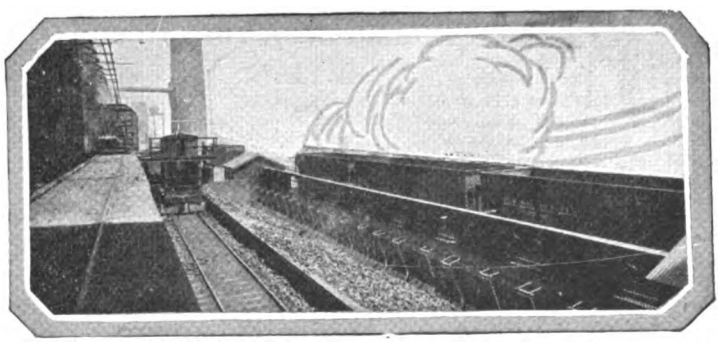
In January, 1922, for the first time a "U.S." Coke Conveyor Belt was installed. When it was taken out of service on November 6, 1923, it had conveyed 1,400,253 tons of coke—twice as much tonnage as other belts.

Expressed in other terms, a tonnage of 1779 tons per lineal foot was secured with this particular "U.S." Belt. The belt operated 10 to 12 hours per day. The tonnage of hot quenched coke carried per day at a belt speed of 225 feet per minute, was 2000 tons.

These are the belt specifications in detail; length 787 ft.; width 42-in.; 32 oz. duck, 7x5 step ply construction; cover on conveying side 1/4-in. thick. Diameter of head pulley on conveying installation 24-in.; diameter of tail pulley, 24-in.

The drive is a tandem drive from the head pulley. The belt is troughed and operates on an incline of about 15 degrees. There is a screw-type take-up with a 24-in. diameter take-up pulley. The belt operates over a 5-pulley idler system, distance between pulleys being 4-ft. There are no side idlers.

Another length of "U.S." Belting, installed when the old belt was removed is still in use on this conveyor today. We will gladly furnish the name of the plant upon request. If interested, you may write the customer for confirmation of the facts, and information concerning the service of other "U.S." Conveyor Belts. "U.S." Conveyor Belts are fabricated for extreme abrasive conditions such as are met with in handling various materials in the process industries. The engineer and purchasing agent expecting large tonnage should specify "U.S." Belting.



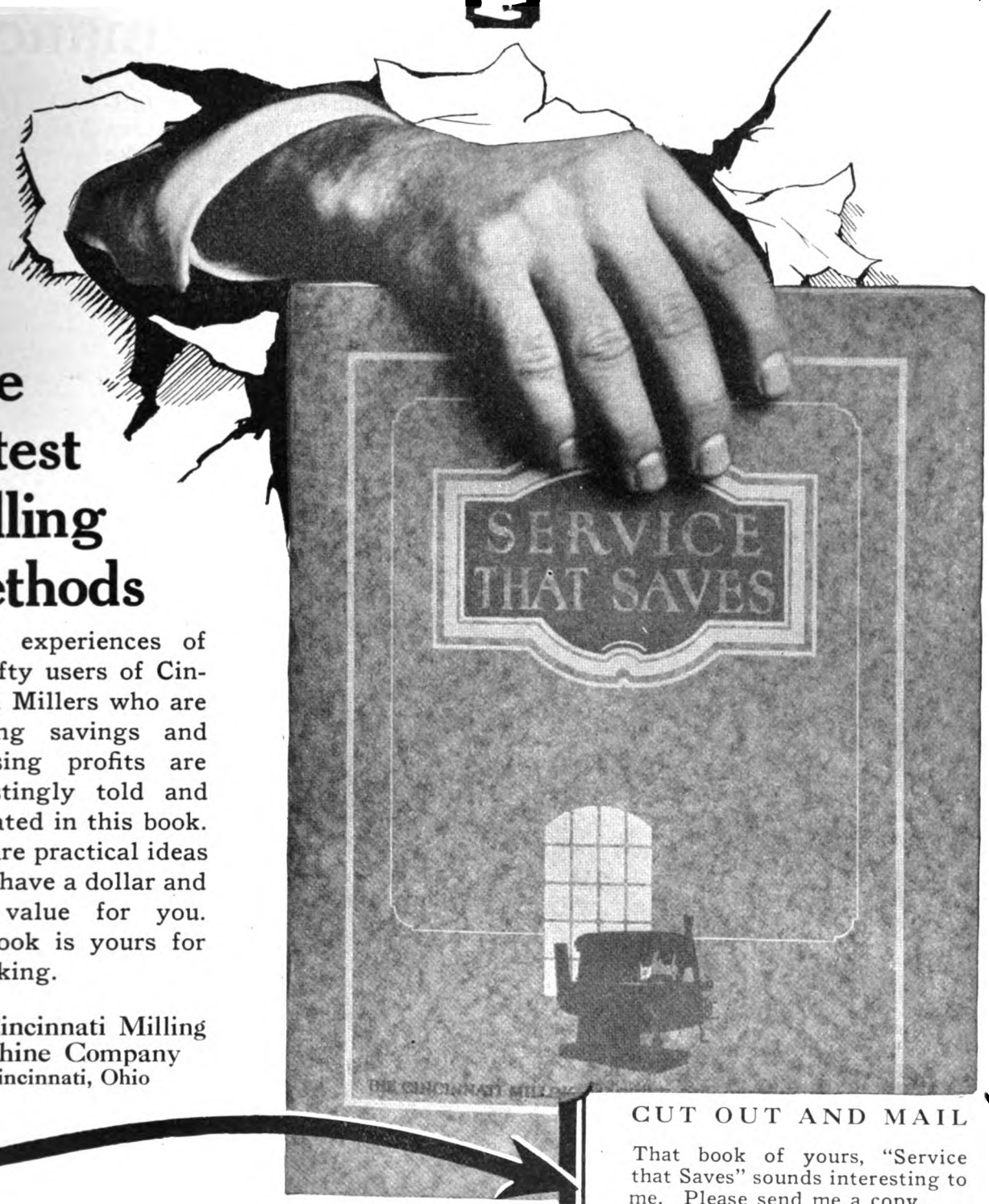
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The Cincinnati Milling Machine Company
Cincinnati, Ohio

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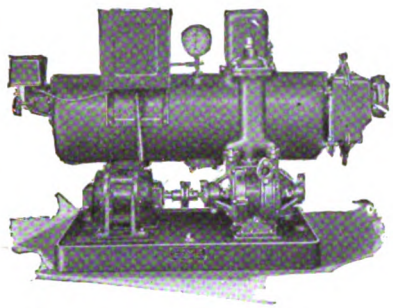
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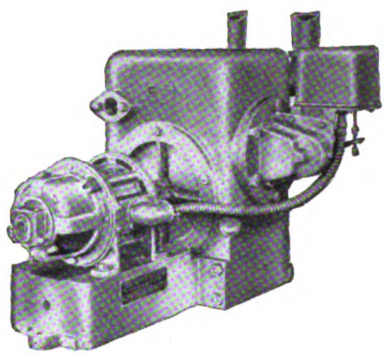
CINCINNATI MILLERS

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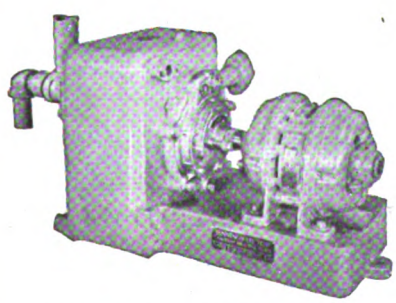
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Motor-Driven Jennings Vacuum Pump for return line heating systems, in capacities up to 300,000 sq. ft. equivalent direct radiation.



Motor-Driven Jennings Condensation Pump, Unit Type, for removing condensate from steam heating systems, in capacities up to 16,000 sq. ft. equivalent direct radiation.



Motor-Driven Jennings Vacuum Pump, Size M, for return line heating systems, having up to 5,000 sq. ft. equivalent direct radiation.

If you are now recommending and installing Jennings Heating Pumps for return line vacuum systems, you of course, like thousands of Jennings users, are familiar with the superior service Jennings Pumps always give season after season.

However, if you have never looked into the Jennings Pump, the following comments are certain to interest you:

"These Jennings Pumps operate continually twelve hours a day, and, in the three years they have been in use, have given no trouble. We are perfectly satisfied." Mr. Ellingwood, Chief Engineer of the American Surety Company Building, New York City.

"The Jennings Pump is a real good pump. Would recommend them again without hesitation." Mr. F. C. Campbell, Chief Engineer of Oppenheim-Collins & Co., New York, N. Y.

"We heartily endorse the two Jennings Pumps on our return line heating system. Ever since these vacuum pumps were installed, about two years ago, they have given steady and reliable service." Mr. Hane, Assistant Superintendent of Property, New York University.

These records are typical—not exceptional. As a matter of fact, innumerable Jennings Pumps have been in continuous service for 10 years and more and given just as dependable performance.

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Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures

JOHN H. VAN DEVENTER, *EDITOR*

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Associate Editor

ADOLF SCHILDKRAUT
Art Director

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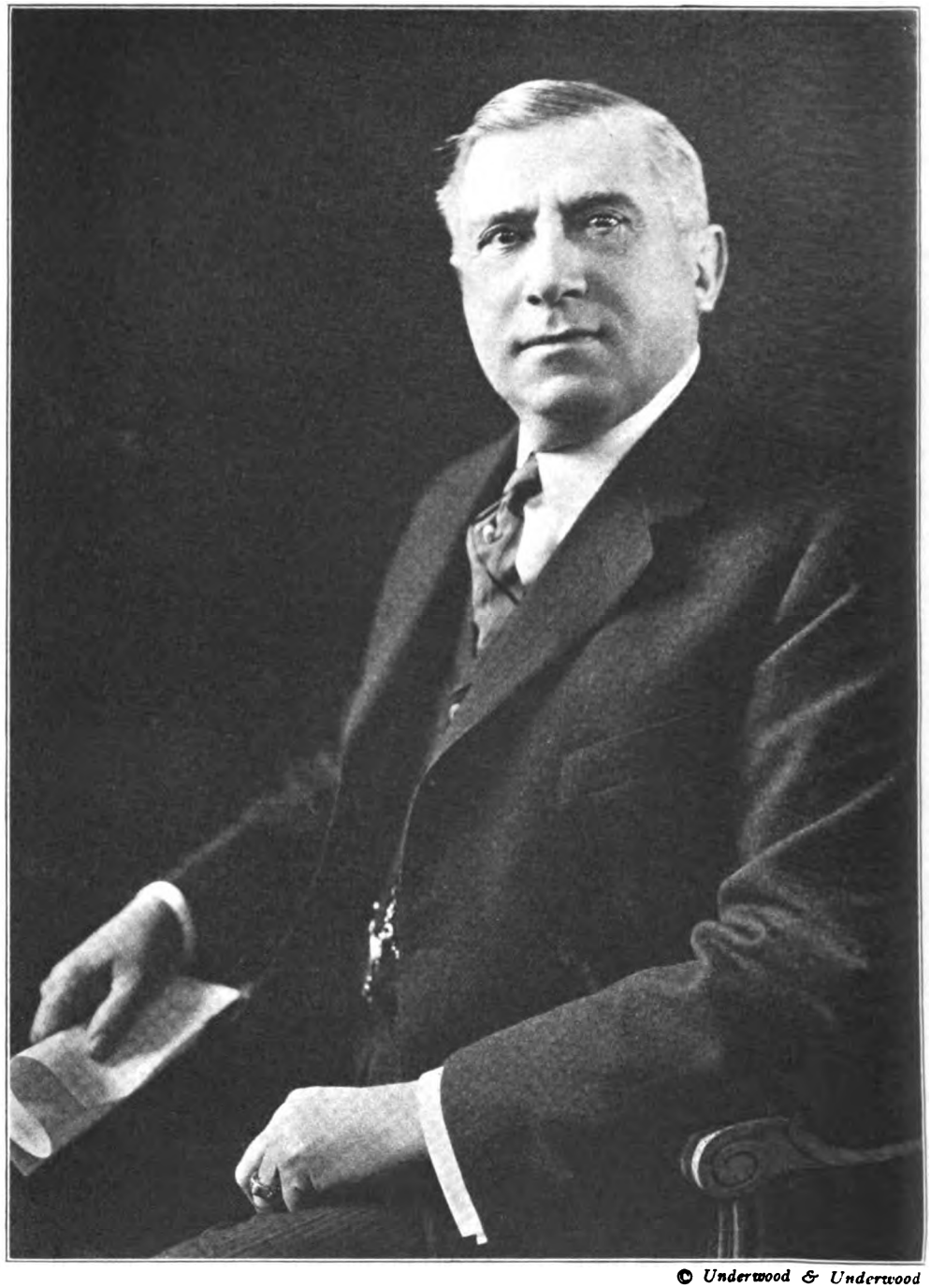
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Readers' Guide to Profitable Equipment 108
Practical helps for mill and factory managers

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Charles M. Schwab

Analyzes Our Prosperity



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WE have had prosperous years in this country in the past; we have had bad times and business depressions; we have had periods of inflation followed by disastrous reaction. Is it inevitable that our present prosperity will be succeeded by a period of dull business and hard times, or is there something new and different and substantial about the conditions of today?

Charles M. Schwab, Chairman of the Board of the Bethlehem Steel Corporation, at a recent banquet, gave a convincing answer to that question. Explaining why he was an optimist on the business outlook, he said:

"Because the American people as a whole are hard at work producing new wealth at an amazing speed. That means new purchasing power, new savings, new opportunities for expansion of production.

"Because nature promises a year of bountiful crops on top of the enormous agricultural productivity of last year.

"Because the wage earners of this country are working in a spirit of greater peace with their employers than I have known in twenty-five years.

"Because business men have been carrying on their work carefully in recent years and not indulging in speculative expansion resulting in overproduction and the inevitable crash.

"Because our railroads are providing a transportation service of greater efficiency than the people of this country have ever before enjoyed in the past.

"Because, through the operation of our banking laws, and by reason of the prudence of those in charge of our banks, credit facilities have not been taxed, and the business of the country is generally sound.

"Because the government of the United States, under the leadership of the President, stands for a policy of sanity, conservatism and progress in all the affairs of the nation.

"With the government seeking to conduct its own affairs in the most economical manner," Mr. Schwab continued, "arranging our tax laws upon the sound principles advocated by Secretary Mellon, and pursuing a policy of non-interference with the legitimate activities of business and with the American people working together as they are doing—we can have confidence that permanent prosperity shall have every opportunity to flourish."

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Specialization Is the Policy Here

One of a Series of Pictorial Visits to Noted Plants

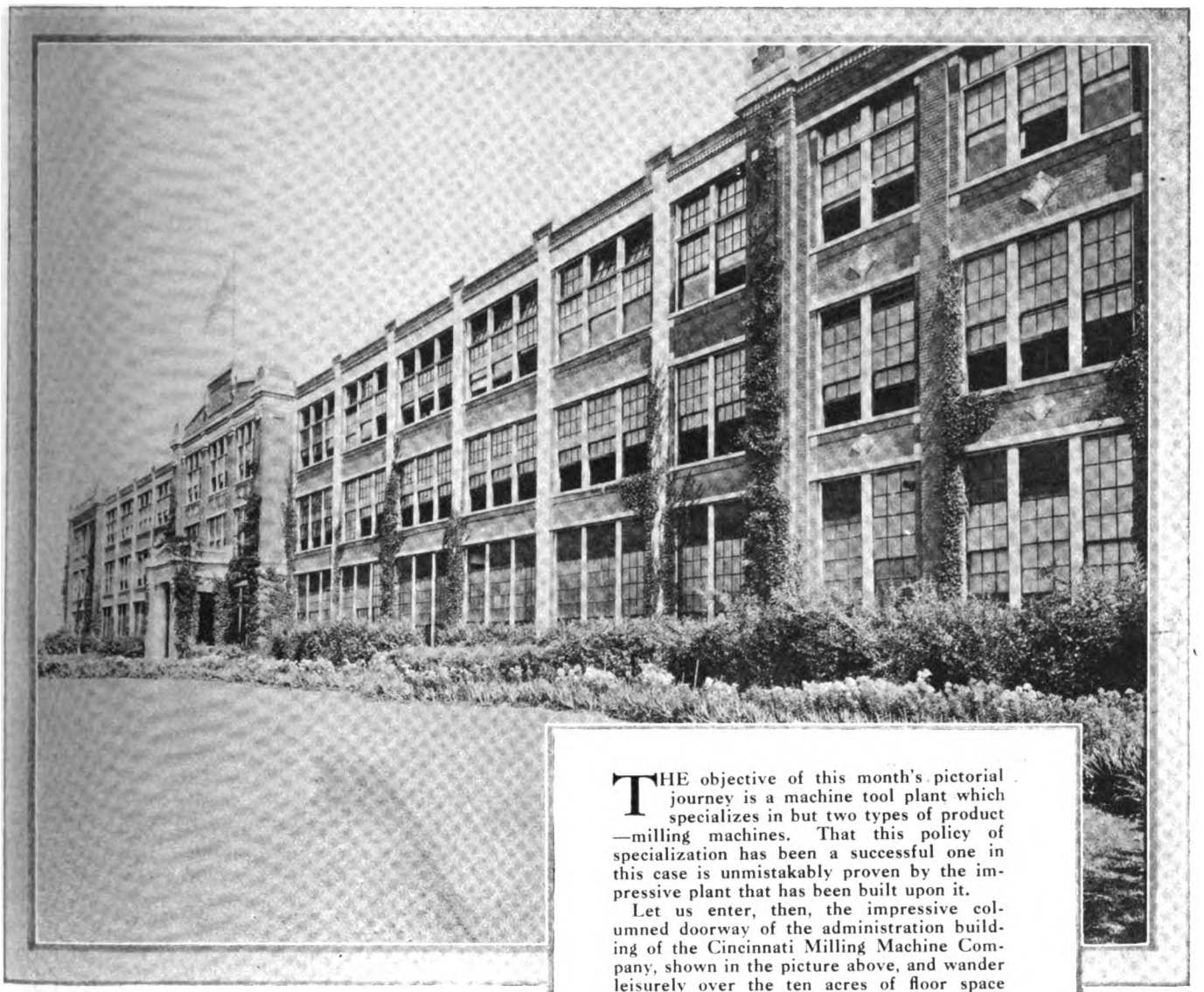
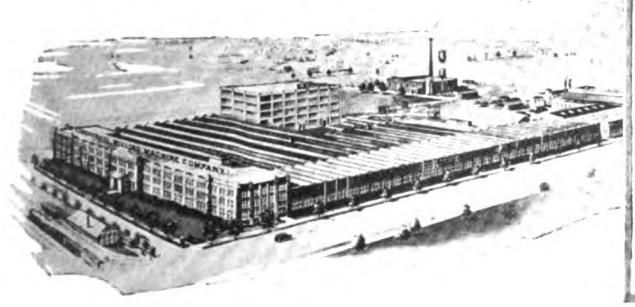


Fig. 1. The administration building of the Cincinnati Milling Machine Company is an impressive three-story brick and concrete structure, shown above. The ground in front is well landscaped. Below is a bird's-eye view of the plant, the floor space of which is now ten acres. This company was started in 1884 in a little shop down by the Ohio River.



THE objective of this month's pictorial journey is a machine tool plant which specializes in but two types of product —milling machines. That this policy of specialization has been a successful one in this case is unmistakably proven by the impressive plant that has been built upon it.

Let us enter, then, the impressive columned doorway of the administration building of the Cincinnati Milling Machine Company, shown in the picture above, and wander leisurely over the ten acres of floor space which are occupied by the manufacturing departments and which abut this main building. We shall be well repaid in interest and ideas.

The machine shop and administration buildings are shown in the bird's-eye plant view. The power plant may be seen in the background and the foundry and pattern shop at the extreme right. This foundry is a single story, saw-tooth, brick and steel building, unusually high under the trusses, which, together with the arrangement for opening the entire upper third of the roof windows, provides ample ventilation under all atmospheric conditions. This shop is heated by a forced circulation hot-water system, and lighted with mercury vapor lamps.

With this brief introduction, we shall turn the visitor over to our pictorial guide, who will call attention to the various points of interest.

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Fig. 2. Here is a corner of the engineering department, and gives an idea of the number of draftsmen employed. Note that excellent natural as well as artificial lighting is provided



Fig. 3. Bulletins are periodically posted to keep employees interested in the ultimate destination of the machines that they help to build. This shows a group examining a display of equipment for the Star motor.



Fig. 4. A view of the Physical Laboratory, in which all materials, springs and castings are thoroughly tested. Quality is carefully checked, and modern facilities are provided for that purpose.



Fig. 5. "Reading maketh a full man," according to the poet, and reading makes a well posted man according to the best industrial experience. This shows a corner of the library.



Fig. 6. The pattern shop, shown above, is an important part of this specialized plant. An error in the pattern will be multiplied in each casting. But good light helps eliminate pattern errors.



Fig. 7. Surface gaging tool, slide surface with an indicator tells whether the planing and scraping previously done has been satisfactory. This is one of many hundred inspections.

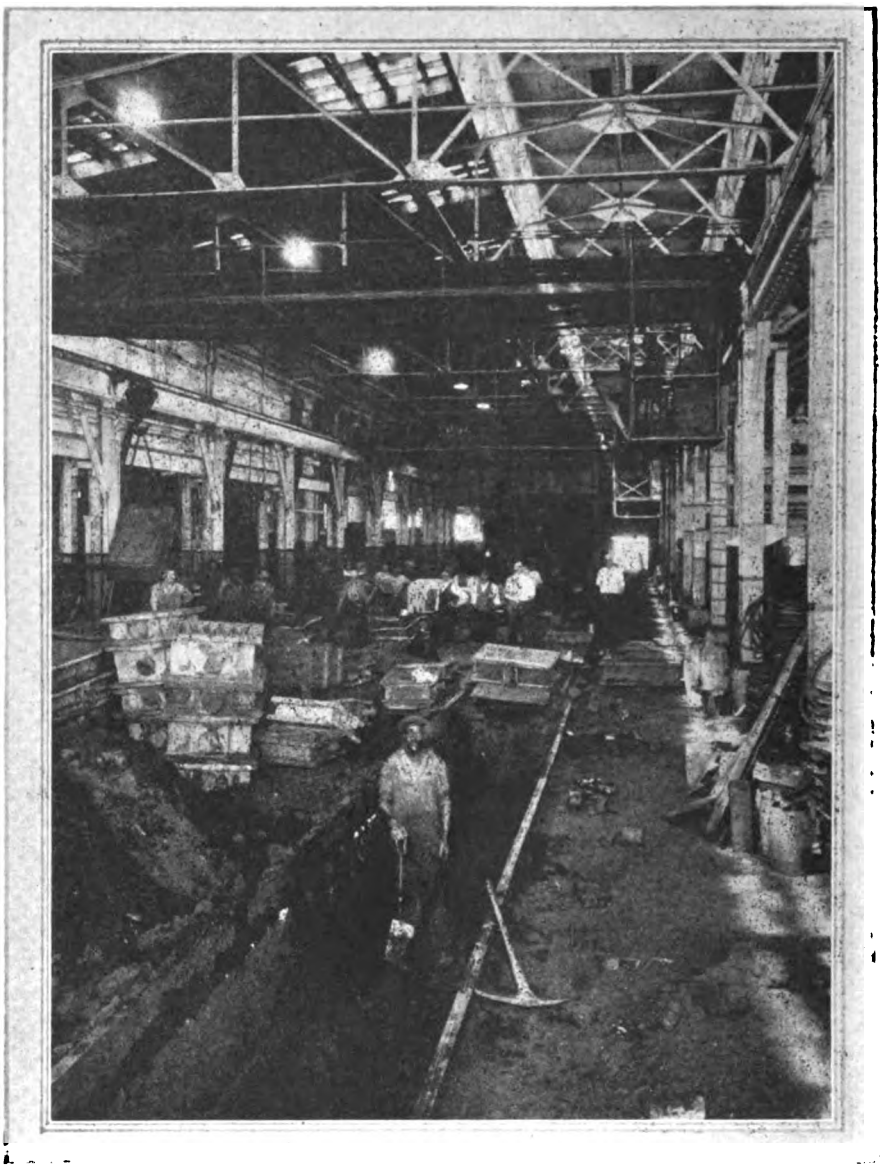


Fig. 8. The dark complexioned gentleman in the foreground is digging a pit in which will be molded and cast the bed for a long grinder. Metal flasks are used on floor work, cranes are provided for all heavy lifting, and machine molding is done under the galleries.

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Fig. 9. This shows the long bay of the machine shop. At the further end is the foundry. Note the lift truck platforms with parts ready for transportation, the jigs, hand hoists on steel gallery frames, and the use of white safety lines on the floor aisle.



Fig. 10. The Cincinnati Milling Machine Company is recognized as progressive in safeguarding the health of its workers. This is a corner of the medical department room.



Fig. 11. Modern machine tool manufacture is a scientific process that goes below the surface and into the chemical contents of the materials employed. This is a corner of the chemical laboratory.

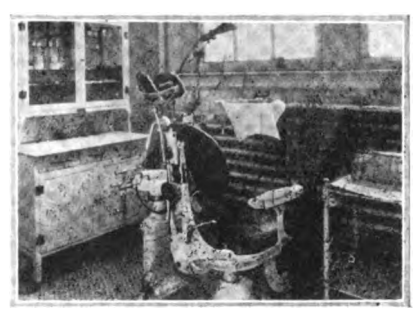


Fig. 12. "Ouch" might be the caption for this picture, except for the fact that modern dentistry is practically painless. Employees of this company have the best dental facilities that can be provided.

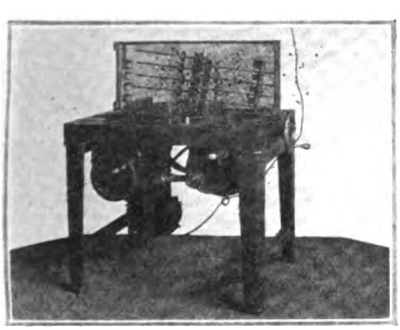


Fig. 15. In testing springs it is not sufficient merely to know the resistance to tension or compression. The endurance of the spring must also be determined for this determines its life.

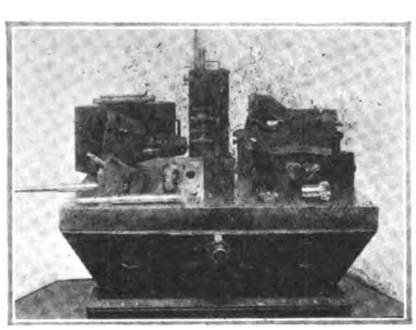


Fig. 14. A variety of fixed center gages are shown above. They are used for testing the mesh of bevel and cluster gears. They reproduce the exact center distances used on the machines.

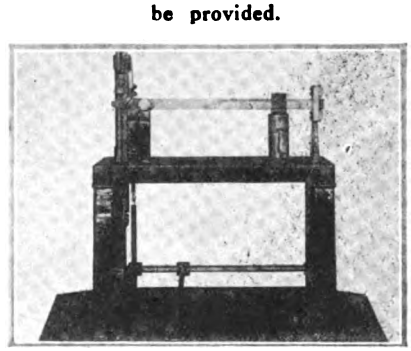


Fig. 13. This device is a scale for weighing the tension or compression of springs. It is used in connection with other physical tests on product parts.

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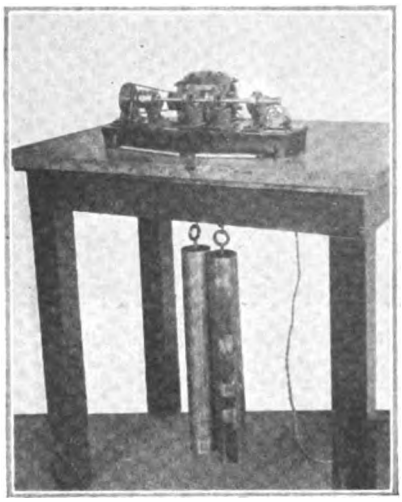


Fig. 16. In this fatigue testing machine, the weights hang on ball bearings which are mounted upon the bar to be tested. This bar is rotated by motor and a revolution counter shows how many revolutions before fracture.

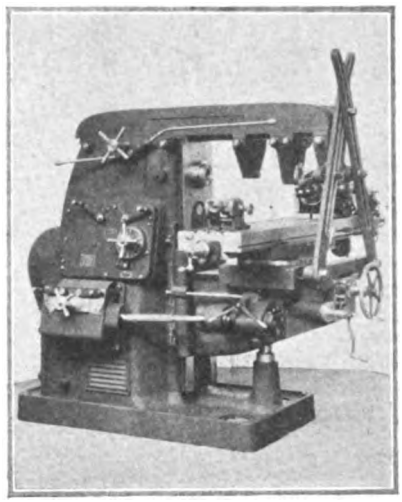


Fig. 17. One of the finished products of the company is shown above. This is the Number Three Universal Miller. As stated in the text, milling machines and grinders form the exclusive products of this company.

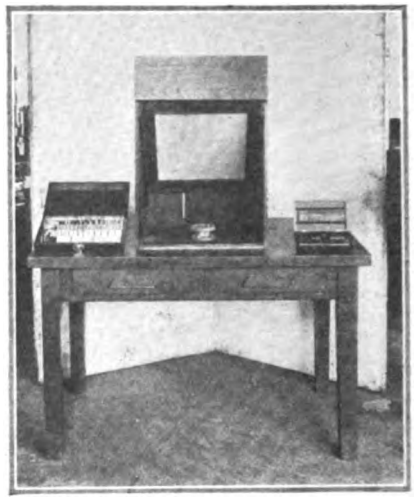


Fig. 18. Reference gages of the Hoke and Johansson type are used for checking the dimensions of jigs, tools and fixtures. These in turn are checked for accuracy by the refraction process.

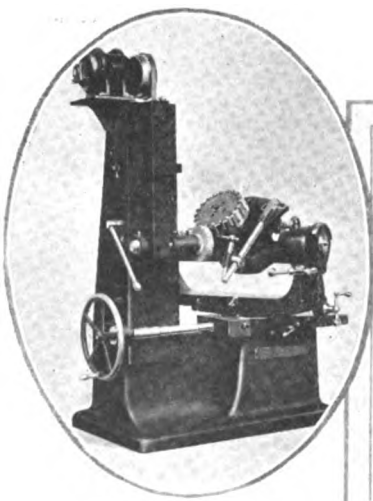


Fig. 19. This face mill grinder is one of the newer products in the grinder line made by this company. It is used for grinding large face mills.

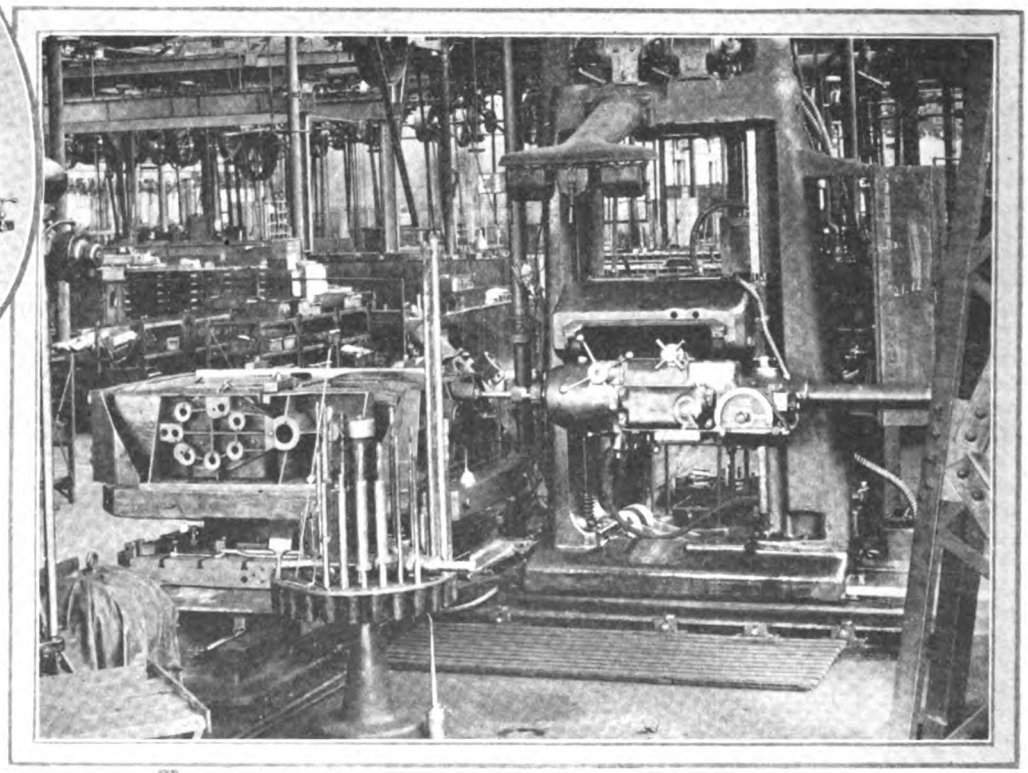


Fig. 20. This special horizontal boring and drilling machine is used for boring frames and other parts that are jigged in box jigs for accuracy.



Fig. 21. A corner of the foundry yard. Note the neatness, the use of electric trucks and the prevalence of metal flasks.

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The Most Efficient Industry in the World

Automotive Now Leads the Industrial Procession

By John H. Van Deventer

Graphic Visualization by Frederick H. Peard

THE charts on these pages tell an interesting story of the industrial struggle for supremacy. The position of leader is now held by an industry which, thirty years ago, was not yet born.

Perhaps, thirty years from now, there will be another huge industry in first position—one that as yet is unknown and unimagined.

Not many years ago, the food products industry was chief in value of its manufactured products. People in those days evidently placed "eats" ahead of transportation. But today, the place of honor goes to the automotive industry. Its output, expressed in dollars and cents of sales value of products, is greater than that of any other branch of industry.

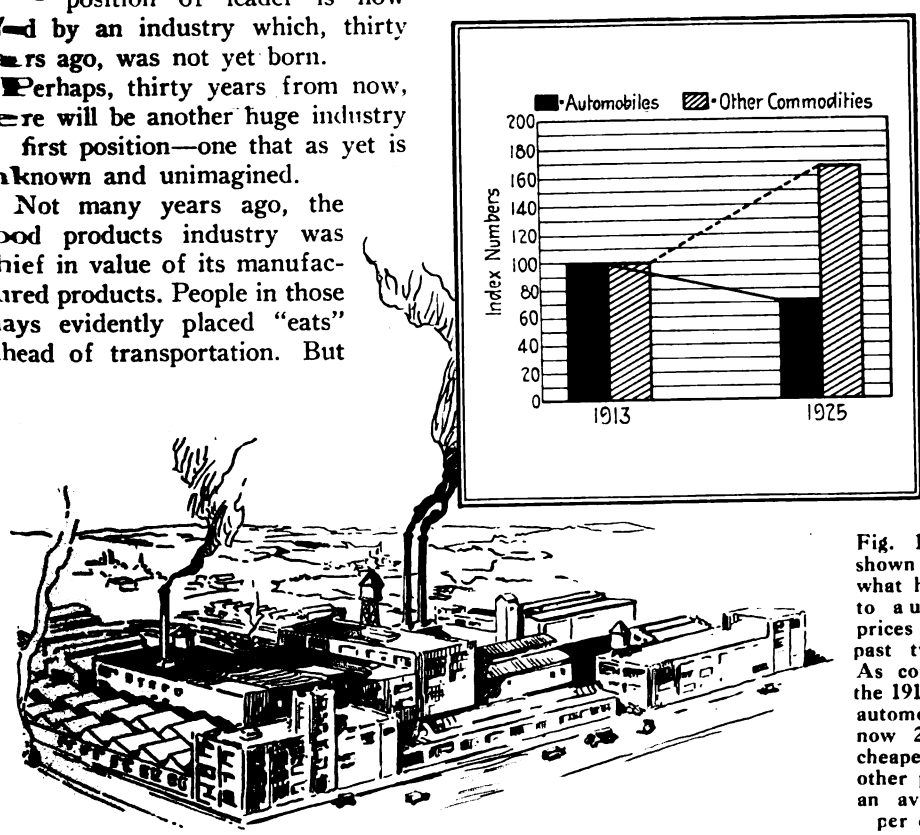


Fig. 1. Above is shown graphically what has happened to automobile prices during the past twelve years. As compared with the 1913 price level, automobiles are now 29 per cent. cheaper, while other products cost an average of 65 per cent. more.

Nor has it alone the single honor of being largest. It is also the most efficient. Today it is selling its products at an average price of 29 per cent. below prewar price levels, while most other industries are offering their products on a level about 65 per cent. above prewar levels and almost 85 per cent., therefore, above the automotive level.

This means that both manufacturing and selling costs in the automotive industry have been tremendously reduced during the past ten years, and that waste reduction in that industry has been accomplished to a remarkable degree.

Undoubtedly, the low sales price of automobiles, which has placed the motor car within the reach of even the moderately

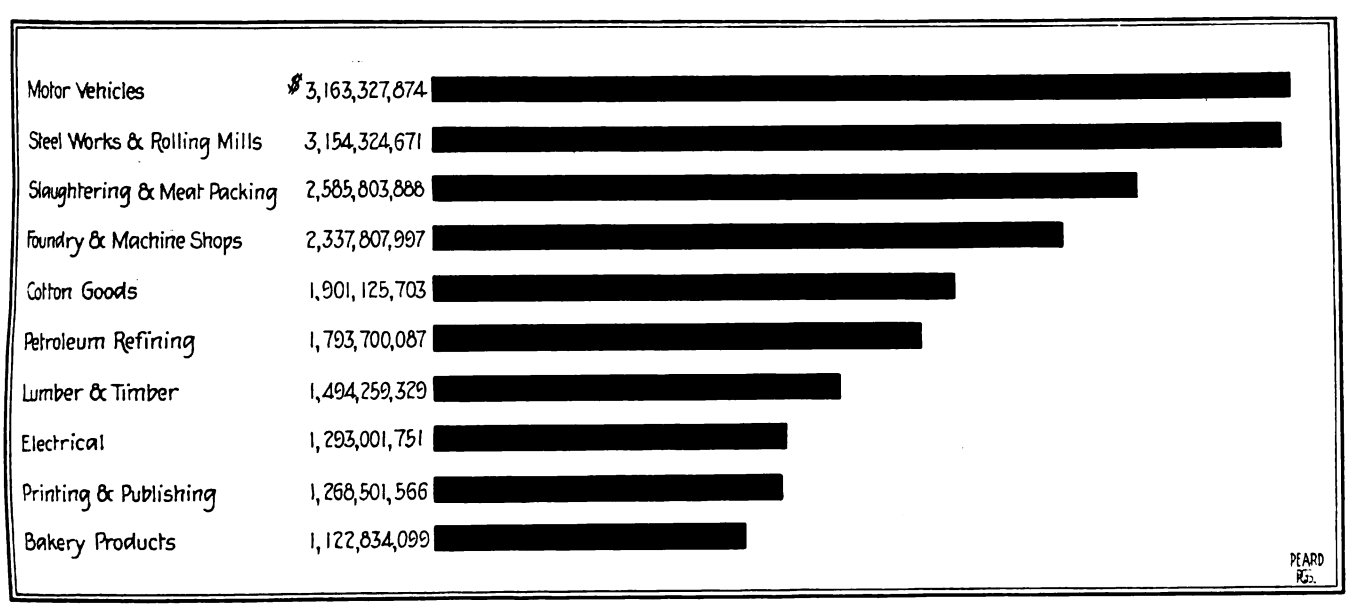


Fig. 2. This chart shows what low prices have done to the automotive industry. It is now the world's leader in total value of its products. Only a few years ago, food products held the leading place, and automobiles were hardly in the showing for place.

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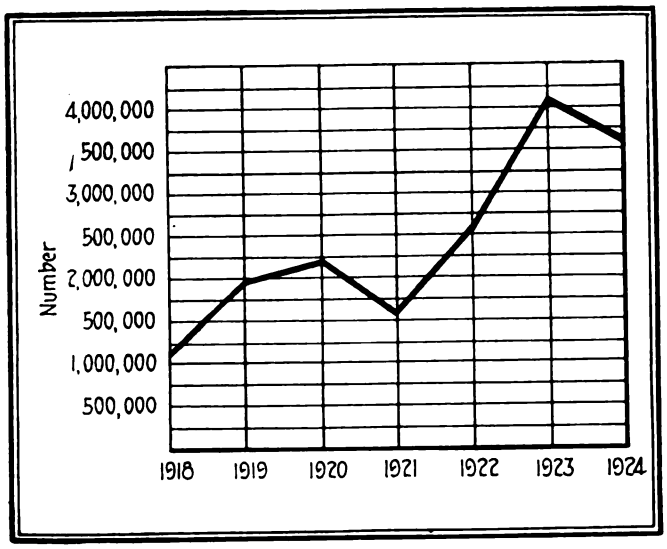


Fig. 3. The number of automobiles produced each year in the United States is apparently increasing without sign of the saturation point being reached. For while 1924 showed a slight falling off, 1925—not shown on this chart—beat them all.

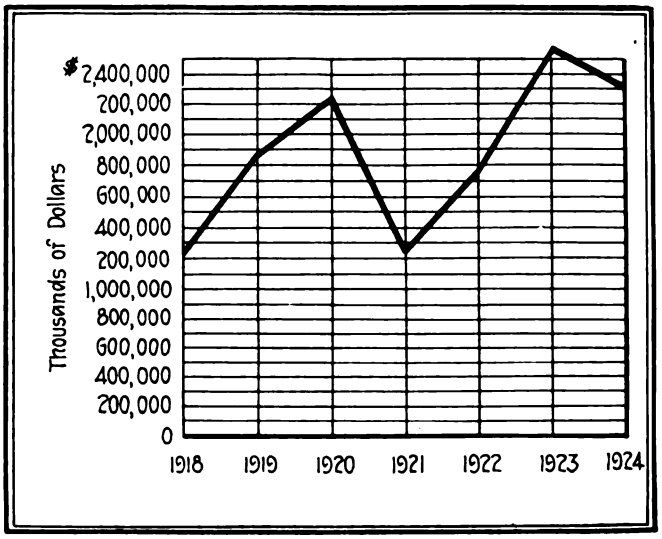
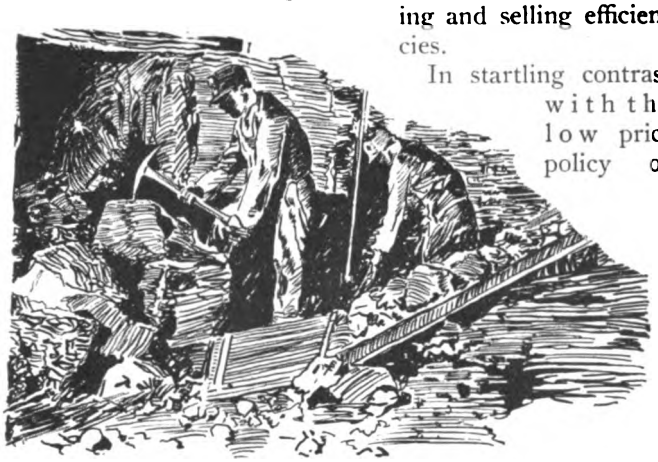


Fig. 4. The wealth of the automotive industry has increased with similar rapidity. Here is a chart of its income. The figures for 1925—received after these charts were drawn—puts it in a position of leadership.

paid wage earner, has been responsible for the amazing growth of that industry. But this low price average has had to be secured through the most careful manufacturing and selling efficiencies.



In startling contrast with the low price policy of the automotive industry, which has been possible because of its efficiency, is the present position of the coal industry, which is one of the least efficient of American industries.

There have been no very startling reductions in the price of coal since prewar times, to say the least. The tendency of the producers, miners and dealers has been to "let the devil take the hindmost" in the mad race to empty the coal consumer's pocketbook. The charts on this page show what happens to an industry that pursues such policies. In spite of the higher prices charged per ton, both total tonnage and total value of the coal produced, have fallen off. Consumers, both industrial and domestic, have been driven to the study of ways and means not to burn coal, or to burn less coal. Virtue, in the form of industrial efficiency, reaps its own reward in this world especially when a share of its fruits are passed along to the consumer.

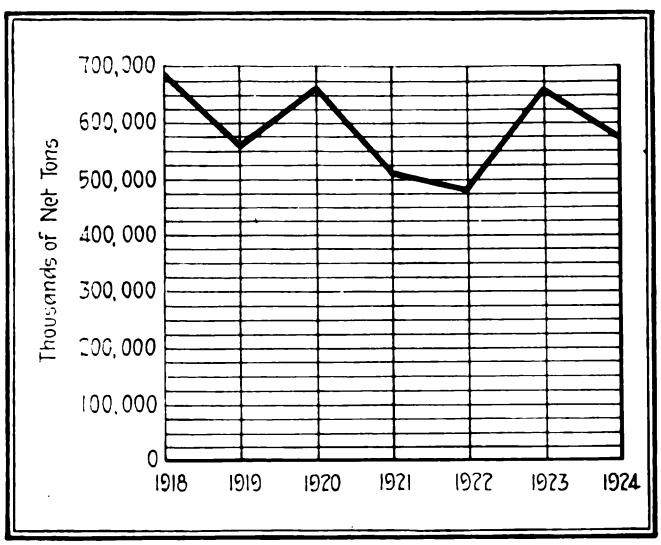


Fig. 5. Price boosting has not helped the coal industry to solve the problem of its inefficiency. Notice how its output has fallen off during the same years that have boosted motor car output to dizzy heights.

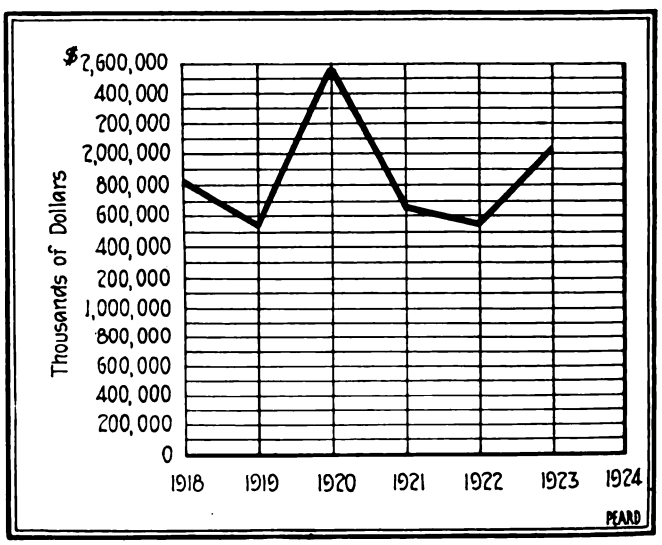


Fig. 6. In 1920, the American people spent more money for coal than they did for motor cars. But it is safe to say that the spending of it for that purpose was not done ungrudgingly. People today spend more for autos than for coal.

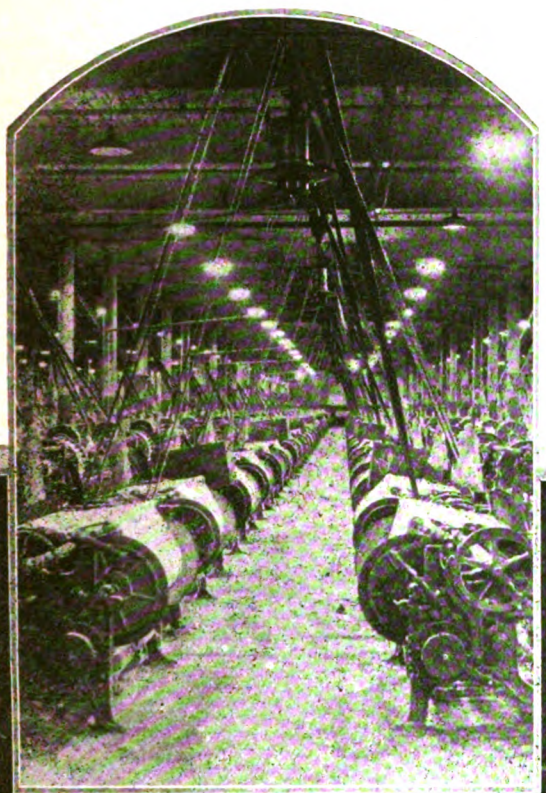
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Electricity Is Conquering Industry's "Blind Spot"

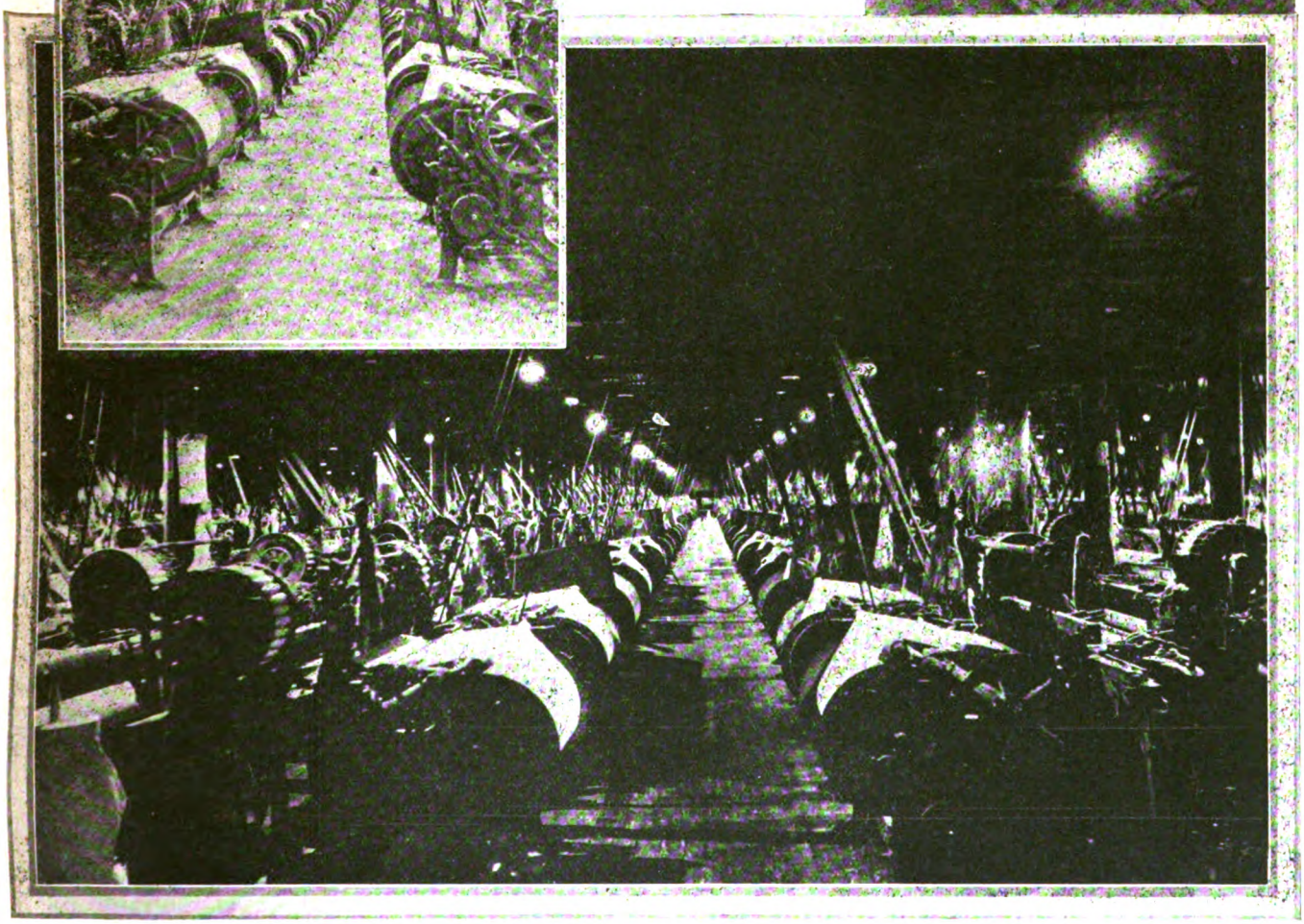
Wide-Awake Management Has Learned the Value of Good Lighting

By Roy A. Palmer





THIS weave room, at the left, is lighted by a modern system consisting of 200 watt white-bowl lamps in RLM domes, spaced twelve by twelve-and-a-half feet. The improvement is obvious, when contrasted with conditions as shown in the larger view, below



This is the same weaving room as shown above, but under the lighting conditions formerly obtaining. These lights were of 60 and 75 watts, in deep bowl reflectors. Note the heavy shadows under the machines and overhead; increasing the liability to accidents and slowing up production.

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The work of typesetters, pressmen and proofreaders, requires close visual application. That is one reason why this fine lighting system replaced an installation of drop-cord 60-watt lamps.



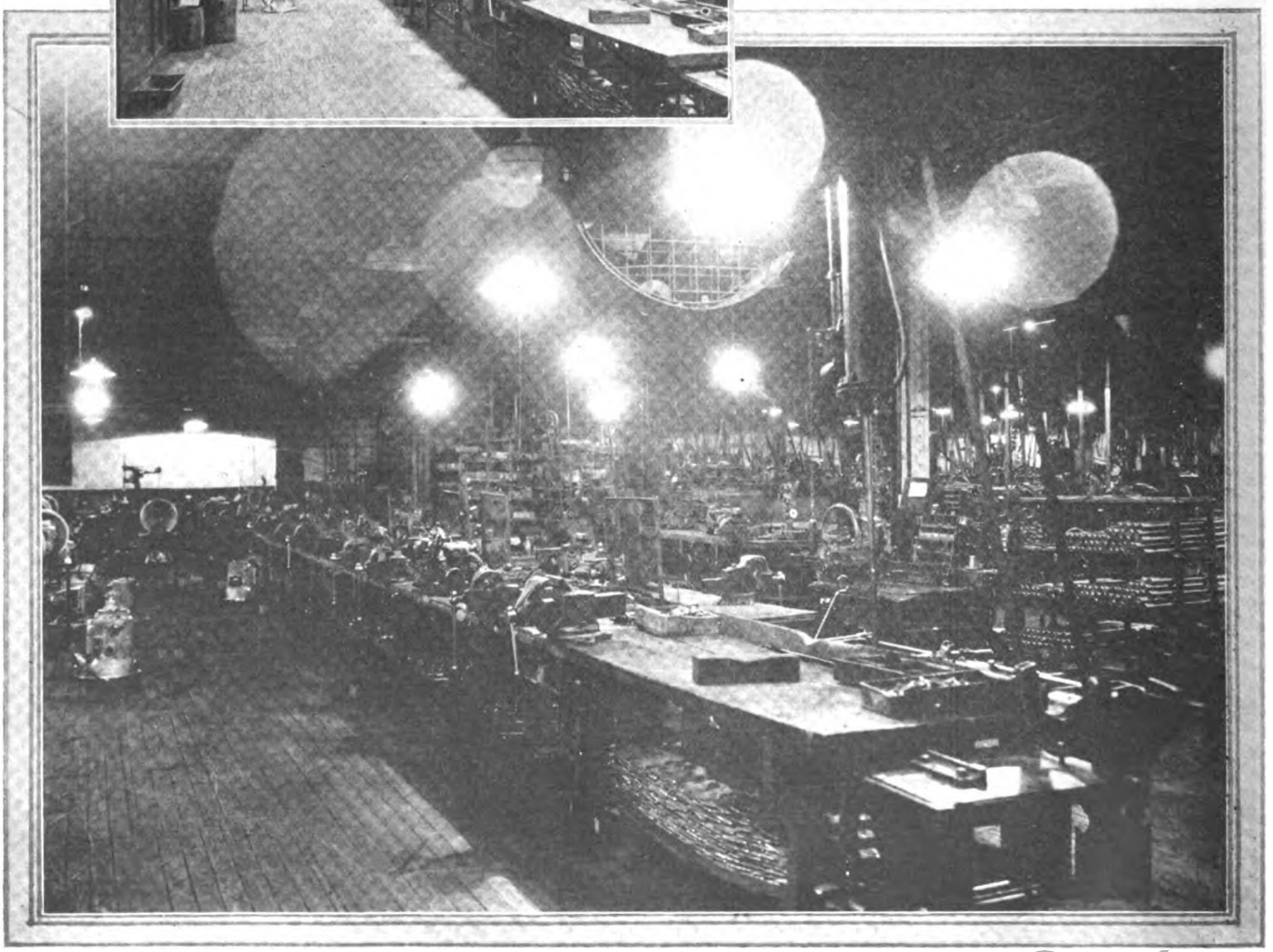
Good lighting in the buffing room of this aluminum utensil plant assures good vision with a minimum of shadows. Proper diffusion prevents undue brightness of reflections from the bright metal surfaces while the high level of illumination enables the workers to see every detail of the utensils as they are polishing them.



A sewing machine has many intricate parts. As in other industries where the product contains numerous details, good lighting is required to maintain high quality and to speed production. This sewing machine factory is no exception to this rule for a modern lighting system provides adequate illumination throughout. The lighting units are spaced ten feet apart and mounted eleven feet from the floor.



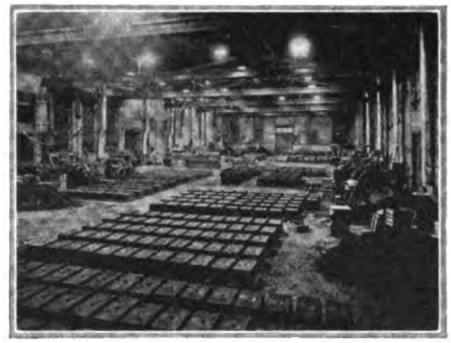
Even a fairly good lighting system is not good enough for the progressive plant if it can be bettered to advantage. The White Motor Company, of Cleveland, found that the modern system shown at the left helped materially to increase production and minimize spoilage. Below is the "fairly good" installation which it supplanted.



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Where ceilings are high and where there is an overhead crane, the reflectors must be mounted high enough to clear the crane. This is the Erie, Pa., plant of the General Electric Company, where 1,000-watt clear lamps are used in RLM domes spaced 25 by 30 feet apart and mounted 35½ feet above the work. This installation provides a level of illumination of about 8 foot-candles.



Wherever work is done, more and better work can be accomplished where the eyes function the quickest and easiest. Good lighting is therefore as necessary in a foundry as in a watch factory. The excellent lighting in this foundry more than pays for itself.



The high level of general overhead illumination in this clothing factory makes it unnecessary to have local lighting at the sewing machines. General overhead lighting will provide satisfactory lighting in the great majority of industrial plants.

At the right is an illustration averaging about 5 foot-candles; below is the system which replaced it. The Timken Roller Bearing Company, at Columbus, made tests to determine the effect on production of various light intensities. A modern system, with but 6 foot-candles, showed an 8 per cent. increase; and with 20 foot-candles, production was 12½ per cent. greater than with the old system of lighting.





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The inspection and packing room of this automobile accessory manufacturing plant is illuminated by a well designed system of illumination. In the inspection work good lighting is required to detect flaws and blemishes, while in packing and labeling, the work can be done quicker and easier, and mistakes are less likely to occur.



There is no question but that high quality work is done in this fine machine shop. And the lighting system contributes no small part to the high quality product as well as to the neat, cleanly appearance of the shop. All workmen are human and like to work under pleasant conditions.



Faulty lighting in this plant invited accidents. It is easy to imagine how one might stumble over some object hiding in the dark shadows of a poorly lighted aisle. When groping for some tool it is easy to get the fingers in swiftly moving machine parts. Poor lighting, according to R. E. Simpson of the Travelers Insurance Company, is responsible for 15 per cent. of industrial accidents.



Belts and line shafts are no excuse for unsightly and unsatisfactory drop cords. Well-designed overhead lighting systems will provide a higher level and quality of illumination and aid very materially in speeding production, reducing accidents and labor turnover.



Overhanging machine parts provide a source of annoying shadows if the light does not come from a sufficient number of directions. In this shop, the arrangement of units minimizes shadows and provides uniform illumination in every part of the room.



The improved lighting system in this gear cutting room helps to minimize accidents and to prevent eye strain among the workers. Surely, under cheerful working conditions such as this, production will be high in quantity and quality.

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Lubricating the Work-Horse of Industry—The Pump

By Allen F. Brewer

THE maintenance of productive machinery in condition to bring about maximum and continued production is one of the outstanding problems which confronts the management in the average industrial plant today. Only can it be solved by the most careful attention to details such as, cleanliness, the elimination of friction and the prevention of undue wear of bearing elements which would probably ultimately result in the necessity for replacement of parts.

While this, of course, applies to productive machinery as a whole, such equipment as serves to coördinate the efforts of individual units or departments, must, of course, be given special attention. In many phases of industry, notably the paper mill, the petroleum refinery and certain branches of the textile and leather trades, the pump is the essential device for the transference of products or treating solutions. By reason of the part which it plays in general plant operation, it must not fail, for failure might easily cause cessation of production or, at least, interruption or retarding of certain stages of treatment.

This will be true regardless of the nature of the product, provided fluid or semi-fluid materials are involved in the course of production. For the pump is the standard means of transferring such materials to the various process departments involved.

Industrial pumps must therefore be capable of functioning continuously and meeting requirements of load as necessary, more or less regardless of temperature conditions and the relative fluidity of the material to be pumped. Only can this standard be maintained by reduction of wear and frictional resistance in every way possible. In other words, by effective lubrication.

Wear of bearing elements as the natural outcome of development of excessive friction is the primary cause of failures, barring, of course, any accidents or breaks which might occur due to entry of unbreakable pieces of foreign matter via the suction line. In the properly designed, well managed industrial plant, this



Fig. 1. View of a high-duty compound standard pressure pump, equipped with a slide valve steam end. Here lubrication involves a dual problem, i. e., that of steam cylinder and external bearing surfaces.

Fig. 2. Below—A striking picture of typical pump service. Fire streams from the pumping station of a modern shipyard.



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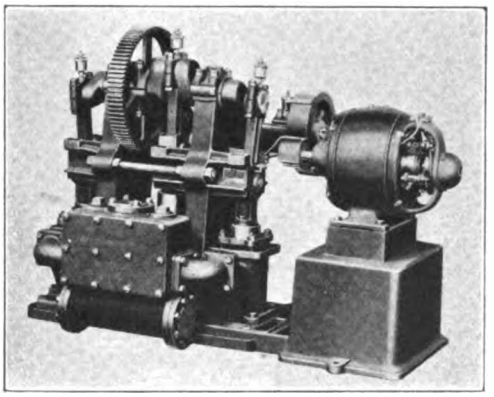


Fig. 3. A triplex plunger pump with external bearings equipped for grease lubrication by means of compression cups. Note also the gearing installed, which must be properly lubricated.

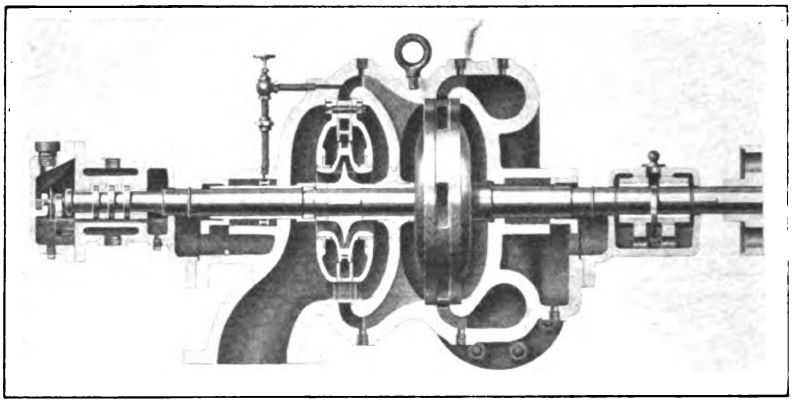


Fig. 4. Sectional view of a double suction turbine pump. Note that there are but two bearings requiring lubrication, ring oilers being installed for this purpose.

latter is a remote possibility. The slip pump in a ceramic plant for example, rarely strikes a stone, and in the paper mill, oil refinery or textile dye house, damaging foreign matter in any of the liquid products is just as seldom encountered, unless it is deliberately or most carelessly allowed to gain entry.

So it is with the bearing elements, viz. those parts which are in continuous motion with respect to one another, that we are essentially concerned. Strictly speaking this motion, while it is usually sliding wherever plain bearing surfaces are involved, can be regarded as either reciprocating or rotational. In the plunger or piston type of pump, so familiar in the power plant, reciprocating motion occurs between pistons and cylinders, guides and cross heads, and valve mechanisms. In the rotary or centrifugal pump, rotary or uni-directional motion is prevalent between rotor shafting and the respective bearings.

In regard to motion of the latter variety, it is well to state that anti-friction bearings of the ball or roller type can frequently be substituted for plain bearings where it is possible to protect their wearing elements from entry of fluids. As means of reducing friction, and affording opportunities for economies of time and lubricants, bearings of this type installed on rotating shafting are especially advantageous. The more perishable nature of their wearing elements however, from the viewpoint of corrosion, renders it essential to install, protect and lubricate them with the utmost care.

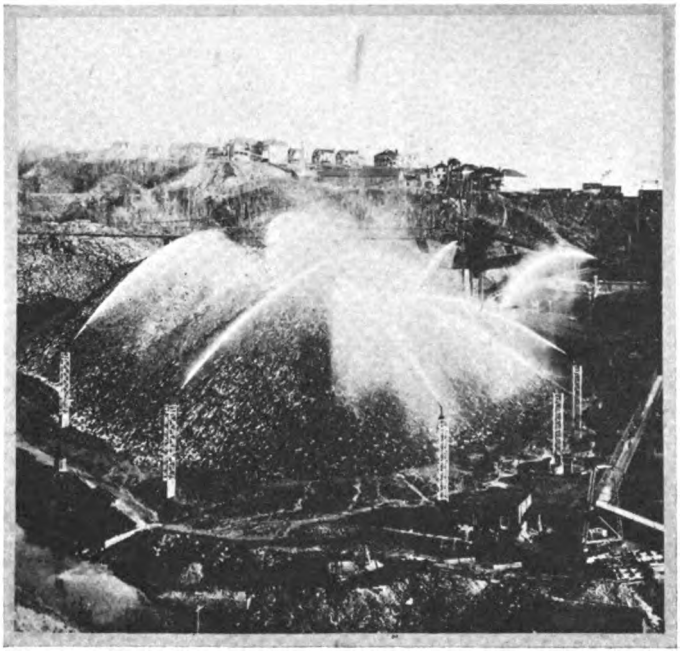


Fig. 5. In the conditioning of wood pulp and prevention of spontaneous combustion, the pump plays a most important part as shown. The intensive and frequently continuous service requirements impose exacting lubricating conditions.

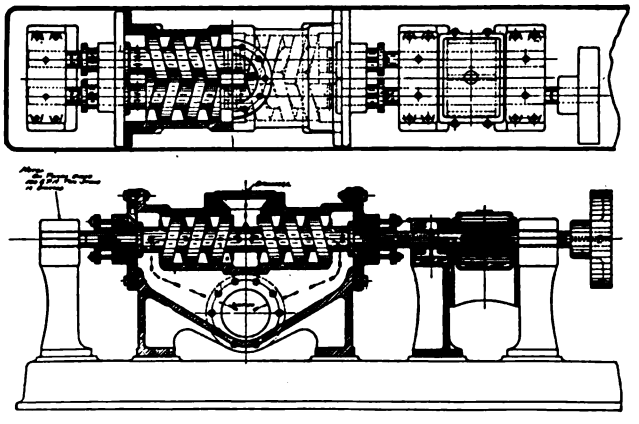


Fig. 6. Sectional view of a screw pump which is admirably adapted to fuel oil service and the handling of other heavy products. Discharge at the center eliminates end thrust.

The fact that reciprocating pumps will in general be steam driven, involves the necessity for two distinct types of lubricants — one a steam cylinder oil to serve the internal wearing elements such as cylinders, pistons, valves and valve seats, etc.; the other straight mineral engine oil of medium viscosity (say in the neighborhood of 200 to 300 seconds Saybolt at 100°F.) to lubricate all external bearings; or a grease, according to the type of lubricating equipment installed.

In the selection of steam cylinder oil for reciprocating steam pump cylinder lubrication, as a general rule we can assume that saturated steam under pressures of approximately 150 to 200 pounds per square inch will be customarily involved. In consequence, a compounded oil, that is a petroleum

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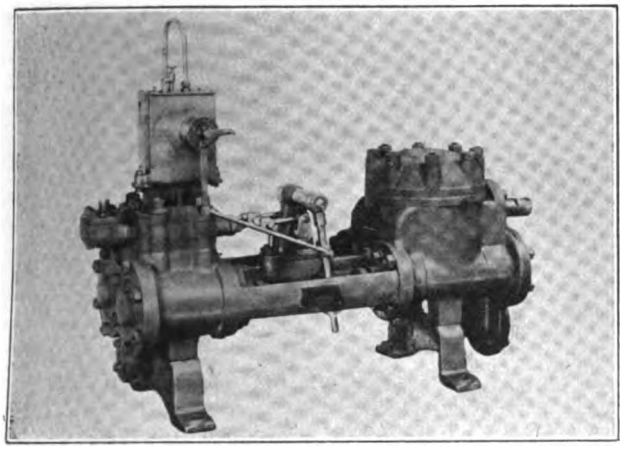


Fig. 7. A typical steam pump showing in particular the mechanical force-feed lubricator installed for supplying oil to the steam cylinders. Faulty lubricated steam cylinders are a most prevalent cause of steam pump troubles.

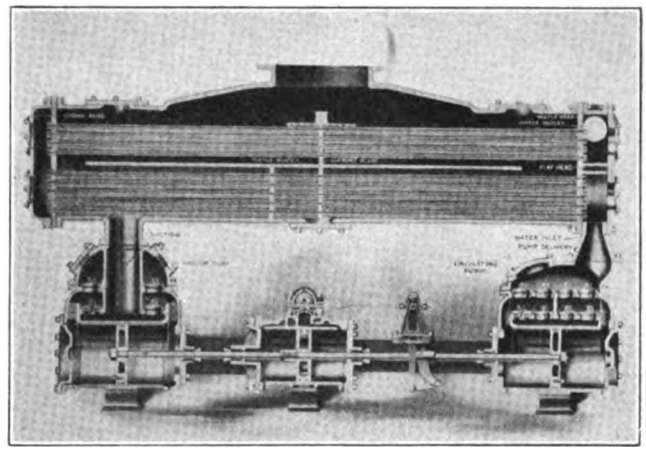


Fig. 8. Section of a Worthington standard surface condenser mounted over a simplex combined air and circulating pump. Note straight line connection from steam element to air and water pumps respectively.

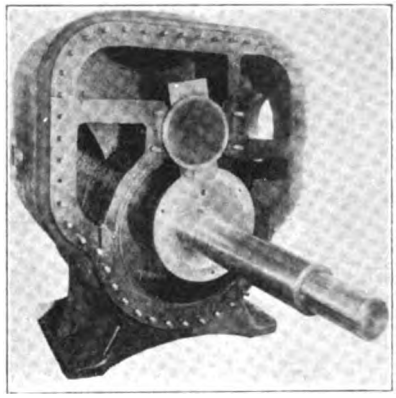


Fig. 9. Cut-away view of a rotating piston type pump. The pistons are actuated by cams. To enable internal lubrication suitable holes are drilled through the pistons.

residual product containing a certain amount of animal or fatty compound, should be chosen. The percentage of this latter should be based on the extent of moisture contained in the steam. The higher the pressure, in all probability the lower the moisture content, and consequently the lower the chance of washing action eliminating the lubricating film on cylinder walls, etc. As a result, were a cylinder oil with 8% compound necessary for a pump using steam at 150 pounds pressure or under, it would probably be well to use an oil containing from 5 to 6 per cent. of compound for steam pressures, much above this. Too, an oil of somewhat higher viscosity would be required under higher pressure conditions, to meet higher temperatures involved.

The selection of suitable lubricants for external bearings of reciprocating steam pumps is a matter of choosing the right grade of grease or oil, according to the means of application installed. Grease can be applied by means of compression cups, pin type lubricators or pressure grease guns. In general a medium consistency cup grease will be best suited to pressure systems. Pin type cups, however, which depend on heat or pumping action may require a product of somewhat lighter body. Where oil lubrication is involved, the means employed will generally be the sight feed oil cup, or the old fashioned squirt can. The average steam pump has not been the recipient as yet, of too much attention in regard to more automatic means of lubrication. A straight mineral red engine oil as mentioned above will generally be best suited to such parts.

With the rotary or centrifugal pump, in turn, we will be solely concerned with bearing lubrication. For general all-round service, the average horizontal pump of this type will have its rotor bearings equipped with ring oilers. Such devices are comparatively simple and fool-proof in design, conducive to cleanliness and economy and practically automatic as regards the delivery or circulation of oil through the bearings. They possess natural advantages in that by flooding the bearings with oil, any possibility of accumulation of foreign matter in oil ducts, etc., is practically eliminated. As a result, wear is reduced to a minimum provided the oil is of the proper viscosity to maintain an adequate film of lubricant between the surfaces of the shaft and bearing, commensurate with operating pressures and temperatures involved.

But this washing action of the oil, naturally results in ultimate contamination to

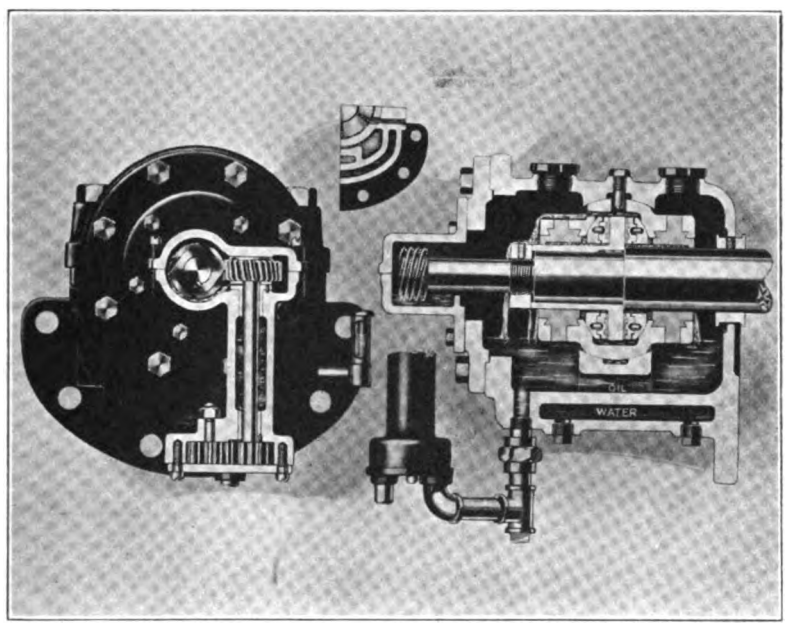


Fig. 10. Thrust bearing details on a Cameron multistage turbine centrifugal pump. Lubricant is circulated by a suitable gear pump under adequate pressure to insure the maintenance of the requisite film of oil between all wearing elements. Note relation of geared (oil) pump to bearing and manner of drive off the main shaft which insures simultaneous operation.

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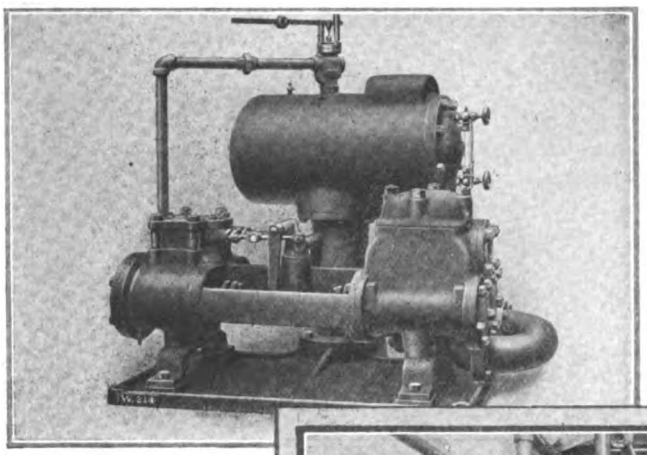


Fig. 11. An automatic duplex piston type of feed pump with receiver. On such service as the handling of boiler feed water in the power plant positive and continued operation is absolutely essential.

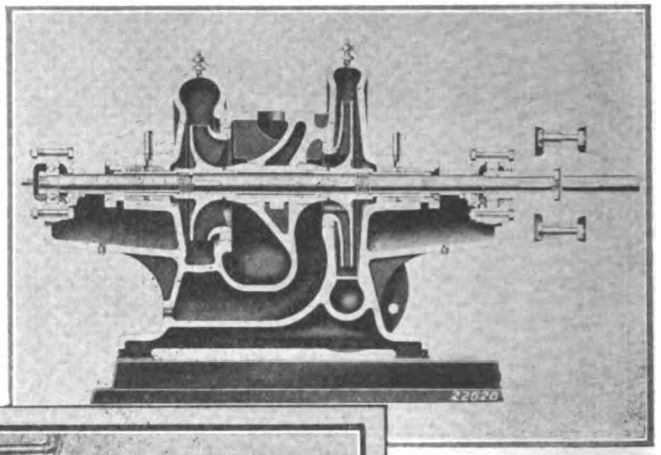


Fig. 12. Sectional view of a high head condensate pump. Note in particular that the rotor shafting is mounted on ball bearings. The latter are an especially advantageous means of providing against failure, involving a minimum of friction.

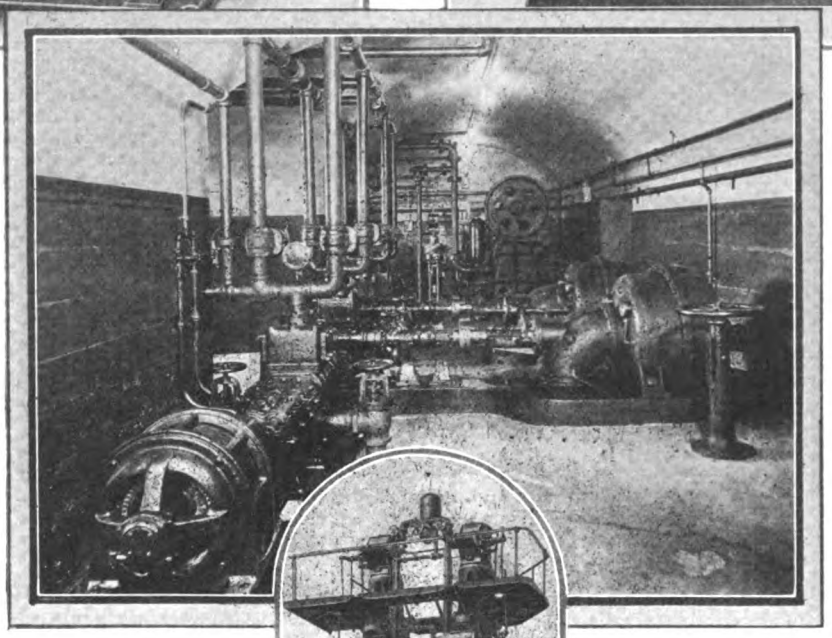


Fig. 13. Above—A battery of screw pumps handling lubricating oil on a turbine oiling system at Keokuk Dam. Note that two of these are motor driven, the other two being water turbine driven.

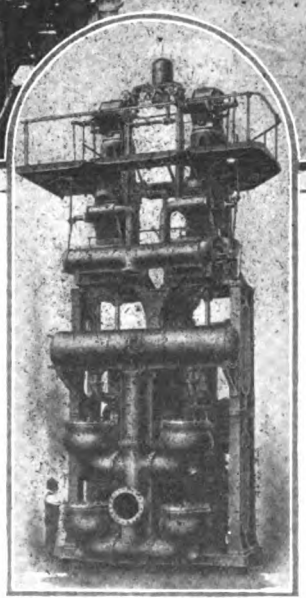


Fig. 14. The relative size possible in the construction of the modern vertical plunger pumping engine is well illustrated at the left. As size and duty are increased, it is logical to expect that the cost of failure due to faulty lubrication will mount in proportion.

a more or less extent. It is therefore advisable to drain, flush and clean such systems at periodic intervals, replacing the old oil with a new charge.

Ball and roller bearings are also adaptable to rotary or centrifugal pump bearings as stated. Whereas ring oiled bearings are virtually flood lubricated, the anti-friction type works just the opposite. That is, on just enough lubricant to furnish the necessary lubricating film.

Where ball and roller bearing housings are oil-tight in construction, it is generally deemed best to lubricate them with a relatively light, straight mineral oil. The essential function of the lubricant is more to protect the highly polished surfaces of the balls, rollers, cages and raceways against corrosion, than to actually reduce friction. It is not always possible to build such devices oil-tight however, in which event a semi-fluid grease should be used which will have sufficient body to enable it to "stay put" and not leak out from the bearing housing.

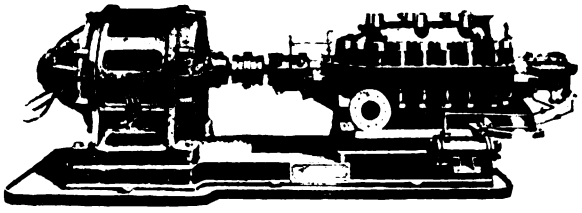


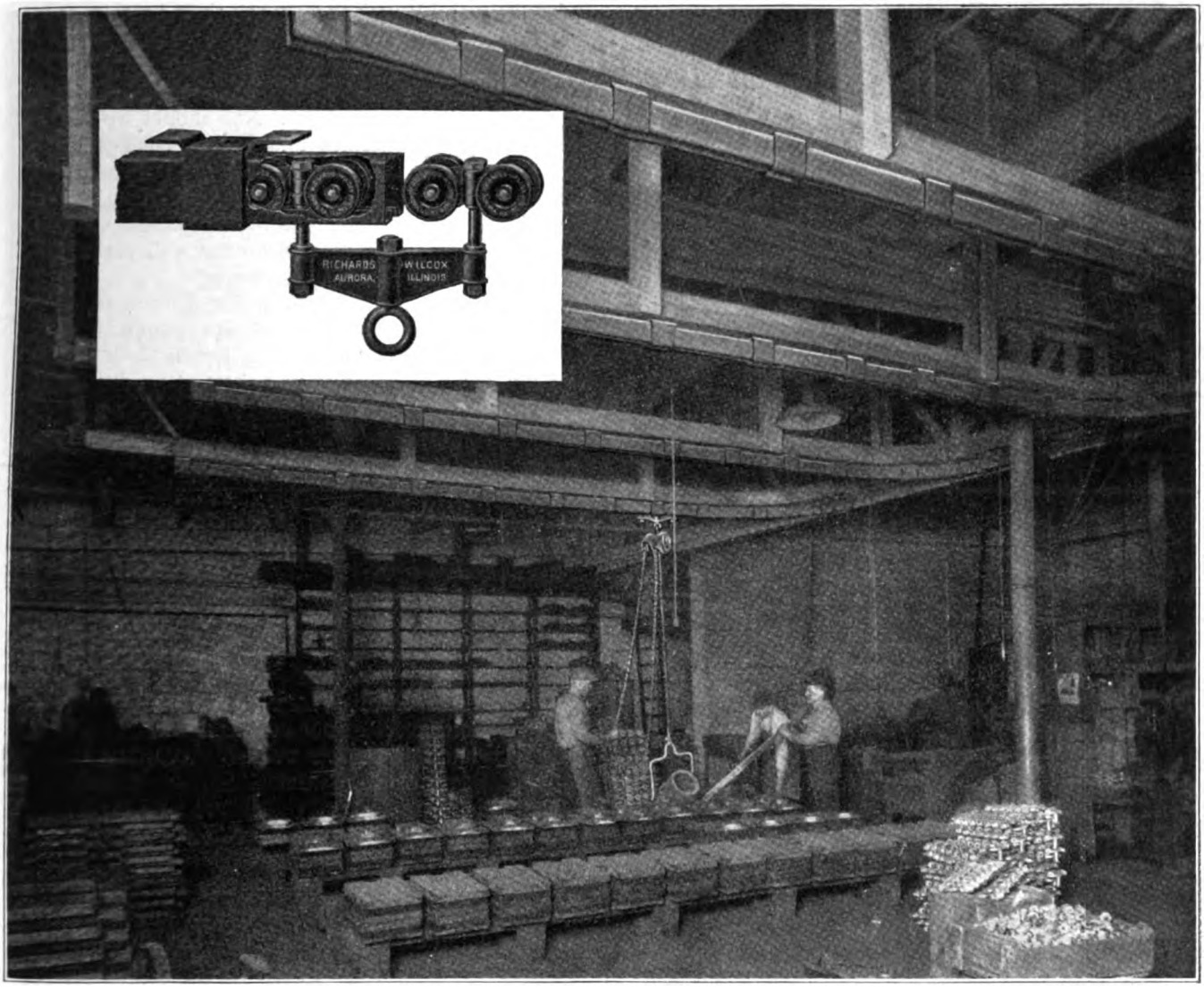
Fig. 15. A multi-stage turbine centrifugal pump. Note in right foreground the oil tank and piping, and the geared pump (as shown in Fig. 10), which serves to circulate oil to the Kingsbury thrust bearing at the extreme right of the pump.

Automatic means of lubrication such as mentioned above, however, are not always found on rotary and centrifugal pumps. In certain cases the builders may provide their pumps with plain babbitted bearings, installing means for grease lubrication by pressure, etc., or sight feed oil cups. On pumps intended for more or less intermittent operation, or installation in duplicate, such means of lubrication are perfectly satisfactory. There is, however, always the possibility of neglect on the part of the operator, in which event bearings may be scored or even burned out.

The fact that such occurrences may easily throw out an entire production schedule has led many engineers to insist on more attention to their pumps, from a lubricating point of view. Just because a pump is the veritable "work horse" of industry is no justification for its neglect. Nor, because so many of them will continue to function under adverse conditions and neglect, should we expect them to operate

(*Continued on page* 34)

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Charles Reith, Foundry Supt., Illinois Engineering Co., Chicago, says: "The Richards-Wilcox OveR-Way system—installed three years ago in our steam fittings foundry—has proved the greatest time and labor saver in our plant. A 1,000 pound chain block is suspended from the R-W eight-wheel ball bearing trolley, which runs on an enclosed overhead track from the brass furnace to the moulding floor, with four switches from the main line.

"Formerly four men would lift the 280 pound crucible of molten metal out of the brass furnace, carry it to the moulds, and pour. This was such a back-breaking job that the men could not pour steadily, and were always dissatisfied. Labor turnover was enormous.

"With the OveR-Way system, three men can pour the moulds, saving us over $1,500 a year. As we can pay the remaining men five cents to ten cents an hour less because of eliminating strong arm labor, we save another $600 a year. And now it takes only five minutes to lift the crucible and pour 250 pounds of brass to twenty-one moulds; the old hand method took more than twice the time.

"We no longer have tired men resting on the job. The men do not burn their clothes from the molten metal. They are contented and labor turnover has been cut to normal.

"The R-W trolley operates easily and costs practically nothing for maintenance."

Richards-Wilcox Mfg. Co.

"A Hanger for any Door that Slides."

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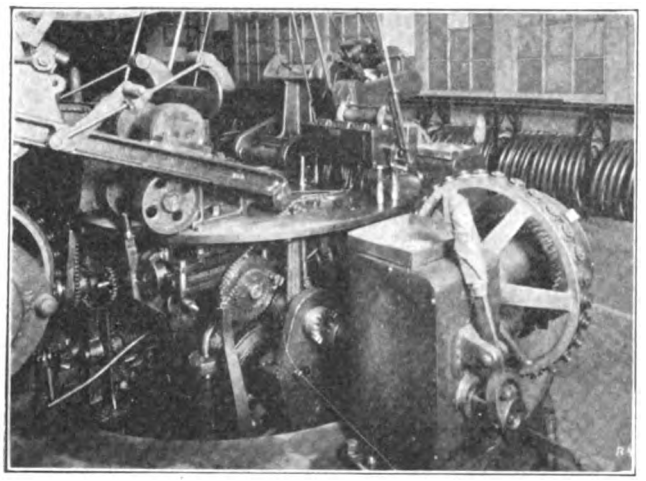
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There are many parts on this tire assembly machine that require constant lubrication, yet it works continuously without the necessity of the operator stopping to feed oil. In fact no operator could satisfy the ravenous appetite of this machine. A McCord force feed lubricator is the answer, and it is the solution to better lubricating problems in every industry.

McCord force feed lubricators have not only solved the problem of continuous operation but have also been an important factor in the reduction of wear and depreciation, with the result that frequent breakdowns and shutdowns have been eliminated. Maximum production can only be possible if machine parts are oiled by a positive automatic mechanical force feed method of lubrication. Modern methods of speeding up production require it.

In nearly one hundred different lines of industry McCord force feed lubricators show definite savings and they may be the key to your production problems.



The Economy of Better Lubrication

This Book Tells Why

McCord's new guide to better lubrication pictures difficult machines to lubricate and how simple it was to solve the problem. It is just the book you need to show you one way to increased profits during 1926. May we send you a copy?

McCord Radiator Mfg. Co.

Detroit, Mich.

McCord Lubricators

indefinitely and "cuss" them when their bearings fail or they begin to slap and pound.

The price of neglect is being paid, let's not forget that fact. Any idea that black oils or other cheap products are an economy is erroneous. Nor should we feel that because a pump operates under dirty conditions, it is useless to attempt lubrication or pay much attention to it. Friction is taking its toll, as careful check up of steam or electrical power consumption will indicate. Ultimately the expense of repair or replacement will probably far exceed any false economies as above.

It is therefore advisable to give a little more heed to the lubricating requirements of our pumps, whatever their duty or the products being handled. It will pay over the long run, in lower unit costs of production, and decreased maintenance expense.

IF accidents on the streets, at home and throughout industry are costing America five billion dollars a year, why don't more of our industrial captains do something to prune this terrible waste? According to C. B. Scott, president of the National Safety Council, 4,200 corporations, firms and individuals are now participating in the organized, country-wide safety movement, and most of them are reaping financial rewards. For instance, in ten years the United States Steel Corporation expended $9,763,063 to curb accidents and the savings effected amounted to $14,609,920. The Equitable Gas Company of Pittsburgh saved $15,555.08 more in 1925 than during 1924. And, the Peoples Gas Light & Coke Company of Chicago reports a saving of $9,541.50.

President Scott informs us that the council has hundreds of similar sets of figures showing the value of regular, persistent, thorough safety work. There is no logical argument against such efforts. Accidents certainly pay no dividends. No organized group is opposed to the nation-wide safety movement. While it is true that at first some of the labor people questioned the stated motives behind the safety movement, today even the heads of national labor unions are strongly in favor of their members supporting the various safety campaigns staged by employers. Scores of trade associations, professional, medical and technical societies, local, state and national bodies are now engaged in organized efforts to conserve human lives and limbs and property.

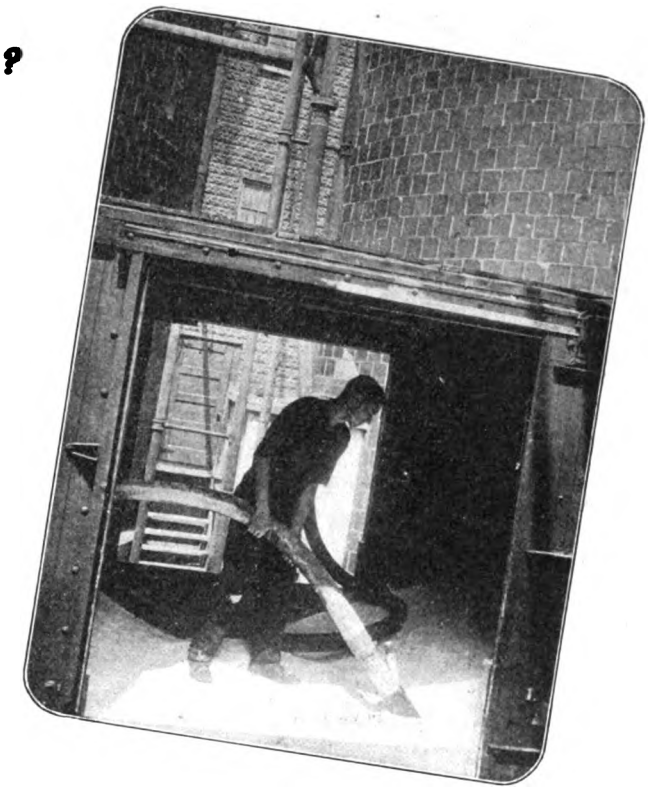
Safety, however, is not profitable for the big companies alone. It should be given consideration by the small manufacturer as well; by the small public utility and corporation that have much at stake. The employer who has only a handful of workers on his payroll can cut down medical expenses, compensation costs, labor turnover, decreased production, etc., just as much, in proportion, as have the larger concerns.

Safety in industry is directly correlated with efficiency and economy of production and with the establishment and maintenance of proper relations between employers and employees—and these two are probably the most important problems facing industrial America today.

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Did you ever try smoking a cigarette when you had a cold ?

not so good·····is it ?



AND that same condition may exist, in a different form, in your plant.

Men like good, healthy working conditions and their production records show it.

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Dracco Engineers have helped many plants to better production methods and decreased costs.

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and others.

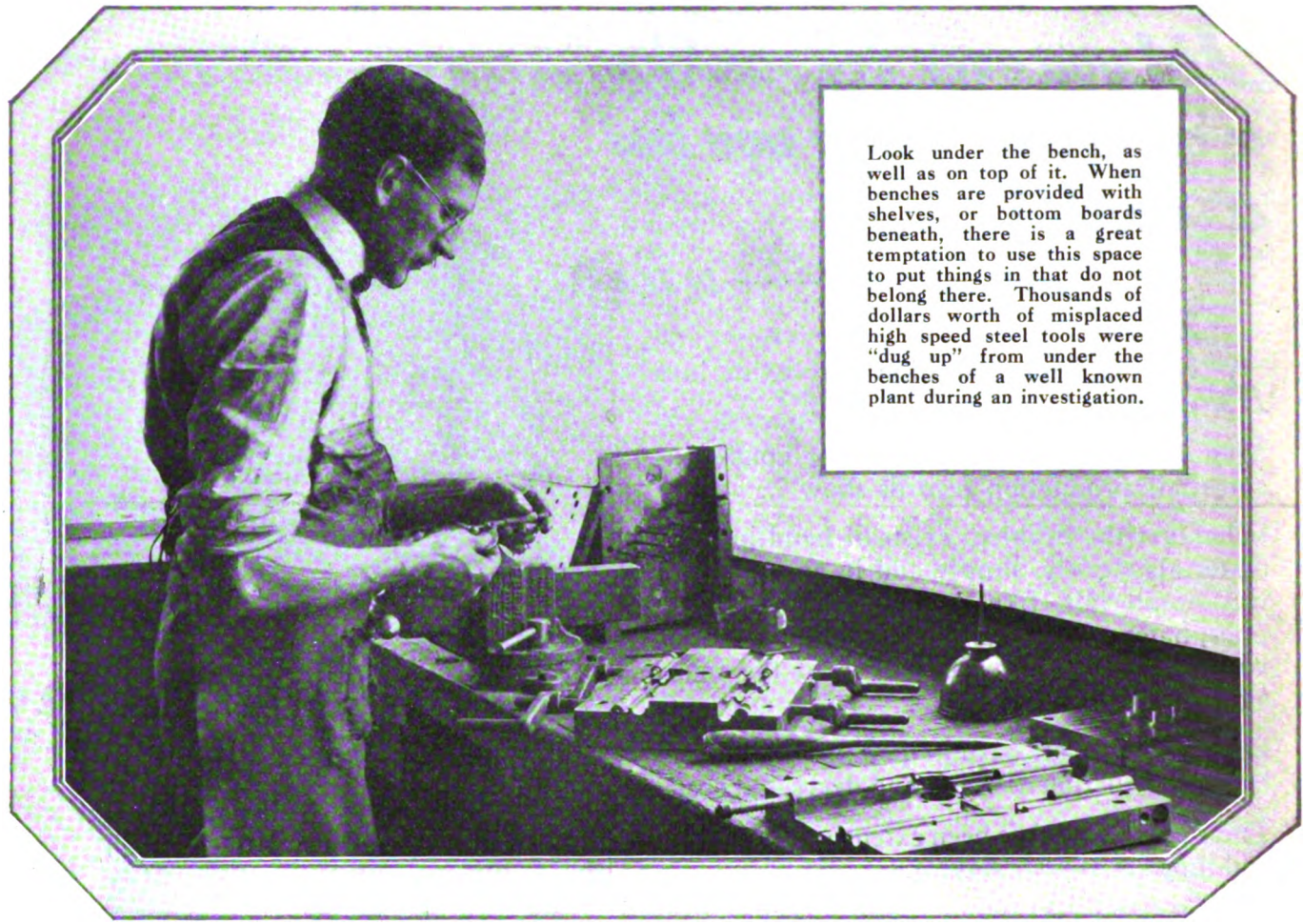
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Look under the bench, as well as on top of it. When benches are provided with shelves, or bottom boards beneath, there is a great temptation to use this space to put things in that do not belong there. Thousands of dollars worth of misplaced high speed steel tools were "dug up" from under the benches of a well known plant during an investigation.

The Little Things That Save Big Losses

Timely Reminders on Maintenance and Methods



Factory roofs cover the world of industry. There are good and bad ones. The good ones last a long time and no one thinks much about them. There is no excuse for a leaky roof staying leaky, except the excuse of bad housekeeping.

An orderly tool crib, provided with a simple tool checking system, is a necessity. It prevents both loss of tools and loss of time. To have to "hunt" for a tool, gage, or appliance, is an indication of bad housekeeping, and wasted effort.





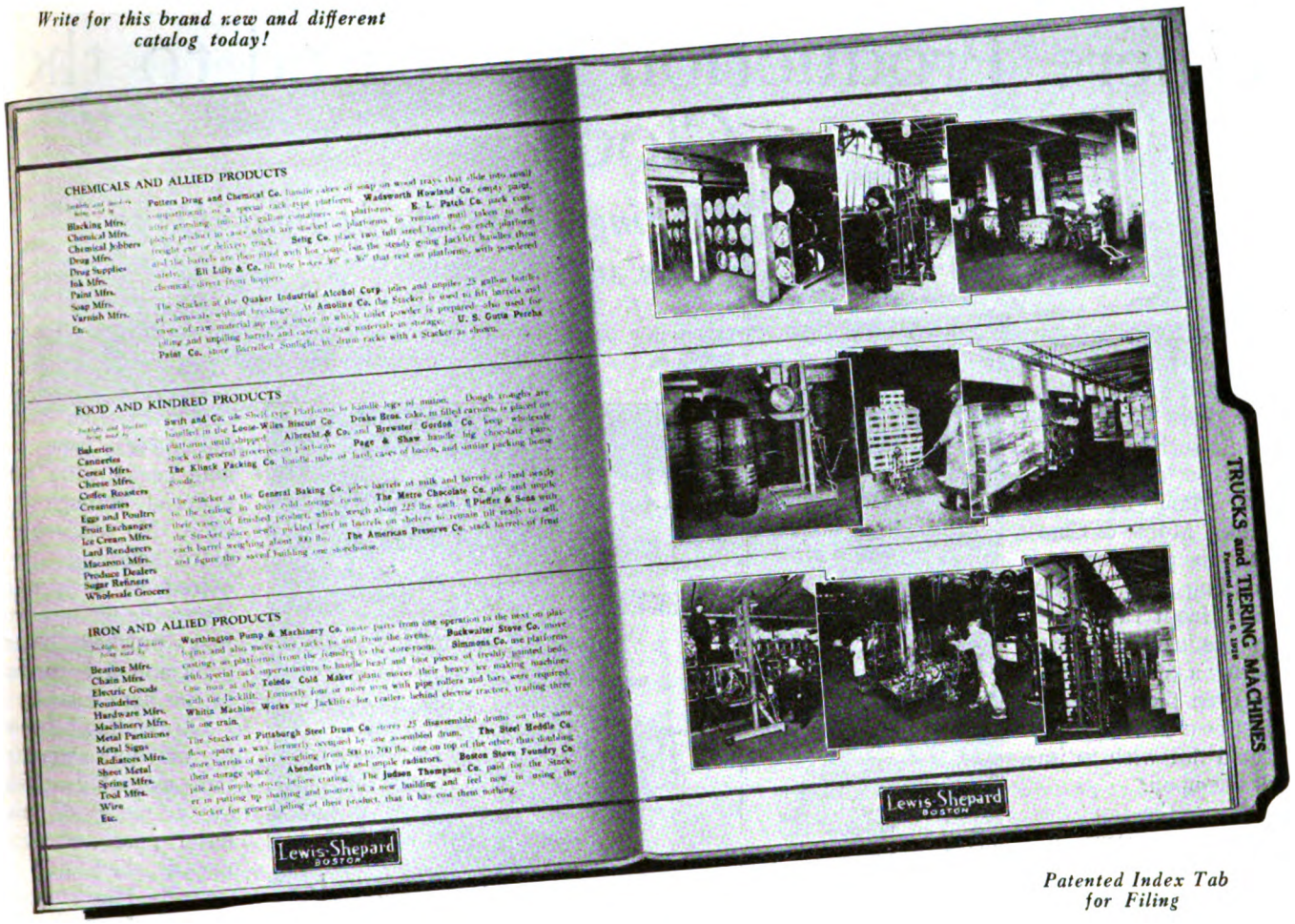
A good gage of management and its housekeeping is to be had through an inspection of the sanitary arrangements. These being kept "out of sight" and off the main thoroughfare, are often neglected where good housekeeping is superficial.

In most states, the law compels certain safeguards against accident. Good management, however, goes further. It safeguards health wherever processes involve a risk; as in spray painting, for example.



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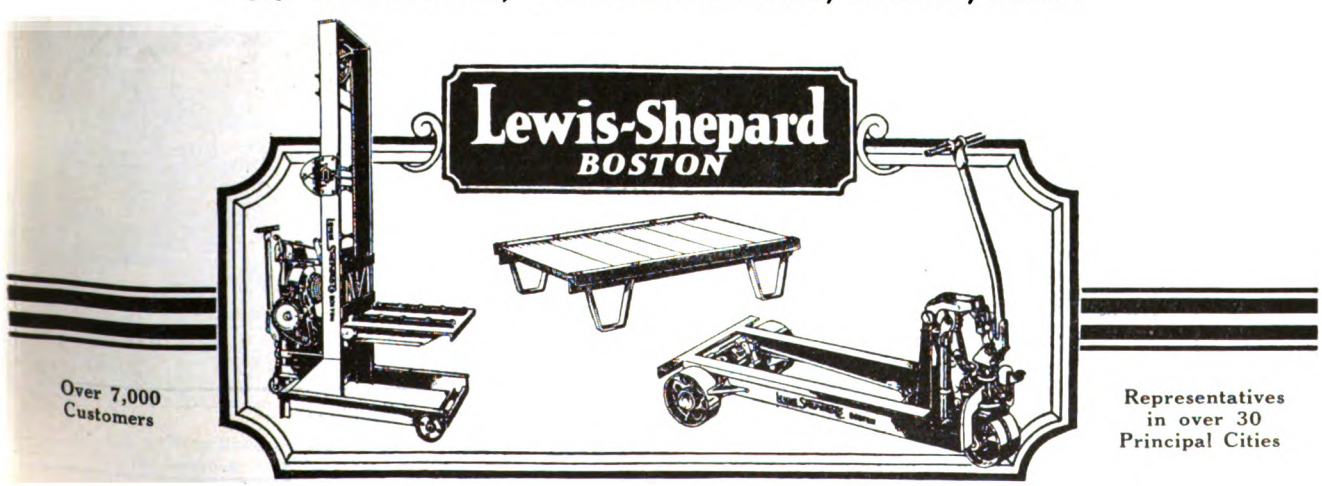
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Where Production Is Geared to the Clock

From Raw Stock to Shipping Platform in Four Days

By L. S. Monroe

FOUR days between the time that the pig iron is delivered to the foundry and the finished engines are packed into box cars for shipment; such is the ideal turnover that the Beloit Plant of Fairbanks, Morse & Company is planning and building for. Four days from raw stock to the shipping platform: a turnover such as even the most ambitious accountant could not wish to improve upon.

From the time that the iron enters the foundry, it is kept moving. As a finished casting it travels at once to the machine shop where it moves from machine to machine, each one working on it and then passing it on to the next until, at the end of the shop, it is ready for the assembly track.

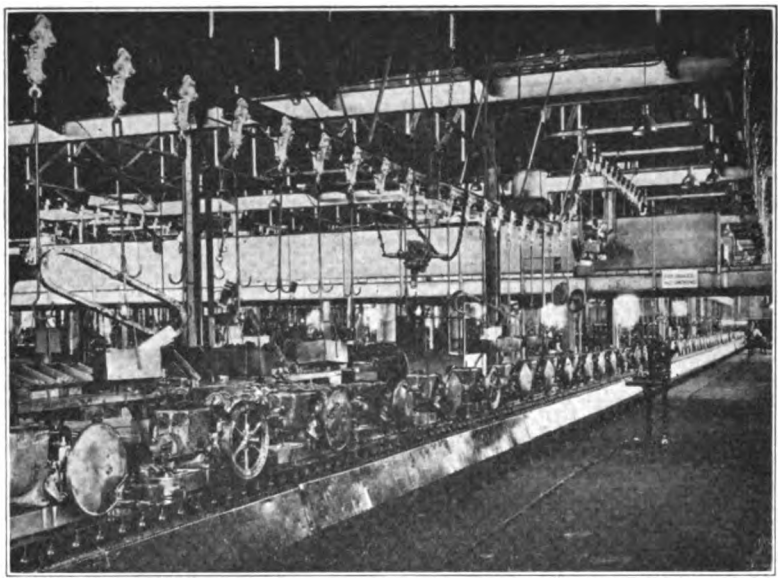


Fig. 1. The erecting line for 2 Hp. engines. A flat conveyor carries the engine, while hooks on the monorail conveyor carry the pieces for assembly. Here, the monorail conveyor has just passed through a stockroom where these parts were placed on the hooks.

Lines of monorail conveyors from which the pieces hang on long hooks, carry this material through the shop. No trucking or extra handling is required as each man places the piece he has just finished on a hook and it is carried to the next machine.

On the line between the machine shop and the assembly track, every piece of material passes through the finished stock room. Here, other lines of conveyors join those carrying the heavy parts from the machine shop and as they pass through the stock room to-

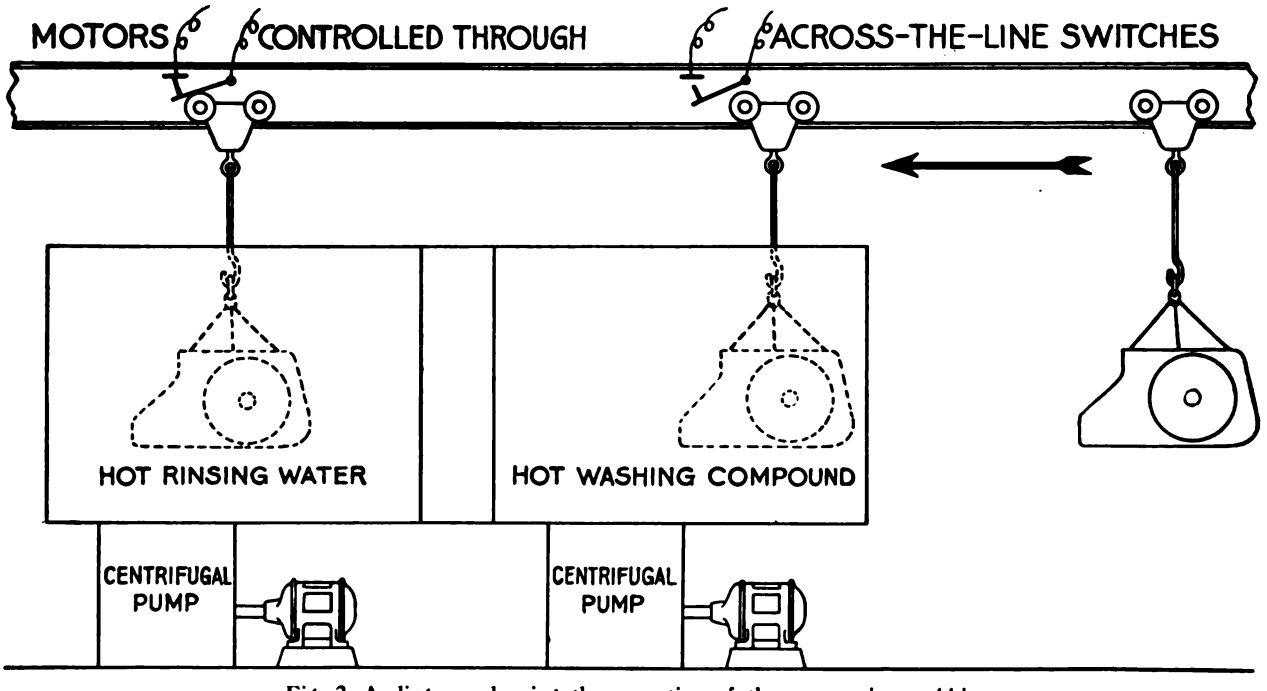


Fig. 2. A diagram showing the operation of the automatic scrubbing booth, where each engine is washed preliminary to painting.

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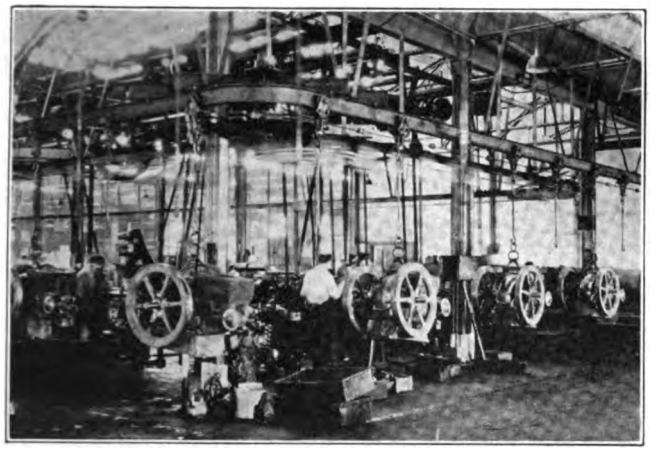


Fig. 3. A turn in the monorail conveyor line carrying 6 Hp. engines.

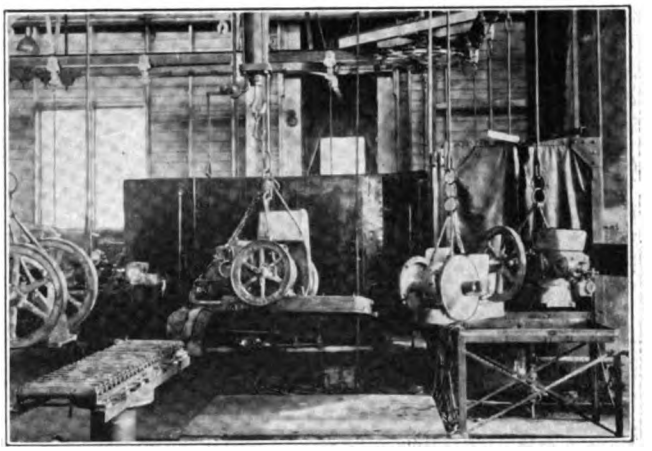


Fig. 4. All of the engines pass through this automatic washing booth. Electric switches on the trolley (see Fig. 2) start and stop two centrifugal pump motors, through across-the-line starters. No attendant is needed here.

gether, the small parts which are to be added on the erecting line are hung on brackets and in trays on the conveyor hooks. In this way, all of the parts reach the assembly line at the proper time.

All of these conveyors are synchronized so that the travel and delivery of materials is exactly timed. On the assembly line, the entire group of parts needed to make up each engine are delivered together and, although everything is moving along from one assembler to the next, when any part is needed it is right within reach.

In line with the policy of making this system extremely flexible, push button control has been provided for every one of the motors used to drive this extensive conveyor system. Across-the-line switches were installed for this push button control and also for protection to the electric motors.

Many novel features have been incorporated in this continuous conveyor which is to run unbroken from the foundry through the machine shops, stock rooms, assembly line, finishing department, final test and crating department to the shipping platform.

Every engine as it comes from the assembly line is covered with grease and oil which must be washed off before it can be painted and enameled. This is done in an automatic washing booth through which the conveyor carries the engines. No operator is required, for, after an engine has entered the booth, the hanger passes switches on the monorail track which supervise the job.

First the hanger strikes a switch to start up an electric motor which drives a small centrifugal pump. This pump throws a regular flood of hot water containing a washing compound over the engine from every direction and continues to do so until that engine has passed out of range. Then the pump stops until another engine passes that point. Farther along in this same booth is another similar outfit which throws boiling hot, clear water to rinse off and hasten the drying of the engines as they leave this automatic scrubber.

After passing those men who paint the engines, this conveyor enters a long oven in which the paint is thoroughly dried. Not to waste a bit of time or floor space, this drying oven adds its bit to the general scheme. Have you ever seen plate glass windows in an enameling oven? This one has two at the point where the oven passes through a stockroom so the stock-keepers can know in advance what engine is coming next. They at once put the fittings to suit that engine on a conveyor which carries these parts to the final assembly where engine and fittings meet and move along together.

Even on the last job, when the engines are being crated, this conveyor still carries the brunt of the labor. For the crates are lifted to the engines and as an assembly the packages travel to the shipping platform where they are packed into cars for shipment.

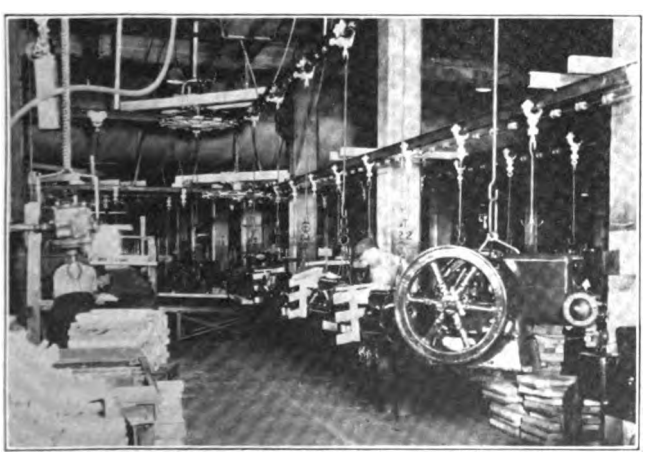


Fig. 5. Note how the crating sections are brought to the engines, which are crated as they move.

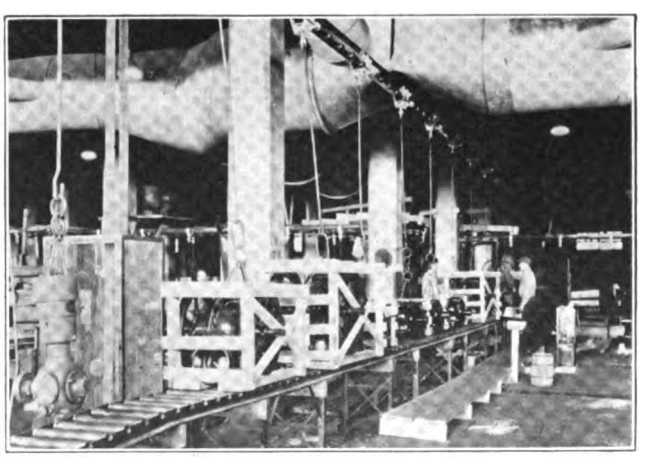
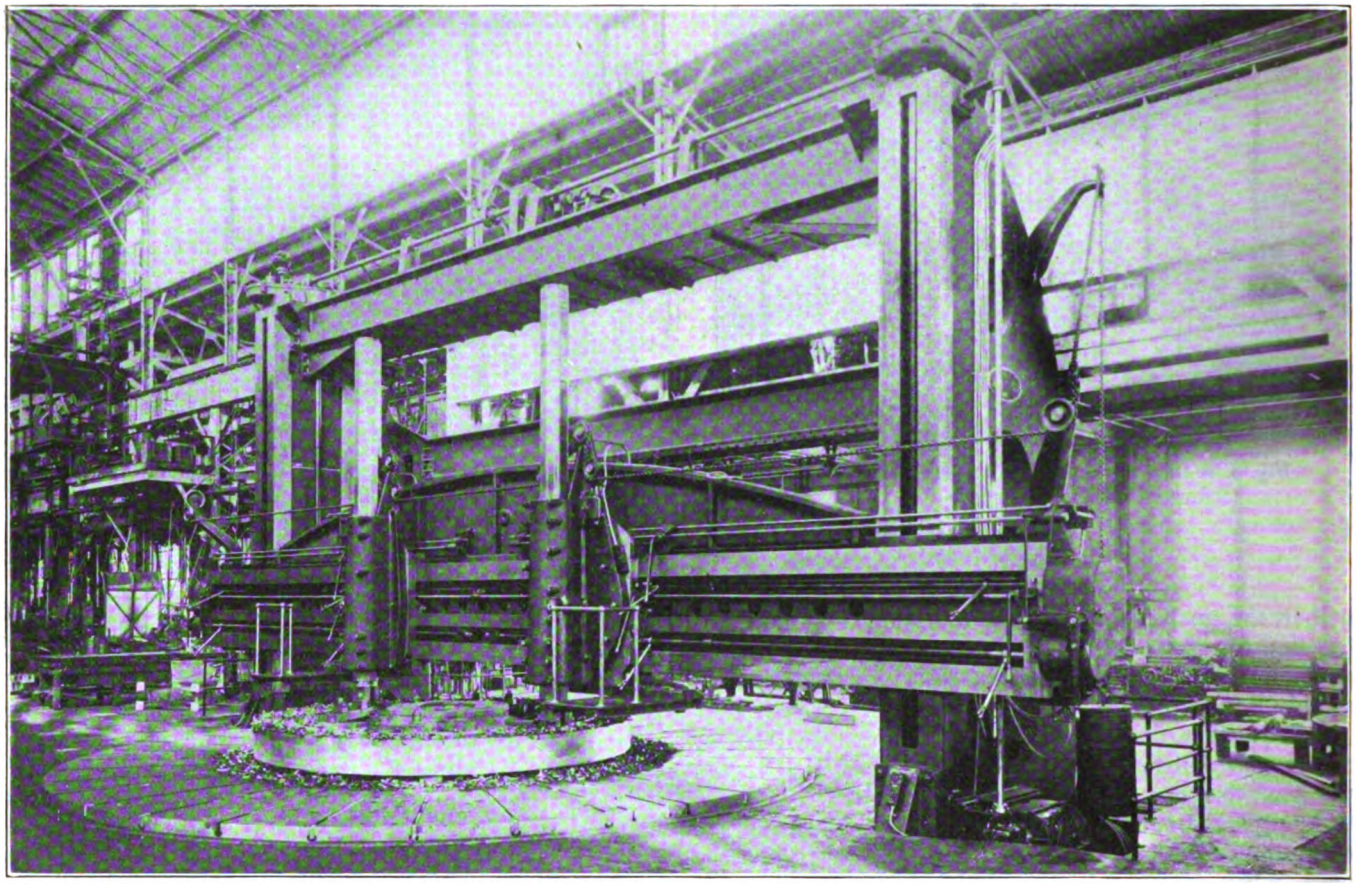


Fig. 6. The crated engines pass on to the shipping platform for loading on the cars.

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Have You a Bigger Boring Mill Than This?

If So, How Do You Figure Its Wages?

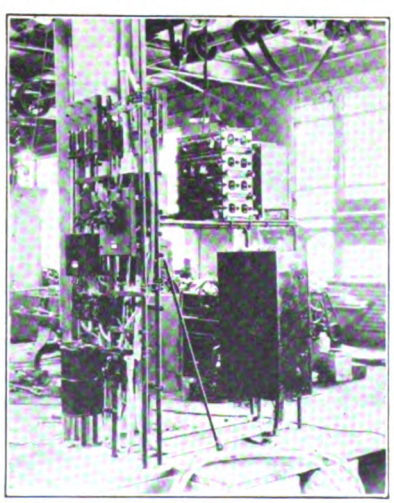
IN the preceding issue of INDUSTRY ILLUSTRATED we described a lathe that ranks with the world's biggest machine tools. This month we have a monster boring mill.

The boring mill in the accompanying illustration was installed about a year ago at the Peterboro plant of the Canadian General Electric Company, Ltd., and is said to be one of the largest machines of its kind in the world. A few of the chief dimensions are:

Actual swing	36 ft. 2 in.
Swing with housings moved back 9 inches	40 ft. 0 in.
Height under tools	12 ft. 0 in.
Table diameter	28 ft. 0 in.
Carrying capacity of table	125 tons.

The weight of the table complete with the table gear and spindle is 110 tons, the weight of the cross rail with saddles, swings and boring bars is 80 tons and the weight of each of the main housings is 26 tons.

Ten motors with an aggregate horsepower rating of approximately 143 horsepower are used on the machine, and, with one exception, standard control devices are used to operate it. A number of special, protective operating features are provided.



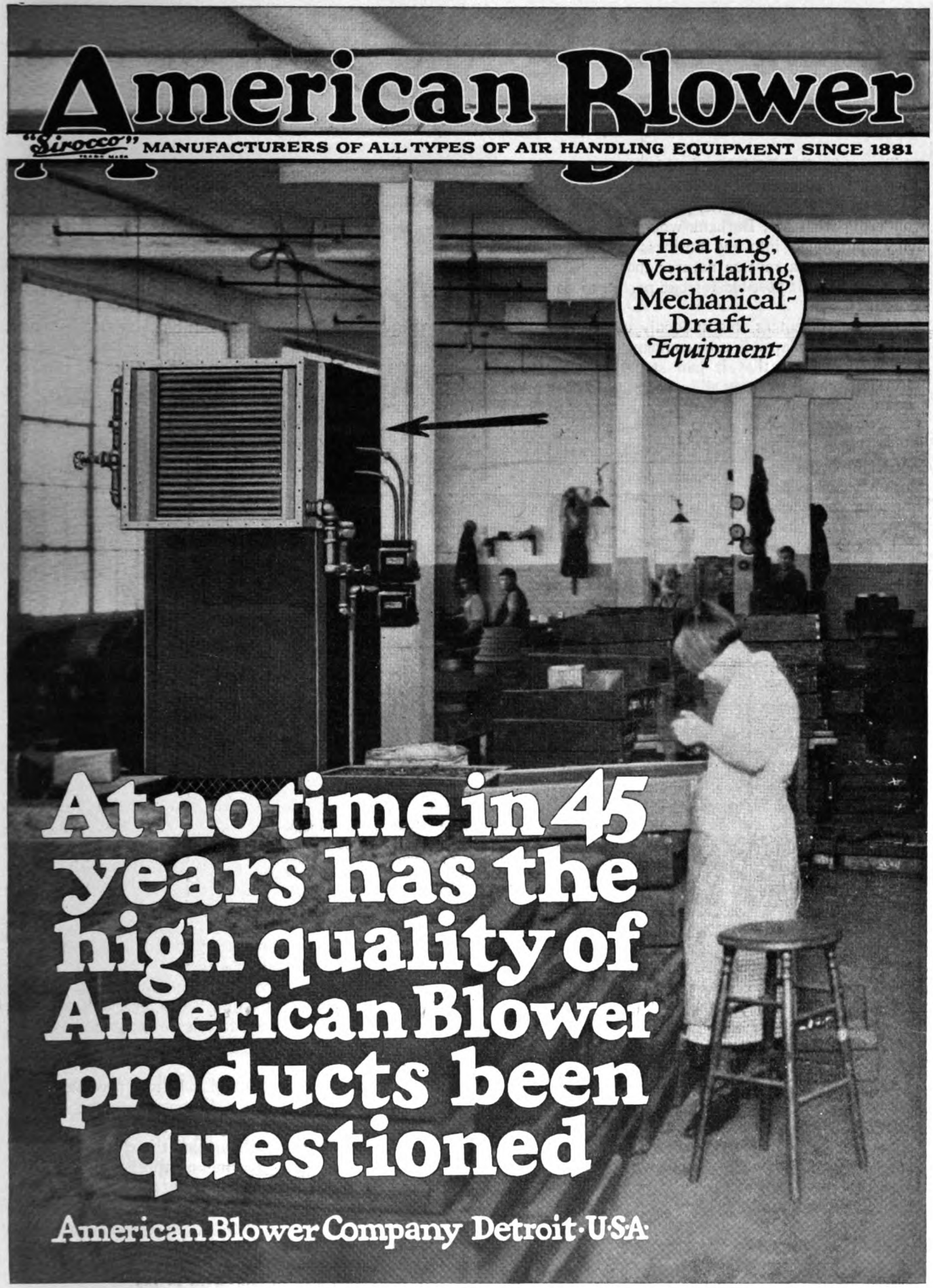
View of control panel for the big boring mill illustrated above, showing magnetic control of motors by push buttons.

Big tools like this are very costly, running into many thousands of dollars. They occupy as much floor space in the shop as perhaps a dozen or more ordinary machine tools. And this particular one probably draws from 75 to 100 horsepower of electric current at full load.

How do you figure the wages of such a machine? It is certainly a mistake to charge against it in computing costs only the wages of the operator, for in the case of such big machinery this is only a minor element of cost. We must consider depreciation, repairs, power, floor space and interest on the investment in calculating the charges per hour which must be assessed on work done on such tools.

Many concerns which employ big production tools of this or other types use the "machine hour" rate in computing the cost of work done on such machines. This rate includes all of the above factors as well as the operator's hourly wage, and is a safeguard against the management fooling itself in the matter of costs.

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Photograph shows one of the units in a typical industrial installation of the American Blower Venturafin Method of Heating

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Making One Do the Work of Four

By Helen Siraff Macdonald
Secretary of the Sun Tube Corp., Hillside, New Jersey

IT was Luther Burbank, was it not, who started the fad of making four potatoes grow where one grew before? Perhaps it was prunes. At any rate, I am wondering what Mr. Burbank would do if he were suddenly summoned into the business world and told to make magic of a reverse nature; that is, to discover a way of making it possible for one person to do the work of four?

Such a problem as this suddenly confronted me one day when the collapsible tube company with which I was associated decided that it had struggled along on an unprofitable basis too long and was going to do something profitable about it or go out of business. Collapsible tubes, as some may not know, are those important containers for such household helps as tooth paste, shaving cream, sardellen, anchovy paste, glue, cold cream and so on and so on,—indiscriminately. It seemed to us that every third manufacturer, along about war time, was a collapsible tube enthusiast; with the result, when the slump came in 1922, that the potential production was considerably greater than the normal consumption and all of us were about to starve to death.

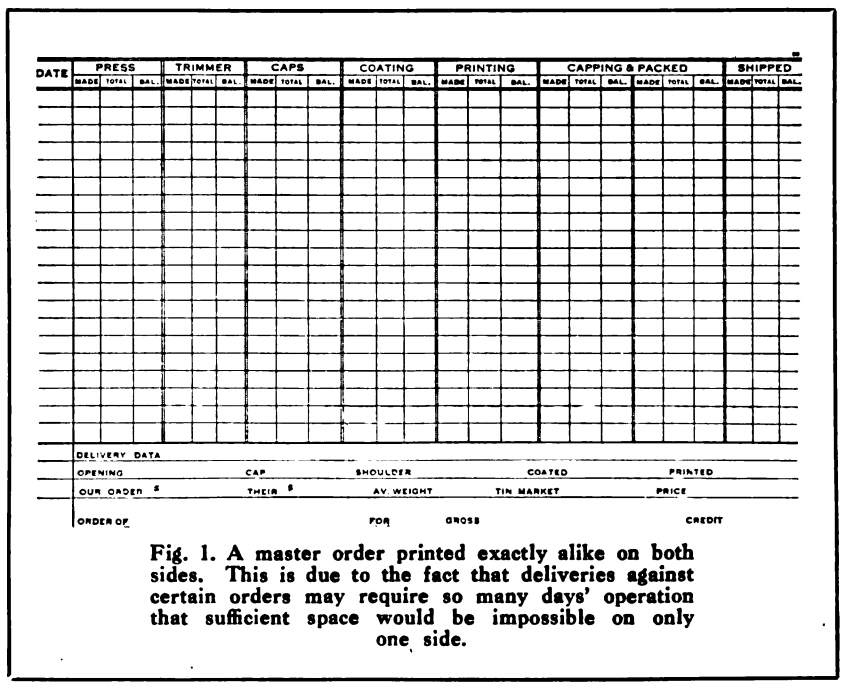


Fig. 1. A master order printed exactly alike on both sides. This is due to the fact that deliveries against certain orders may require so many days' operation that sufficient space would be impossible on only one side.

Well, I didn't have to worry about the manufacturing end of our revolution. Suffice it to say that the company reorganized as the Sun Tube Corporation and that it is now doing four-tenths of the maximum production of the country and shows a continual increase in profits. This, because a group system of manufacturing was adopted which cut down the need of floor space to one-seventh of what it was before; because five workmen are now needed where nine were formerly scarcely enough; the saving in shrinkage is now one against the old method of eight; inventories are relatively two to the old method of fifteen and so on. The new method permits us to turn over our capital approximately four times a year, whereas our most efficient competitor turns his approximately one and four-tenths times.

The organization of office control at this time was up to me and I took a leaf from our mechanical development and planned for accuracy, simplicity and minimum personnel.

Under the old regime, sales letters were written, salesmen's reports were recorded, advertisements were keyed and analyzed, income orders were recorded, and incidental systems kept operative, taking the full capacity of Girl Number One.

On the receiving of orders, the master order was made out with the customer's name, kind of tube and style, the material required, style of decorating, style of packing and delivery required, prepared on one side of the order. The reverse side carried space for the crediting of deliveries as fast as they were invoiced. Partial duplications of this order were made out under separate forms for manufacturing department, capping department, cost department, decorating department, and shipping department. This with the checking of these separate orders, when issued, and the keying of their identity kept Girl Number Two occupied.

The third girl operated a control board of goods in process, perpetual inventory of metal and material, payroll records for day, piece and bonus methods, stop orders on goods manufactured, and the preparation of records for monthly inventory, preparatory to the issuance of a monthly audit. This department functioned continuously and Girl Number Three was kept extremely busy.

Girl Number Four checked weights of tubes periodically invoiced goods, helped on books, checked receiving and delivery records, filed, took care of some overflow correspondence, and managed to keep busy on her numerous tasks.

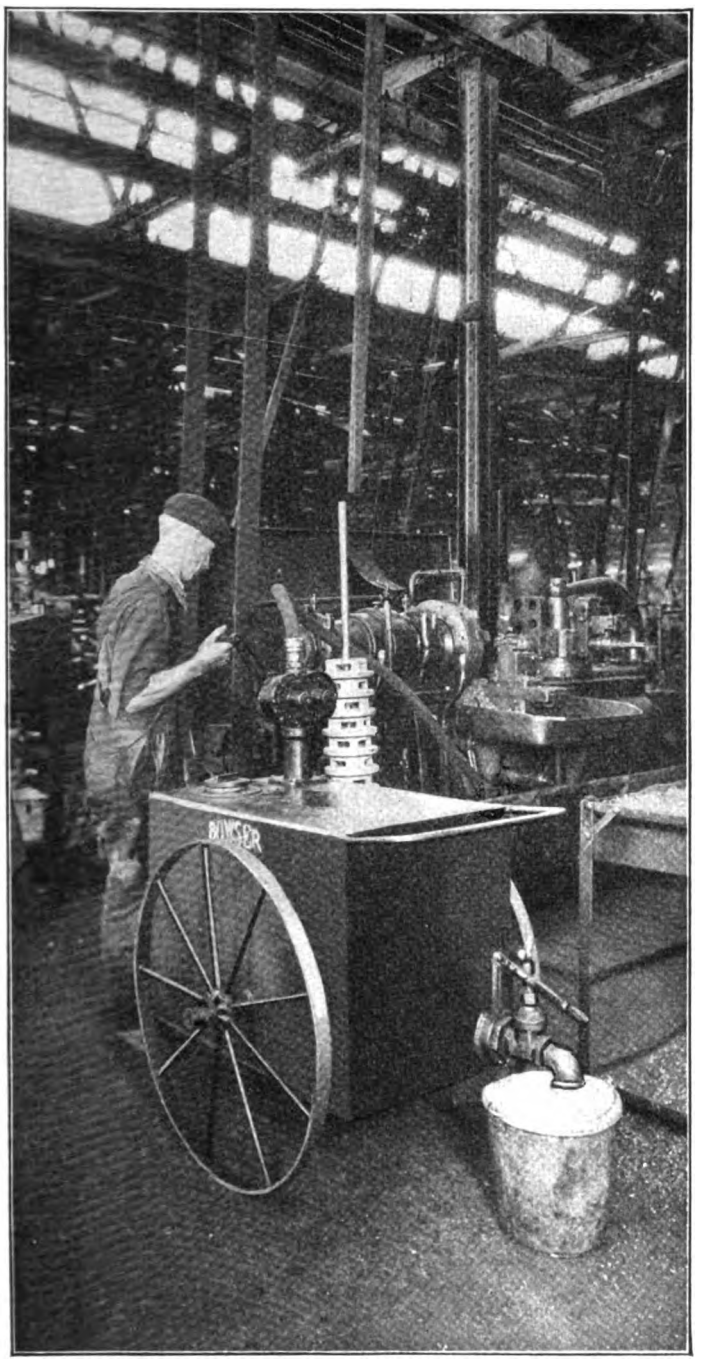
Under rush conditions, more help was necessary, and you can draw your own conclusions as to the lack of responsibility with so many people handling the details of an order. Also, considering that the chief raw material used in the manufacturing of tubes, tin, carries a valuation of approximately sixty cents a pound, it is important that all materials balance and direct responsibility for records is necessary.

Obviously, the operation of this system was expensive; there was a great liability to error, and the training of the personnel was an important factor.

I analyzed the conditions as to where we could im-

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In Detroit, Bowser is extremely well-known because of its service to the automotive industry —Chrysler, as this picture shows, depending on a reliable unit for lubricating a great battery of automatic machines.

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prove methods in the development of a new system, how to cut, and how deeply. The decision was reached and here we are:

My operative office equipment is: a billing machine, the typewriting of which is used for ordinary correspondence. This is situated to the left of a steel desk. The left hand drawers of this desk are two in card index size and the right hand drawer is of file size. On the right hand top of the desk is a visible index, twelve drawer type. On the left hand top of the desk is an adding machine, and also an electric calculator. Steel files are to the rear of the desk, as is a change-making machine. This layout makes it possible to use all the equipment in the office with the least possible effort.

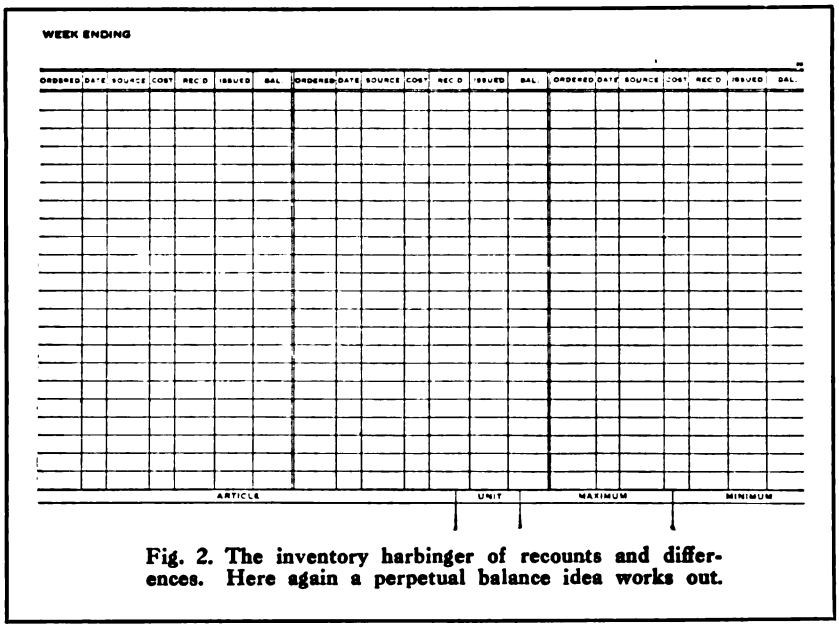


Fig. 2. The inventory harbinger of recounts and differences. Here again a perpetual balance idea works out.

As for system, how does this sound?

An order is received, acknowledged, passed on for credit and entered and here is the way it is taken care of:

The master order carries full description, price and shipping directions, and when the order is in production shows complete progress of daily production and a perpetual balance for each department. This eliminates the necessity for department head conferences, and eliminates the necessity, also, for any record outside the office. Here, right at your finger tips, is the complete history of the order from press to finished packing case—simple, effective, accurate, easily checked and kept up with a few minutes' attention at the beginning of each working day, at which time each department head lays on my desk his production for the previous day. If he wishes to know how many more days he has to run, a flip of the finger discloses the proper card in my index cabinet, and the perpetual balance is there under its proper heading, ever up-to-date, easily discovered and always accurate.

This eliminates manufacturing orders in duplication, shipping orders in triplicate, decorating orders in duplicate with their kindred confusion and duplicated effort. They are all in the discard, and in their place is a factory memorandum advising of the receipt of an order, carrying full description and particulars, with details carefully listed—a copy for each department head made with one operation of the fan-fold—and that is that.

Do we want to know our daily, weekly or monthly production? This information is visible on this form, and by carrying totals in each daily column instead of on individual orders, it is available at all times. The process is the same and the hours of summarizing at the end-of-the-month rush are saved when preparing for inventory.

Next on our list of reforms is the inventory (Fig. 2), harbinger of recounts and differences. Here again a perpetual balance idea works out. With the fundamental principle already worked out, it is a simple matter to draw up a form with the necessary columns to prove all relative data, and the sample shows its effectiveness more easily than written words. This record is supplemented by a withdrawal slip which is signed and recorded at the time the material is removed from the store-room.

The same principle as exercised with variations in the problems listed above is applicable to any number of ideas. For instance, since production figures are constantly available and the payroll for labor made up weekly, a weekly direct and indirect labor cost per gross is figured without much effort. This proves invaluable towards checking any apparent rise in cost before the difficulty becomes serious. We figure our costs weekly, and audit our books monthly, and the budgetary control of our weekly influences is very instructive on the monthly analysis. Fig. 3 shows the relation of labor items to the sales value reduced to a cost per gross budgetary basis.

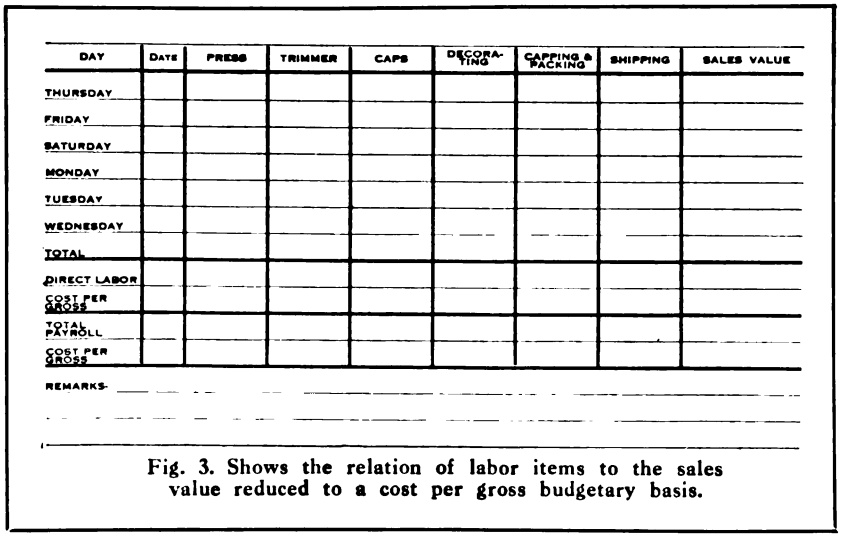
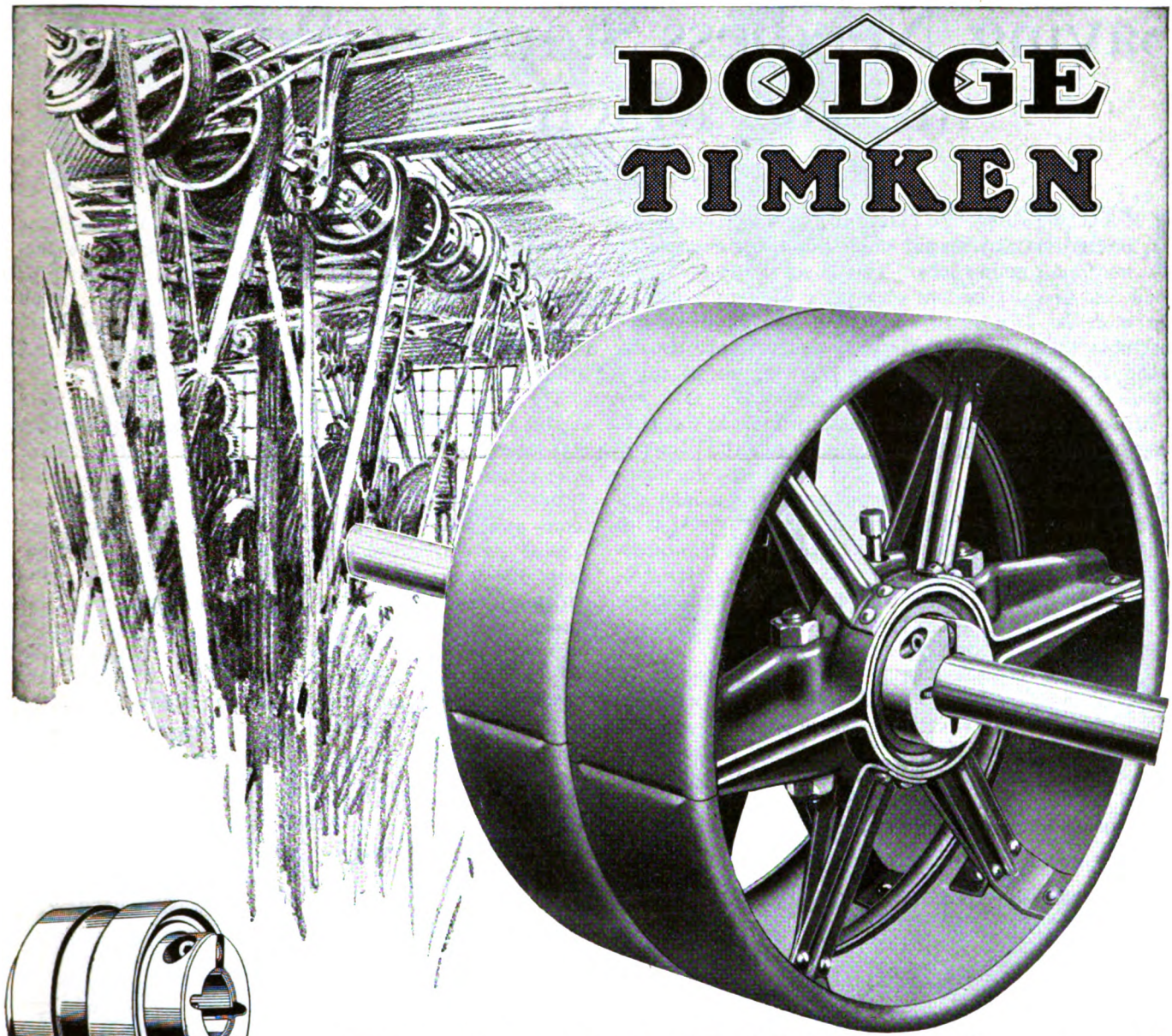


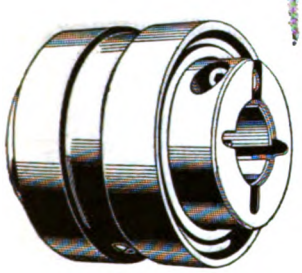
Fig. 3. Shows the relation of labor items to the sales value reduced to a cost per gross budgetary basis.

By simplifying records as above, it is possible for one person to take care of the entire system, answer all correspondence, maintain the bookkeeping records preparatory to audit, take care of the invoicing and be able to know just exactly what is going on.

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DODGE TIMKEN

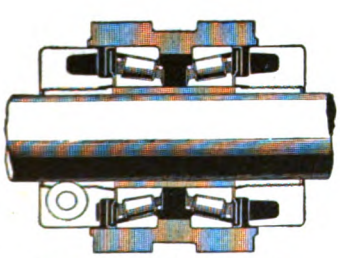




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Rugged-Well lubricated Trouble free

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Sectional view of unit mounting, showing Timken bearings and special grease seals which positively prevent dust from working in or lubricant working out. The lubricating feed pipe is easily accessible through a hole in the pulley hub.

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POWER TRANSMITTING — ELEVATING — CONVEYING AND SPECIAL MACHINERY

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Saving Needless Steps by Rearranging the Machine Tools

By Donald A. Hampson

IN machine shops, the planer hands walk further per piece of work than any other employees engaged on machine running jobs. This is so, partly because a good deal of work is done on a piece while on a planer, but more so because of the length and width of the machines themselves and the fact that cuts are usually made on three faces by heads traveling in as many planes.

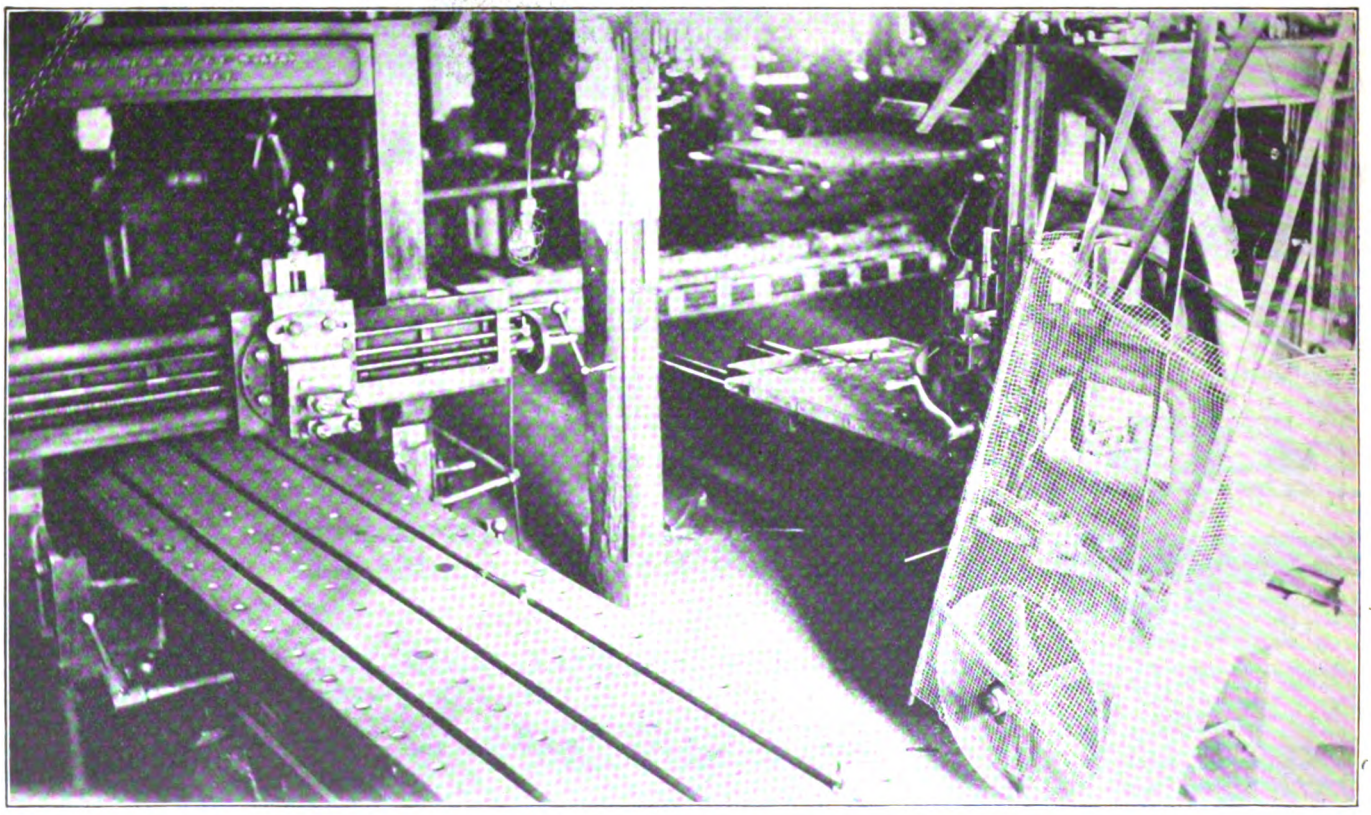
Modern working conditions usually include the running of more than one machine and to this the planer is no exception. From the above review, it may be imagined that the running of two planers keeps a man extremely busy. To go from the operating side of one to the corresponding side of the other involves a trip three-fourths of the way around any one machine. It is always necessary to go to the working side of the machine in going back from a trip because planers are not made right and left handed in their controls.

A machine shop was installing two planers—one a 40″ x 14′ and the other a 54″ x 8′—and they were casting about for a way in which to conserve the energy of the man who was to run them. It will be seen that a trip from one to the other when arranged conventionally would call for about the same number of steps, one machine being long and narrow and the other short and wide.

The illustration shows how the machines were set up. We are used to looking down a room and seeing planers arranged tandem-parallel in the center bay of a shop or else set in parallel rows all facing the windows or an aisle. These conventional arrangements mean a great deal of walking. But these people reversed one planer, bringing the operating sides together.

The problem was complicated because there were square wooden columns supporting the roof, placed on 8 ft. centers. It was impossible to dodge these with the long planer and leave aisle room where wanted, which meant that the machine would have to go between columns and still leave working space or the equivalent. Actually, the reversed arrangement assisted in this because the long planer's cross rail filled practically the entire width, while leaving the handles, etc., in a convenient position and then, by setting the other planer back two feet, the workman could stand between the two handles diagonally and have both under his control.

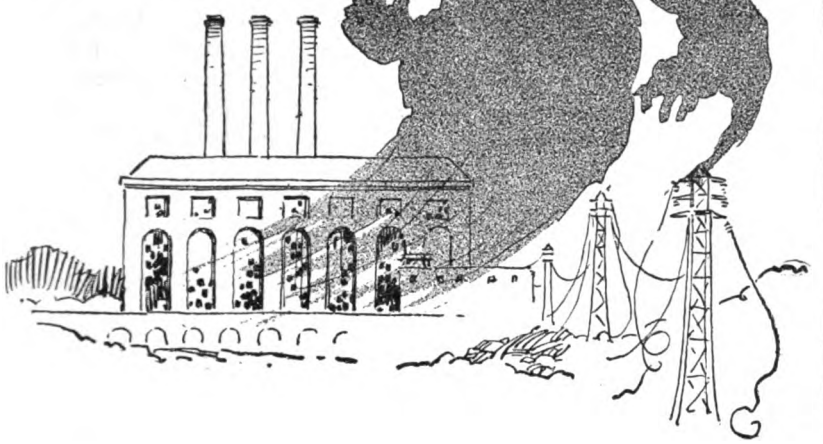
After some years of daily use, this plan has yet to be assailed. During that time, it has been estimated that their workmen have been saved over 1,300 miles of unnecessary walking by having these planers as shown. This estimate is based upon the actual movements that have to be made in carrying on the work and its net represents a startling saving in energy conserved.



This shop was installing two planers, to be run by one man. By reversing the position of one planer, the operating sides were brought together. Note the wooden building column, which complicated the problem a bit.

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The Haunted Power House



The Grey Ghost haunts every power house, little or big. He lurks menacingly in every boiler room. Workmen despise him. Getting rid of him is a dead expense.

The Grey Ghost rides in with the jolly old Coal. You don't see him tumbling out of the car, or in the track hoppers. You can't locate him in the conveyors, the bins or the weigh larries. For the Grey Ghost is a spawn of the devil and is only waiting to be born in the fire and get into the ash pit. The Grey Ghost is the ashes that come from merry Old King Coal.

When you think you have him trapped in the ash pit the trouble commences. Try to get him out of there without his whirling all over the plant choking the working men, getting into the machinery and stinking the whole place up with brimstone.

Getting the hot wet Grey Ghost, with his corrosive sulphur content and abrasive ash out of the plant at the least expense is a job for experts.

The Rex Engineers are regular Ghost-Breakers and have the bag of tricks that are needed to lay the Grey Ghost. A letter will set them at him in your plant.

REX CONVEYORS

CHAIN BELT COMPANY

711 Park Street *Milwaukee, Wis.*

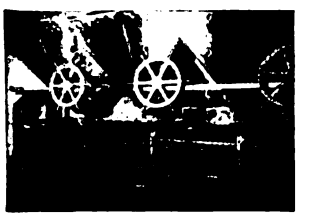




When "40 ways" beat hand labor, *which way is "best"?*

Almost any method of mechanical handling of coal and ash ought to show a distinct cost advantage over handling the same materials by hand.

This back-breaking job is one that machinery can do better and cheaper than men. Buckets and weigh larries beat scoops and wheelbarrows.



Rex Cast Iron Pan Conveyors in the plant of the Indiana-Michigan Electric Co., South Bend, Ind.

There are at least 40 distinct methods of mechanical handling of coal and ash, not mentioning the various combinations of these methods.

Among these forty methods, there is not one that any builder, user, or engineer can say is the best way.

The most any of them could say is, "best for a particular job."

Our engineering and field forces have been trained to work out the coal and ash handling systems that are best for a particular job.

The coupon below will bring you our bulletin, the "Conveyor," that shows some Rex ways of Coal and Ash handling.

COUPON

CHAIN BELT COMPANY
711 Park Street
Milwaukee, Wisconsin

Please send me the Conveyor for Old King Coal and the Grey Ghost.

Name.....

Address.....

City.....

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The Pitcher and the Light-Well

Some Golf Balls That Didn't Fly Straight

By Chester Lyndelle

DAVID BLANDING was luxuriating in the rush of the train northward across Ohio and mentally checking over the items in his camping outfit when the Pullman porter apologetically tapped him on the shoulder.

"Tel'gram, suh," he offered, hovering nearby as he pocketed Blanding's quarter. "Hope it ain't bad news, suh."

The young man read the message curiously:

"Been bragging about you. Make good and save my face. Money no object. Wire when coming. Golf balls. Signed, Crossley."

Fifteen minutes later a badly puzzled porter stood in the vestibule trying to comprehend the message he held in his hand.

"You hit the bump. No objection to money either. Arrive to-morrow afternoon. No golfer. Signed, Blanding."

Blanding found Crossley in his office, and with him a gray little man with nervous hands.

"This is Mr. Spencer, inventor of the Spencer 'Thruflite' golf ball," Crossley began. "He makes the agile little pill that keeps us old duffers guessing as we try to keep up with it and sometimes even gets its maker puzzled, eh, Henry?"

Henry Spencer steadied the twitching hands by clasping them tightly around one bony knee.

"It's unbelievable," he stated, slowly. "And to have it happen with the Shropshire Country Club, of all the places I've been trying to introduce the 'Thruflite'—"

"Better begin at the beginning, Henry," Crossley broke in. "Mr. Blanding knows nothing of your difficulties."

Thus admonished, the little man told his story, with many digressions. For a number of years he had been making and selling golf balls in a small way, gradually building up a clientele among individual golfers. Only the year before he had taken a larger factory and at the same time had begun a campaign among the more influential golf clubs. Of these last there had come an order for the season's requirements from the Shropshire management—a contract carrying a fair profit, together with advertising and publicity worth many times the actual cash involved in the sale. Trials had been held, specimen balls inspected and passed as satisfactory, and the entire shipment made by motor truck direct from the factory warehouse to the club.

In some manner as yet inexplicable, something had happened to part of the shipment. Instead of each box containing two dozen perfect "Thruflites," each nestling cozily in its tissue-padded compartment, some of the boxes had held as high as eighteen "rejects," balls which had failed to pass the factory inspection and in many instances rough hunks of compounded rubber had supplanted the finished product.

Blanding interrupted the narrative to ask a question.

"Was this shipment inspected before it left the factory, Mr. Spencer?"

"Yes, and no," the manufacturer parried. "A part of our success lies in a secret seasoning, or ageing, of the 'Thruflites.' Following the final inspection and after painting, the balls are wrapped in tissue paper, packed twenty-four to a box, and stored in our cellar under predetermined temperature and moisture conditions for a specified period of time. The boxes shipped to the Shropshire Club were taken from stock, and only a few balls from the upper tier of boxes examined. They were all perfect."

"You have no suspicions? Could the substitution have been engineered by a competitor?"

"No, to both your questions," Spencer replied. "I had a little trouble with some other makers regarding our tests, but they could not have changed the shipment."

"Then it must have been an inside job," Blanding pursued. "As I see it, there are three possible points of attack: while the balls are being packed for inspection; during storage; and in the truck en route to the Shropshire Club. Have you any of the rejected shipment here?"

Henry Spencer steadied his hands long enough to unwrap a package.

"This is one of the boxes, just as it came back to us from the club."

Blanding picked out one of the lumps of compounded rubber and squeezed it between thumb and forefinger; then dropped it to the floor.

"I'm not a rubber expert," he observed, "but I'd say that bit hasn't been more than a few days out of the mixing mill, to judge by the feel. It's too soft to have stood very long—am I right, Mr. Spencer?"

The little man took time to unwrap one of the bits of rubber and examine it for himself.

"I've been in the business for upwards of twenty years and I didn't think of that," he admitted. "That seems to eliminate inspection and packing—and the truck."

"The first, but not necessarily the latter," Blanding qualified. "It would not have been a difficult matter to take along some fresh rubber in the truck, and make the substitution on the road. Whoever engineered the job realized that the boxes must weigh about right or the club steward would note the discrepancy at the time of unloading."

"Think you can do Henry any good, Blanding?" Crossley asked. "I bet him an even hundred dollars you could, and I'll just add that amount to his check if you can."

"I'm no gumshoe artist, Mr. Crossley," Blanding demurred, "but if Mr. Spencer will arrange to take me through his place tomorrow as a prospective customer, I'll look the ground over and see what I can do."

The plant inspection helped little toward a solution of the problem. Final inspection and packing of the "Thruflites" took place on the street side of the third floor, but the crowded condition of the department, together with the constantly passing traffic below, rendered it improb-

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Note: The *new* "Hallowell" home work bench (shipped knocked down in 3 packages) is the thing you've been wanting for your own home.

***Standard* PRESSED STEEL Co.**

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Mercury

[This is No. 4 of a series]



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This careful selection and wise application is the province of you men who are making it your sole business to reduce the production costs of your respective establishments.

However, we do contend—and this contention is supported by thousands of satisfied Mercury users—that for the *horizontal movement* of goods—(and this movement is common to all factories and comprises 90% of all handling)—no method can approach in efficiency and low cost a well planned and properly supervised *tractor-trailer system.*

Mercury makes a complete line of tractors and trailers. Our sales engineers are, by ability and experience, fitted to be of real help to you in selecting the right equipment.

Mercury Manufacturing Company
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Tractors and Trailers

able that any worker would risk smuggling balls from there.

Leaving the inspection department the balls went directly to the basement for the ageing process. Here the boxes were stored on racks in a dark, but dry, cellar, electrically lighted save for a light-well at the farther end. This boarded-in space sloped upward and outward at an angle of forty-five degrees to an enclosed courtyard—much like an overgrown coal-chute—and closed by a swinging window. At the back of the courtyard ran a solid ten-foot brick wall, enclosing the site.

"What's beyond the wall, Mr. Spencer?" Blanding asked.

"A fifteen-foot alley, then a high board fence and the back yards of the houses on the next street. Why? Did you think our loss was through here and over the fence?"

"Possibly."

The manufacturer shook his head.

"We haven't been idle. The day after the shipment came back from the Shropshire Club my superintendent and I went over each box in the room and culled every fake from the lot. On two surprise visits since then we have found fresh substitutions. The thievery is still going on. And for a week I have had the exits guarded, have all but searched every employe, and have had a man on duty out here in the alley. It would be impossible for a man to smuggle anything over the wall without being caught."

"I'm afraid it's going to be necessary for you to have an immediate audit of your books, Mr. Spencer," Blanding stated, with apparent irrelevance. "Your office is on the top floor, and my having work to do on your books will give an ostensible reason for being in the building at all hours. Can you square it with your bookkeeper? I'll try to arrange it so I can come in as your office force leaves, and thus work without disrupting your routine."

There was a vague familiarity in the face of the watchman who paused on each of his hourly visits to scowl suspiciously at the man on the books and to frown disapprovingly at the wide-open vault doors. After the third round the haunting resemblance so impressed Blanding that he looked through the time book for the watchman's name and, with that as a starter, fished out his employment record.

"Jacob Schlamm," he mused, reading the data aloud, "age twenty-nine, unmarried, references good, eighteen months as floor man before requesting job as watchman, clear record, reliable. Residence, 1234 Pearl Street." And in a footnote: "Disqualified for skilled labor by stiff right elbow."

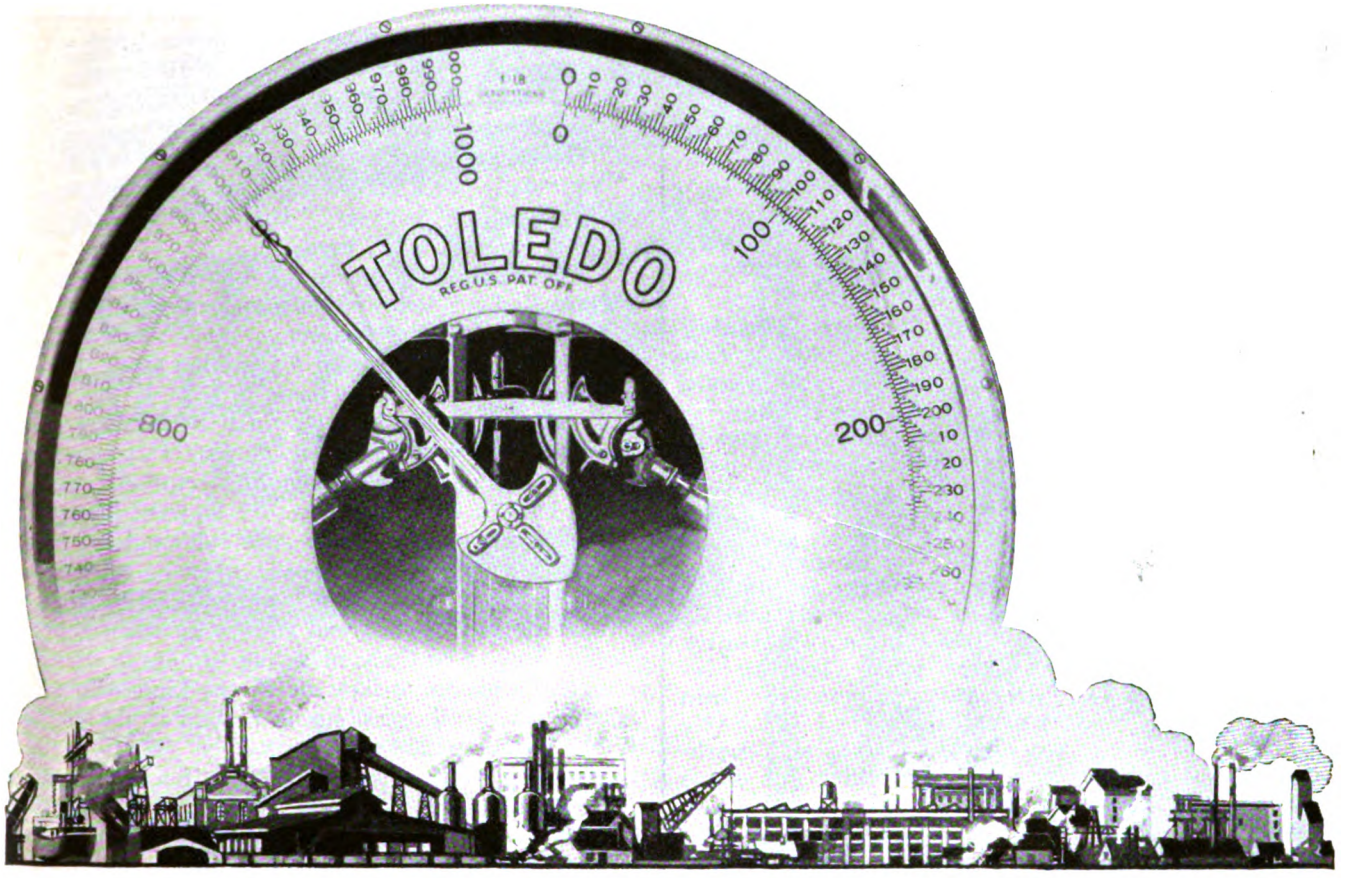
At the Pearl Street transfer point the next morning Schlamm turned angrily to demand of a grease-smudged mechanic: "Who in th' hell yuh think ye'r pushin' anyway?"

The man showed a set of white teeth in an ingratiating grin and returned: "Parrdon, M'sieu. Je ne spik pas z' Eengleesh."

And when both had found seats there was apparent verification of the smut-faced one's apology to be found in the creased French newspaper he began reading.

Three mornings in succession the smutty-visaged man with the Parisian accent fought his way into the trolley alongside the burly Schlamm, and on the third morning found an available seat adjacent that of the watchman. Both lost themselves in their newspapers, but had Schlamm had eyes for other than the sporting page he

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The Modern Plant Needs the Modern Scale

HAVE you modernized production departments, but let the old scales remain?

Unless your scales are speedy and automatically avoid human and mechanical error, all your other plant equipment is rendered less efficient.

The materials handled in and out of your plant, and between departments, pass over scales.

A slow scale retards conveying, handling and transportation systems. An inaccurate scale causes incorrect figures of production from automatic machines, errors in the computation of piece work, errors in issuing parts for assembly, incorrect billings, wrong inventory totals, and unexplained losses requiring inventory adjustments.

Toledo Scales are providing high-speed, automatic accuracy in thousands of the most modern plants in America. A Toledo Scale man stands ready to show you what Toledo Scales will do to improve and safeguard your entire operation. Your request for further information will be given prompt attention and will not obligate you to buy. Kindly address Industrial Department, Section U.



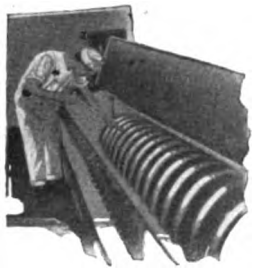
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Cleaning Locomotive Parts.



Cleaning Freight Cars.



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If you are crowded for time in cleaning—

IF your present cleaning practices are not as fast and efficient as you would want them to be—if they restrict and retard the steady flow of goods through your plant, here is a suggestion that may help you.

Call in our service man in your locality. Explain to him the difficulty you are encountering. Give him an opportunity to study your cleaning requirements. Then let him demonstrate what Oakite cleaning materials and methods will do under the same conditions.

Based on our 17 years' experience helping more than 18,000 concerns to eliminate wastes, cut costs, and speed up cleaning, it is reasonable to assume that we also can be of service to you. A request to have our nearest representative call involves no expense or obligation.

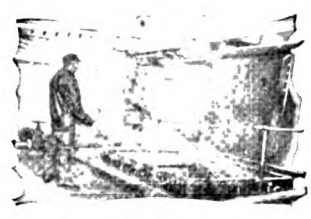
Oakite Service Men, cleaning specialists, are located at:—

Albany, Allentown, Pa., *Atlanta, Ga., Baltimore, Boston, Bridgeport, *Brooklyn, Buffalo, Camden, Charlotte, N. C., *Chicago, *Cincinnati, *Cleveland, *Dallas, *Davenport, Dayton, *Denver, *Des Moines, *Detroit, Erie, Flint, Mich., Grand Rapids, Harrisburg, Hartford, *Indianapolis, *Kansas City, *Los Angeles, *Milwaukee, *Minneapolis, *Montreal, Newark, New Haven, *New York, *Oakland, Cal., Peoria, Philadelphia, Pittsburgh, Portland, Me., *Portland, Ore., Providence, Reading, Rochester, Rockford, Rock Island, *San Francisco, *Seattle, *St. Louis, Syracuse, Toledo, *Toronto, Utica, *Vancouver, B. C., Williamsport, Pa., Worcester.

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Industrial Cleaning Materials and Methods

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might have observed the other as he cleverly exchanged lunchboxes—a substitution which was rectified after a quick search had revealed nothing out of the way in its contents.

That same afternoon David Blanding was closeted with Henry Spencer.

"Your daily check shows a loss of from two to three dozen 'Thruflites,' you say?" Blanding repeated.

Spencer nodded.

"I am sure the day force can not have taken them," he averred. "I have followed your suggestion and had the stock clerk and the trucker put on other work, and they have not had an opportunity for making away with one ball, let alone two score of them."

"I've managed to give your man Schlamm a pretty thorough going-over every morning as I crowded into the street car with him," Blanding returned, "and he hasn't carried a thing with him. I even went through his lunch-box this morning to be sure—although I knew it was empty by the sound it made when he set it down. That police dog he takes on his rounds with him is so confounded keen-scented and suspicious it is out of the question for me to think of trying to hide in the cellar at night. Schlamm strikes me as the kind who would shoot first and ask questions afterward if the dog unearthed anyone in the plant."

The factory owner permitted himself a wintry smile.

"Crossley wanted to wager you would be trying to trace my loss to the watchman. Personally, *I believe* Schlamm has the right idea—to be exact, he receives five dollars additional each pay for keeping his dog here."

"Then I've got to outguess the two of them to convince you," Blanding decided. Then: "What was the extra fifteen dollars a week Schlamm got last summer? The book shows merely 'acct. BBC.'"

"He coached the plant baseball team. Why?"

"The Bobolinks!" Blanding ejaculated. "That's where I saw Schlaam before! He pitched for our home town team, but in the old Midwestern League. I remember all about him, now. He splintered his elbow sliding into a base, and the joint stiffened on him. He tried to stage a come-back as a south-paw—had a rifle-shot fast ball—but couldn't field his position well enough to hold down the job. And now he's your night watchman! I knew I had seen that face before!"

"That the man has played professional ball is not to his discredit," Spencer interjected, testily.

"Hardly," Blanding acquiesced, "it merely sets me to wondering how that fact might be of help to him in getting away with golf balls—"

"I wish you would get some evidence against an employee before you so persistently accuse him, Mr. Blanding," the manufacturer protested. "If you can't bring me some definite proof I am afraid it will be necessary to terminate our little experiment."

"Today is Friday, and the date of the new moon," Blanding observed, glancing at the calendar. "Just get me a duplicate key to Schlamm's locker and give me three days more. If I don't have anything to report then I'll apologize and quit."

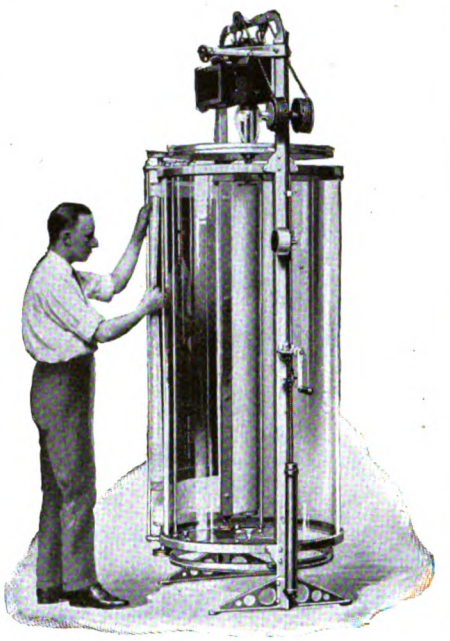
Saturday the factory closed at noon, leaving Blanding still plugging away at his audit. He was still buried in figures when Fogarty, acting plant guard until time for Schlamm was due, tiptoed into the office on his final round.

Blanding looked up.

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Makes Buying Easy—and Economical!

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Medart Catalog 43 is *primarily* a buying guide and *incidentally* a catalog. Between its covers you will find concentrated instructions for concentrated buying of "Everything in Line Shafting Equipment"—the safe, quick, convenient, easy, economical method of buying power transmission machinery so as to save time, freight and (last but not least) money! It is also an Engineering Hand Book, but it is so simply written that you don't have to be an engineer to use it in your daily work.

Remember the name and the number:—"Medart—43." Send for copies today. This guide is useful to superintendents, purchasing agents, owners, managers, master mechanics, as well as designers and draftsmen who plan power transmission installations; likewise to dealers and salesmen of power transmission machinery.

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MEDART
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"Could you spare me a few minutes, Mr. Fogarty?" he asked. "I hoped I'd finish before noon and didn't bring any lunch with me. Could you go over to Joe's and get him to make me up a couple of Western sandwiches—and perhaps duplicate the order for yourself?"

"Ye'll see th' plant doesn't be strayin' away the whiles I'm gahn, wouldn't ye, Mr. Blanding?" the man countered. "I could be eatin' one o' Joe's specials meself, since ye so kindly suggist it."

With a short half hour thus at his disposal, Blanding lost no time in filling a small duster, such as horticulturists use for spreading dry poisons on plants. Then, to judge from appearances, he carefully disinfected the storage room, paying particular attention to the sloping base of the boxing that enclosed the one window. Back across the floor he made his way, puffing strenuously at the stem of the duster. That job completed to his satisfaction, he hurried into the wash room on the second floor, directly above.

Schlamm's locker yielded two pair of old shoes, each with rubber heels. These last Blanding pried off, hastily shaping a hollow in the leather, emptying therein an impalpable black powder, and then carefully replacing the heel, fitting a grooved wooden plug into one of the nail holes instead of the original fastening.

Fogarty's return with the sandwiches found Blanding again busied at the adding machine.

"Phwat's that for, Mr. Blanding?" asked the old man, indicating a net standing behind the desk.

"It's a landing net Mr. Spencer lent me. I thought I'd try my luck jack-lighting tonight. Might land a sucker or two, you know."

It was some six hours later that Schlamm paused to scowl at the shirt-sleeved worker painstakingly checking column after column of figures.

"Goin' ter make a night of it?" he demanded.

"Hope to clean up before morning," Blanding responded. "This ought to be my last try at the job."

The surly watchman had been gone a matter of fifteen minutes when a light in the farther corner of the office suddenly came on bright—though Blanding had not left his desk.

As though the illumination had been a prearranged signal, Blanding seized the net, quietly made his way to the wash room, and carefully opened the ventilating section in the glass outer wall. A yellow square marked the window of the storeroom below and by contrast made the moonless night seem palpably darker.

Cautiously Blanding thrust the net through the window and held it downward so as to cover the center of the basement light-well. An instant later it was nearly jerked from his grasp, and he had barely swung it back into place when he felt another violent tug at the handle. Thrice more came the sharp twitches before darkness closed down again.

Blanding returned the net to its place in the corner of the office, changed his sneakers for his street shoes, and went home.

Sunday morning it was Fogarty who admitted Henry Spencer and David Blanding to the plant.

"Jake's dog has gone!" Fogarty exclaimed, in greeting.

"Score one for me," Blanding put in. Then, to the little Irishman: "You haven't been through the plant yet? Good." And he led the way to the office, carefully closing the door behind them.

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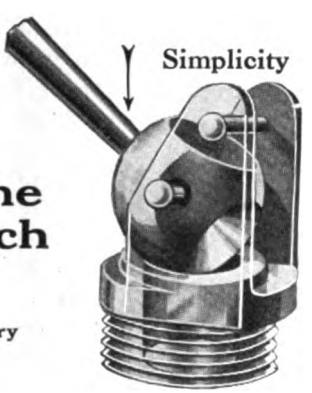
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Naval Air Station—Pensacola
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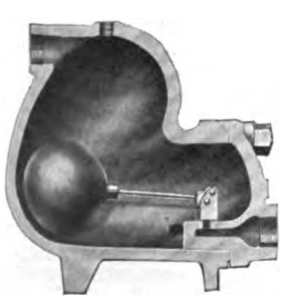
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So simple is the valve construction of the Paracoil Steam Trap, so sure its operation, that the Paracoil practically defies wear and cannot get out of order. A two-year guarantee against repairs is therefore an easy thing to give—and an easier thing to stand back of.

Many of the largest industries have accepted this unusual guarantee and find, even long after the two-year period, that the traps continue to need no attention.

Paracoil Steam Traps have only the one moving part. The float cannot touch the body of the valve and the valve motion gives constant flow of condensate. There is nothing to get out of order and once installed, a Paracoil can be forgotten.

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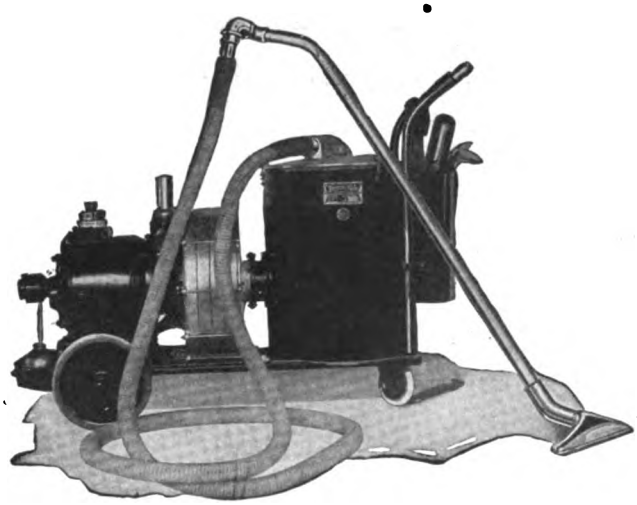


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Dover, Ohio

INVINCIBLE VACUUM CLEANER MFG. CO., Dover, Ohio.

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"You can identify these?" he queried, holding the net out to the manufacturer. "They are 'firsts,' genuine 'Thruflites,' aren't they?"

"You caught these in the air outside the storeroom window?" he asked, amazed. "But it's too low down; no one could throw out of it! It's impossible! A man would have to stand on his head before he could accomplish it!"

"Come down with me: I believe I can show you how it was done. The evidence will all be circumstantial, but I think it will be convincing."

Just inside the door Blanding switched on the lights and motioned for his companion to stop.

"Turning on these lights also illuminates that one in the farther corner of the office—since I changed over some of the wires in the fuse-box—and that warned me someone was in here.

"But still I don't see—"

Blanding stooped to rub his finger over the floor and bring up a trace of white powder.

"I blew a cloud of powdered talc here and in the window and then, to convince you beyond doubt that the man was Schlamm, hollowed out his shoe heels and filled the space with carbon black. Every time he took a step the rubber heel acted as a miniature bellows and blew out a tiny bit of the black through the one screw hole I doctored with a match-stick.

Blanding paced the distance from the window to the grouped footprints.

"Exactly the same as from pitcher's box to home plate," he observed. "But instead of pitching to a batter Schlamm was throwing at the bottom of the window boxing. Like this—" he squatted to draw lines in the dust on the floor, —"imagine a letter 'K' tipped over until its back makes an angle of forty-five degrees with the ground. There you have the slope of the window, while the two arms represent respectively the line the ball takes coming to, and then leaving, the window. Any ball that hit the right spot, with the speed Schlamm could put behind it, would sail out through the window opening and clear not only your brick wall but the board fence beyond.

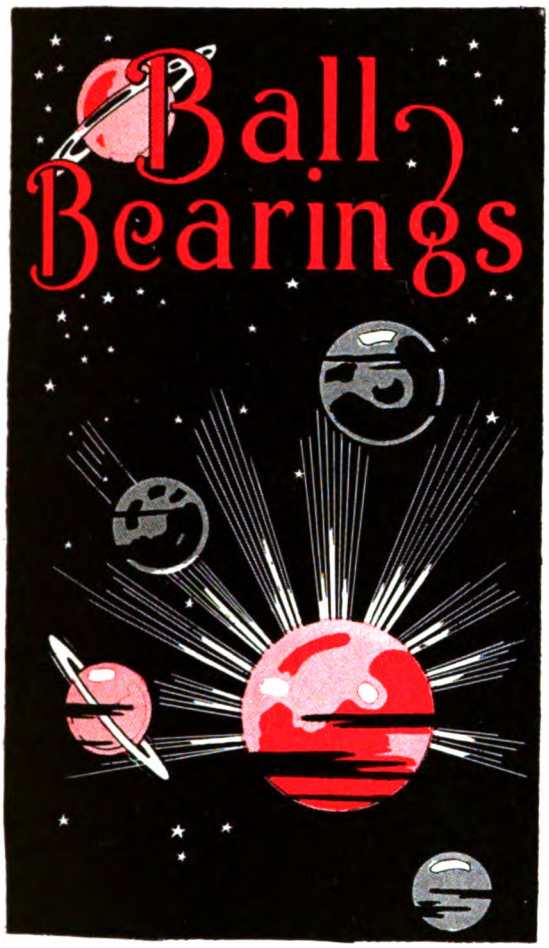
Spencer nodded his head as a man stricken.

"If Schlamm's aim was poor and the ball did not hit the right spot on the window bottom it would strike the top of the boxing, ricochet, and rebound into the basement, where, as we can prove by his tracks, the dog would retrieve the wild ones. It was some of the carbon black from his own shoes that Schlamm got on the fingers of his left hand, and thus gave you convincing fingerprints on the golf balls—should you want to bring him to trial."

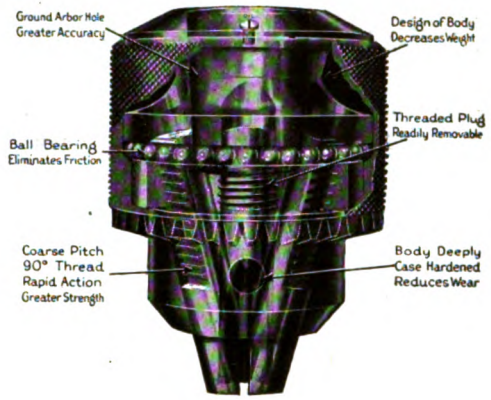
"But why should he want to throw the balls away?" protested Spencer. "There's no logical object in doing that, that I can see."

"I'd say there was," Blanding grinned. "Throwing from here, the shape of the light-well makes it impossible for any ball, once outside, to go anywhere but into the lot across the alley. The house there, as I learned soon after I tackled this job, has been vacant for months. It was a simple matter for Schlamm or a confederate to pick up the balls there at this convenience—and they have a resale value through caddies on the links great enough to make the theft of two dozen a night a mighty profitable side line. But I'm afraid your pitcher went once too often to the light-well."

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Operating One of the Biggest Junk Shops in America

By Robert F. Salade



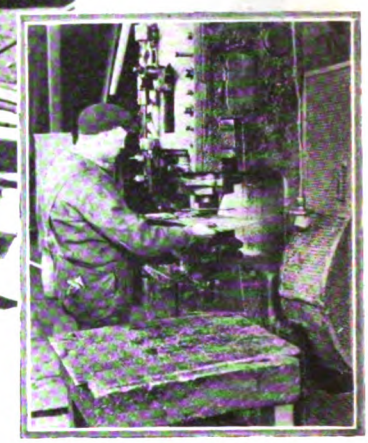


Fig. 1. At the left is a large alligator shear, cutting pieces of light gage chrome-nickel steel armor into scrap metal for melting. Below, by means of a heavy duty punch press, steel washers are being made from scrap steel sheets.

THIS is a brief account of what is probably America's largest "junk shop"—a plant equipped with special machinery used for converting all kinds of scrap metals into useful material. The plant referred to is that of Henry A. Hitner's Sons Company, which occupies more than forty acres of ground along the banks of the Delaware River, in the Richmond section of Philadelphia.

This company buys anything in the line of old metal, from a discarded automobile to a fleet of old battleships; in fact, some few years ago it purchased a large portion of the United States Navy and subsequently dismantled the battleships involved in the transaction, turning them into marketable scrap. That big job had not been entirely completed when the vast train shed of Broad Street Station, Philadelphia, was destroyed by fire. Only the steel frame of the shed remained. This was purchased by the Hitner Company, and it sent a force of highly skilled mechanics to clear away the skeleton with oxy-acetylene torches, electric chisels and other powerful tools. The scrap was then taken to the Hitner plant to be remelted into ingots.

Nothing goes to waste in the Hitner plant. From discarded steel plates, and by means of great punch presses and dies, steel washers are made by the tens of thousands, and in many different sizes. The plant includes a well-stocked lumber yard which is constantly supplied with a wide assortment of second-hand heavy lumber salvaged from old buildings and ships. Among the many different

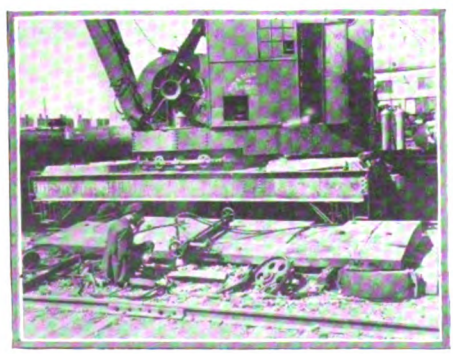


Fig. 2. It is no light job, to cut up heavy battleship armor into sizes suitable for melting. The oxy-acetylene torch is an essential, here.

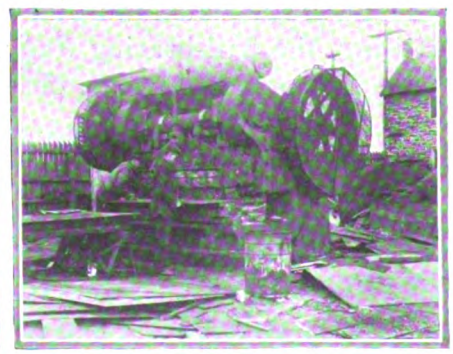
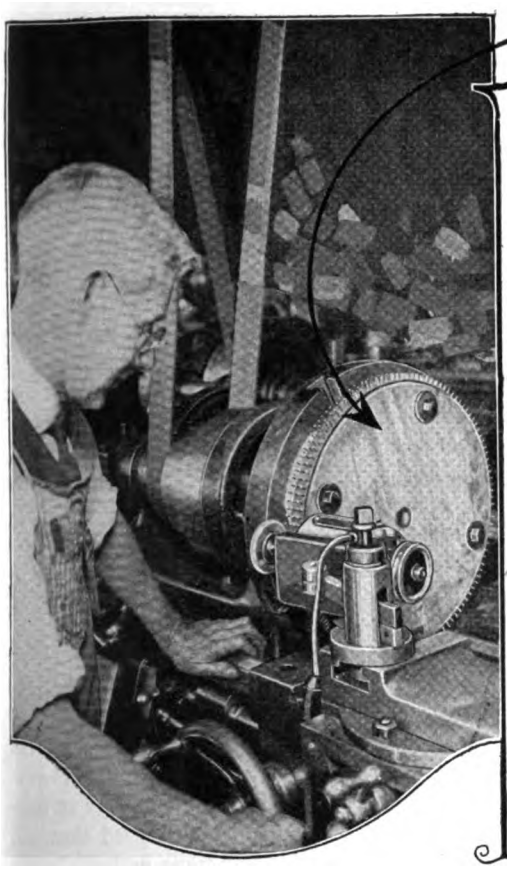


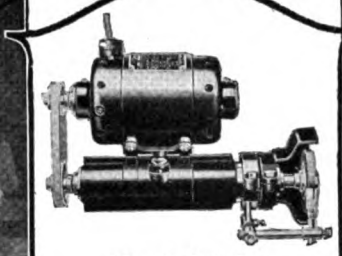
Fig. 3. Cutting up bulkheads, from junked battleships, into steel plates which are used industrially without remelting.



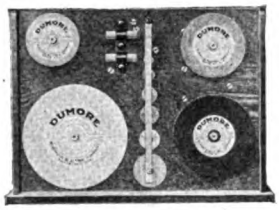
Fig. 4. This shows in detail how heavy battleship armor is cut into billets for melting. This piece of eleven inch armor plate weighs 25 tons.

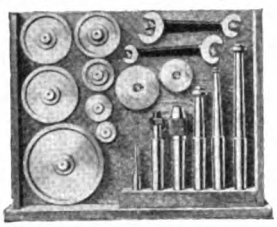
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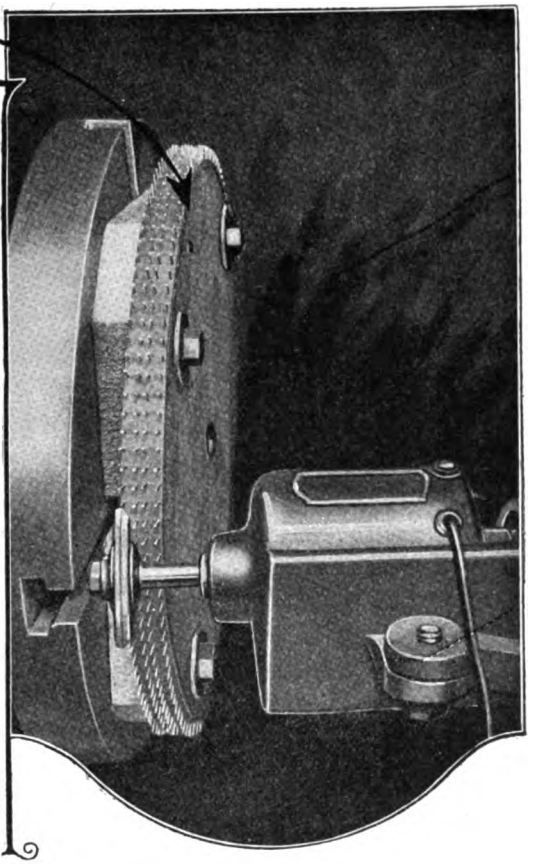


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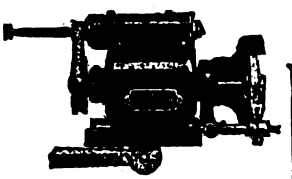
A leather belt studded with 1/32" steel pins had to be "tapped off" to exactly 3/8" long.

They stretched the belt on a circular wooden frame, and bolted it to the face plate of the lathe. Then they set the Dumore High Speed Grinder up on the tool post, accurately adjusted it for distance—and proceeded to handle a delicate grinding operation without difficulty.

Simple? Nothing to it! Dumore convenience and accuracy simplifies all kinds of "tricky" grinding.

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For general tool-room use. Length of internal spindle 3". Spindle speed 10,000 to 30,000 R.P.M. Self-aligning ball bearings. Comes completely equipped.



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An inexpensive tool for garage, repair shop or tool-room. Speed 15,000 R.P.M. Length of arm 4¼". Extension spindle 2". Grinder pivots on base.

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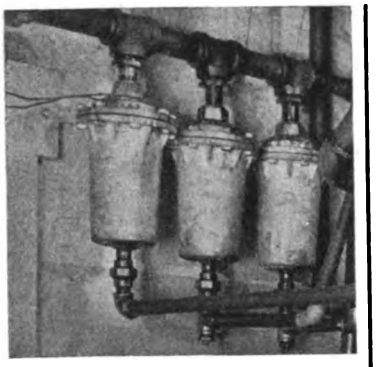
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Armstrongs draining condensing pan coils in Indiana milk condensing plant.

five big reasons for using Armstrongs

1. *Greater capacity*—
You'll get greater capacity with the Armstrong Steam Trap. You'll save—in first cost because of small size—in freedom from great heat loss through radiation—in installation cost because no supports or foundations are necessary.

2. *Non-air binding*—
Air rises to the top of the trap through a vent in the bucket and is discharged with the water—that's the simple way in which Armstrong has made air binding impossible. In the Armstrong, air is eliminated *from* the system—not merely by-passed back into it (around the trap).

3. *No Scoring*—
The great leverage in the Armstrong opens the valve quickly and wide. Scored valves are avoided. The adoption of a new heat-treated chrome steel alloy for valve parts has made freedom from scoring doubly sure.

4. *Self Scrubbing*—
In the Armstrong the flow is through the trap and out the discharge at the top. Air, sediment, oil and other foreign matter is carried out with the discharge. No blow-offs are necessary with the Armstrong.

5. *Small size*—
Its size is a decided advantage. In complicated installations the Armstrongs will fit the hard-to-get-at places. No foundations or brackets are necessary in setting up an Armstrong Steam Trap.



How it works

The Armstrong is the only trap operated on the inverted submerged bucket principle—developed and patented by Armstrong. This view shows how the Armstrong bucket operates. As long as steam is entering, the bucket is held up and the valve is kept closed. If water enters, the bucket will lose its buoyancy and will drop, as shown in the illustration, and the valve will open wide, discharging water, air and any foreign mater that may have entered the trap. Simple, isn't it?

The Armstrong Standard is for pressures from 0 to 300 lbs—for vacuum—for service on grease and oil. The Special is for service where pulsating pressures occur. The Steel Body, for extreme temperatures and pressures, is tested to 3,000 lbs. The 30 and 31 are small traps for draining small units.

TEST AN ARMSTRONG FOR 90 DAYS

Please ship prepaid an Armstrong for 90-day test. It is understood that when test is completed the trap is to be returned collect.

Size of trap..... Size of pipe connections.....

Maximum pressure..... (Do not neglect to state maximum)

Firm .....

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Signed ..... Position.....

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☐ *Send the catalog only; send no trap.*

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326 MAPLE STREET, THREE RIVERS, MICHIGAN 114-Gray

kinds of metal which are remelted into ingot form in the plant are manganese bronze, gun metal, copper, brass, lead, zinc, and grey iron.

The mechanical equipment of the plant is in many ways remarkable. Many of the huge machines in use have been designed especially for the company's work, and by its own engineers. The foundry is one of the largest of its class in the country. And, of course, there is a complete machine shop, furnished with planers, drills, milling machines, screw machines, gear cutters, etc. There is also a large department devoted to tool-making and to the work of re-sharpening cutting tools.

Among the special machines and devices which are used in the plant for the work of breaking up large pieces of old metal are the following: Mammoth crocodile shears; 100-ton stone pile-drivers; powerful oxy-acetylene and electric arc torches; chisels and similar cutting tools operated by compressed air; great electric cranes capable of lifting fifty or more tons of metal at one time; etc. Among the most valuable forms of scrap metals which are salvaged in this plant are steel and armor plates removed from former war vessels.

The Hitner Company recently had the Delaware River in front of its works dredged to a depth of 27 feet, and installed a number of new piers. This improvement was made to provide for the increasing number of old warships and commercial vessels which the company is buying as junk. The new piers are so equipped that old vessels can be dismantled as they are lying in dock.

The company's first big job was in 1900, when it was given the contract to scrap Brooklyn's first elevated street railway which covered a distance of one and one-half miles. All of the material taken from that worn-out structure was disposed of by the company at a substantial profit. During the same year the company bought from the Brooklyn railway concern some eighty of the old Forney type of locomotives which the railway concern discarded when it changed its elevated system from steam to electric power.

In the year 1900 the Hitners also purchased the one-time famous "El Dorado," a heavy railroad and a large viaduct that ran from the pier head of 42nd Street ferry, Weehawken, N. J., and which was from 140 feet to 180 feet high, about 1,000 feet long, and extended over the Palisades. At that time an elevated railway ran through the town of Weehawken to a point known as the Guttenberg railroad. The Hitner Company bought that elevated structure a few months after it had scrapped the "El Dorado," and soon had it dismantled to profitable advantage.

Among the other extraordinary jobs which came to the Hitners in later years were those of scrapping the steel viaduct of the North Hudson County Railroad, (which weighed more than 5,000,000 pounds), the Danbury and Harlem street railway, and 26 miles of the Cape May, Delaware Bay and Sewell's Point Railway. During the last few years the company has turned into scrap one of New York City's oldest and largest elevated street railways.

The Hitners' first experience in dismantling old ships occurred in 1894 when it bought from the United States Navy the old "Ram Alarm." Ever since the company has been purchasing discarded naval vessels, not only from the United States Government, but from many foreign countries as well. Among recent purchases were two old English troopships.

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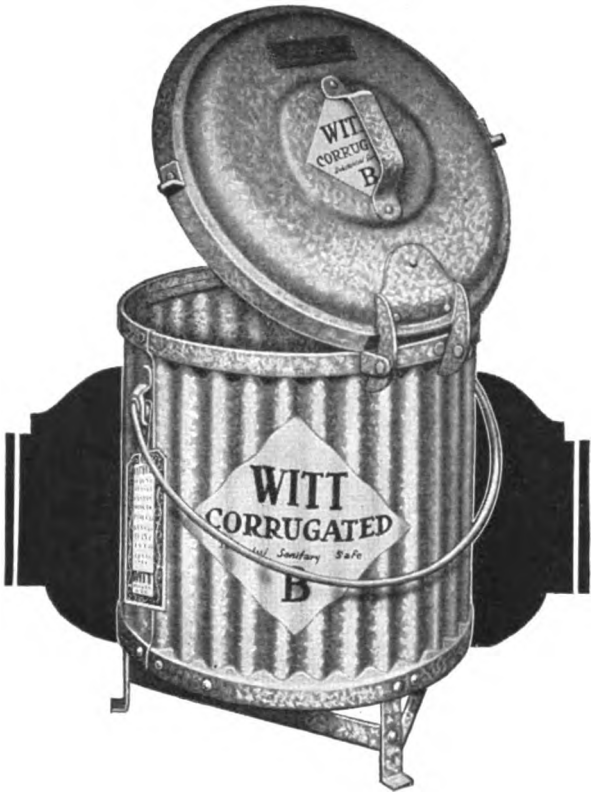
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The Value of Standardization in Industry

In Great Britain, Too, They Are Learning the Lesson

By Mark Meredith

ONE of the features of modern engineering is the wide range of machines and apparatus of every kind, all of a very complicated character, that in earlier days would have involved a considerable amount of hand labor in their manufacture. These complex articles may be large or small, but in its most recent phase, engineering makes their production a matter of everyday practice. Further, there is no monopoly in manufacture, for similar productions come from many different works and pass into all corners of the globe. For their small components renewals will in course of time be necessary, and it will obviously be to the great convenience of all those concerned if these are immediately to hand, so that the trouble of sending to the uttermost of the earth for them, may be avoided.

For these small parts it will be of considerable advantage if, after some amount of standardization in the case of machines or their parts, they are obtainable from many manufacturers and are, on account of standardization, completely interchangeable. Such parts may then be made in bulk and with greater economy in manufacture. Not only does this principle apply to the form of the appliances or their parts, but also to the materials of which they are made.

One of the claims made for standardization is that of the reduction of waste in the use of materials, and there is ample evidence that this has already been achieved in a number of industries. But industrial standardization is a national need rather than the need of the individual manufacturer. Organization and coöperation of the industries concerned are the first essentials, and an excellent example has been set in the coöperation of the engineering industries which finds expression in the body now well known as the British Engineering Standards Association.

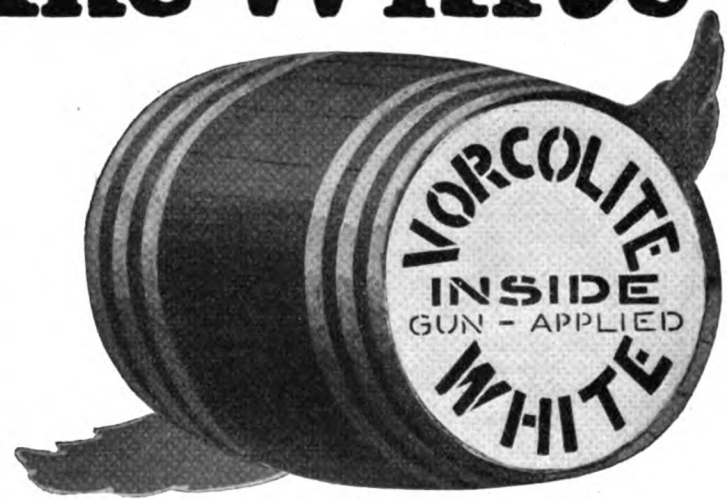
There is just the possibility, however, that the term standardization may to some minds suggest an interference with individual invention, and therefore with progress. Perhaps it would be better if the term standardization were replaced by the term unification. Standardization has nothing to do with the work of a National Department of Standards, though there are specific examples, as in the case of screwthreads, and the limits imposed in the mass production of the war period, which are easily comparable with the work of setting up actual standards. The use of the term unification anticipates this criticism, unification being intended to bring about a saving of time, trouble, labor and money, with all the consequent advantages. It would also inspire greater confidence between buyer and seller, and give greater satisfaction in all commercial operations.

Some ideas of the scope of the activities of the B. E. S. A., may be gathered from the fact that there are at present no fewer than 475 committees, with a total membership of 2,300 engineers.

The advantages of such an organization will at once

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Interior or exterior .....

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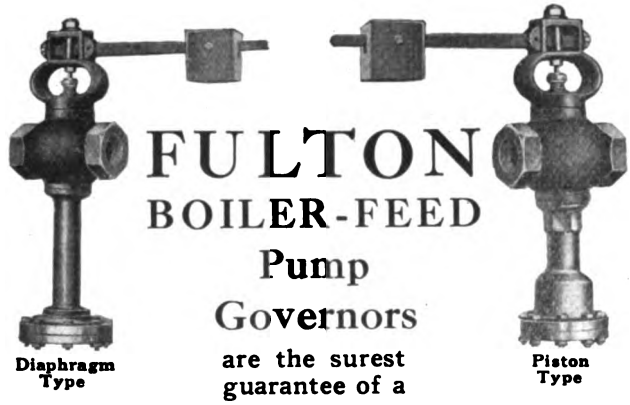
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Ask the men what trucks they prefer—then get our booklet on models and prices.

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Diaphragm Type

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proper water supply for boilers

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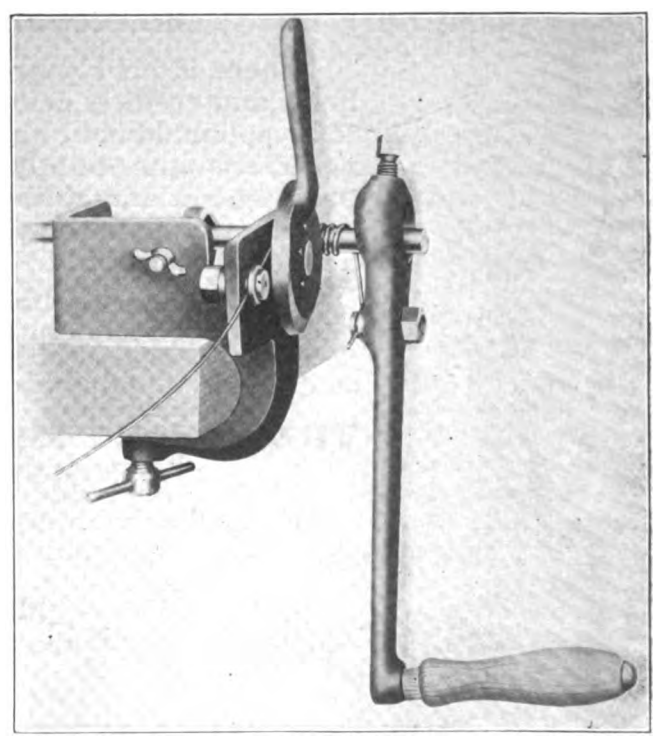
28-36 Penn Ave., Pittsburgh, Pa.

be apparent. It may be claimed to prevent overlapping, waste of time, and any attempt at the coercion of any one section of the industry by any other section. When it is recalled that many hundreds of steel sections were at once reduced to 113, and that the number of tramway rail sections was reduced from 75 to 5, the value of national simplification will at once become apparent.

Possibly the scope of such an international organization as has been proposed will need to be confined to the broadest lines such as questions of terms, definitions and symbols; leaving details to be dealt with by the national bodies. Such an International Commission would thus be more concerned with matters which are closely related to international intercourse. This is a matter which will need to be settled later, but as engineering is destined to play a leading part in the progress of the nations always, the proposal may be the means of promoting international industrial progress.

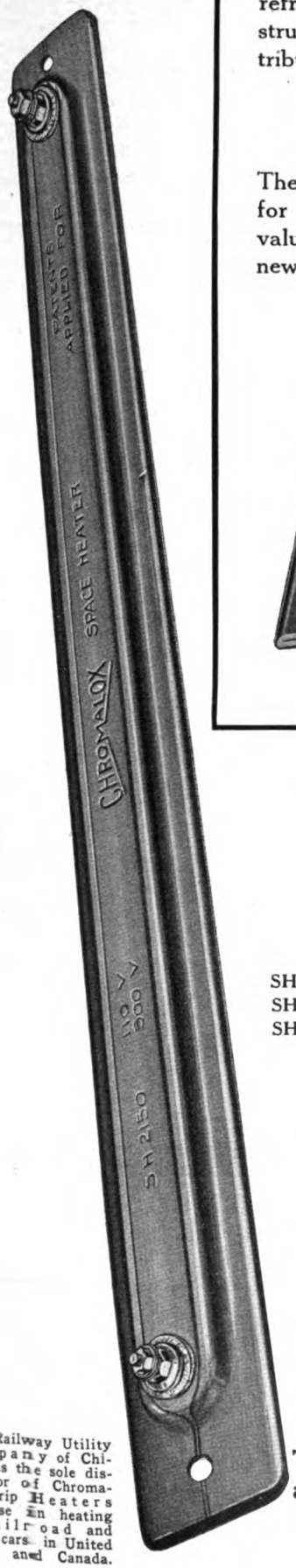
New Rapid Spring Winder

THE accompanying picture gives a good idea of the new "Rapid Spring Winder," which is being manufactured and marketed by the Fostoria Screw Co., of Fostoria, Ohio.



The size of the spring is determined by the size of the mandrel used, while the pitch, or lead, of the spring is determined by the position of the little cam which can be set in any position to produce a spring of any desired pitch, or lead.

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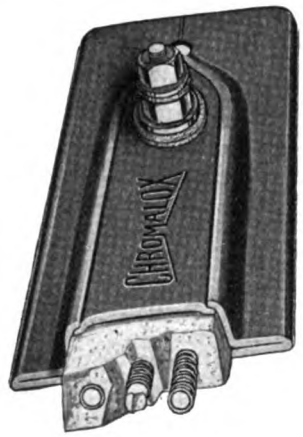


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Section showing the triple resistance coil imbedded in a refractory material. This construction gives uniform distribution of heat.

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The trade mark that stands for supreme quality and value. Look for it on your new space heater.



A Unit for Every Application

As manufacturers of electric heating units only, our aim has been to supply a ready source to meet every requirement for electric heating units.

We carry thousands of units in stock and can guarantee service and quality.

Our satisfied customers who are becoming more numerous every day can verify these claims.

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Trade Mark Reg. U. S. Pat. Off.

SPACE HEATERS

SH—2150, 2 ft. 500 watts, 110 volts
SH—2250, 2 ft. 500 watts, 220 volts
SH—2255, 2 ft. 500 watts, 250 volts

$1.75 each
In Small Quantities

The Chromalox Space Heater is only one of a number of units that we can supply to accomplish that heating problem of yours. It is true the space heater has many possibilities but the Chromalox line has unlimited possibilities. Write us regarding your problem.

Edwin L. Wiegand Co.

422 First Avenue, Pittsburgh, Pa.

Use the Coupon ➤➤➤

Try this new Space Heater and let us prove our claim

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Please send me copy of Bulletin C-105 on Chromalox Heating Units.

Company.....
Address.....
State.....
Attention.....

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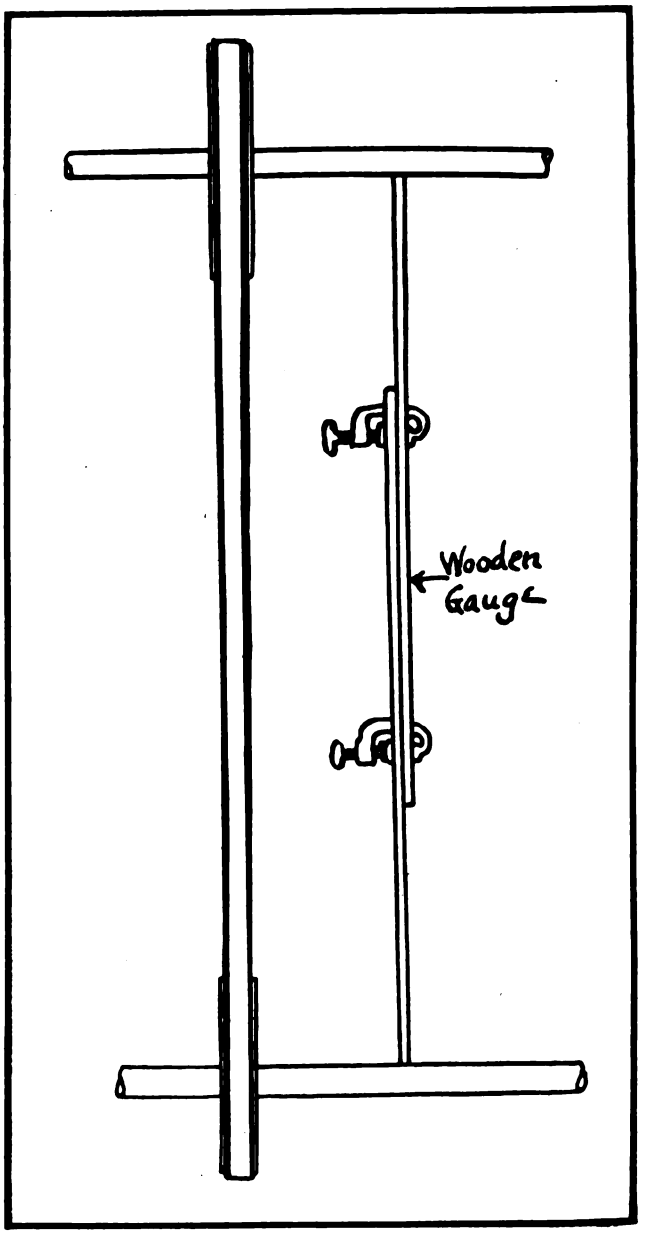
BARRETT-CRAVENS COMPANY—1334 West Monroe Street, Chicago, Ill.—Grand Central Palace, New York—Sole Licensee for Canada, Riley Engineering & Supply Co., Ltd., 360 Dufferin St., Toronto—Paris, Factory, Barrett-Cravens Co., 9 Rue de Rocroy. Distributors in all principal cities of the world.

Barrett Handling Equipment

Handy Shaft Aligning Kink

By W. F. Schaphorst

AN excellent and inexpensive "home-made" gauge for aligning shafting is shown in the accompanying sketch. The gauge consists of two pieces of light, slender, stiff, wooden pieces, and two clamps. With a gauge like this, clamped to the correct length, it is a very simple matter to check up two shafts and learn whether or not they are parallel. If they need aligning the gauge will touch only at the points of minimum distance. Thus, if the shafts are not parallel the distance between them will



not be the same along the entire length, but if the shafts *are* parallel, the gauge will "just touch" at both ends at every place of measurement.

A wooden gauge of this kind is far superior to a cord because it does not stretch or shorten. It is handled with greater ease and certainty. It is even better than a steel tape.

In most any plant where much shafting is used it is worth while to make a gauge of this kind to keep on hand for use as a permanent tool.

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Are your repair bills still too high?

Then these five products will help you reduce them

1 Protect your concrete floors against wear with Lapidolith, a concrete floor hardener that puts an end to dusty, easily-worn-down concrete floors. It is fully described below.

2 Add years of life to your wood floors with Lignophol, a preservative dressing that keeps wood floors from splintering, rotting, or drying out. Further details are below.

3 Make your repainting jobs less frequent by using Cemcoat, a remarkably economical paint that may be washed again and again without turning yellow. Read more about it below.

4 Make your buildings proof against dampness. By treating your exterior walls with Hydrocide Colorless you are assured of warm, dry interiors. Full description is given below.

5 Stop roof leaks before they become serious by using Stormtight. Stormtight stops leaks quickly and easily. If used on the entire roof it gives permanent leak insurance. Stormtight is described in detail below.

1 Lapidolith, a liquid chemical compound, is the original concrete-floor-hardener. It may be applied to concrete floors as easily as water. A floor treated at night is ready for business in the morning. Lapidolith penetrates the porous cement, binds the loose particles together, and fills up the voids. The result is a fine, close-grained surface that is dustproof and wearproof. One treatment lasts for years.



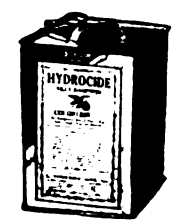
2 Lignophol is just as easily applied to wood floors. It keeps wood floors from splintering or drying out. It penetrates the wood fibres and restores the natural gums and oils. It gives you a wood floor that is hard, smooth, and sanitary. It does away with the use of floor oils entirely. One treatment will last for years.





3 When your next repainting job comes around, try Cemcoat. The wearing qualities of this paint are remarkable. Even on brick, plaster, or concrete walls it will not crack or peel. It may be washed again and again. Because of its unusually heavy body it generally requires one less coat to a given surface than most paints. Cemcoat comes in whites and colors for exteriors and interiors.

4 Hydrocide Colorless. This waterproofing compound is applied to the exterior of a building. It may be applied with either brush or spraying machine. It will not detract from the beauty of the walls, as it is absolutely invisible when applied. It will accomplish its purpose in a most thorough and permanent manner by penetrating and filling the surface pores with a compound that is absolutely resistant to the elements.





5 Stormtight stops leaks instantly. If it is applied to the entire roof it will add years of wear to even an apparently worn-out roof. Stormtight is a thick, adhesive, rubber-like substance. It may be applied by anyone to any roofing material. Stormtight has often saved manufacturers the cost of a new roof. It can be secured in either the semi-liquid or plastic form.

L. Sonneborn Sons, Inc.

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The above products have helped many manufacturers reduce their maintenance expense. Concerns such as the Ford Motor Company, Swift and Company, and the Bethlehem Steel Company have used some or all of these products for years. On the left is the plant of the H. E. Varran Co., Stamford, Conn., also a user of Sonneborn products. J. W. Ferguson, contractor. Let us send you free samples and literature that will tell you more about them. Use the coupon.



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Please send me, without any obligation, demonstration sample and literature on:—Lapidolith ...; Lignophol ...; Cemcoat ...; Hydrocide Colorless ...; Stormtight ... (Check those products that interest you)

Name .....

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City ..... State .....

Company .....

Position .....

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The Control of Mechanical Power Transmission

II—*The Far-Reaching Effect of Correct Belting on Profits*

By William Staniar

Belting and Transmission Engineer, E. I. du Pont de Nemours & Co.

IN the demand for industrial economic efficiency the supposed necessary evils of plant operation must be brought to the surface for analysis and inspection.

Transmission belting is one of the most necessary of plant essentials. *With it right,* the machinery is producing to capacity; *with it wrong,* there is a puzzling leak in production and, with its failure, both capacity and production suffer; therefore, is there anything in plant capacity and operation that ranks higher in importance?

The question of cost, therefore, in selecting and purchasing a type of belt should and must take into consideration, not only the purchase price, but also the expense of constant adjustment, the enforced idleness of machinery and men during such repairs and the frequent renewals necessary by reason of rapid wear of inferior types for the operation. Buying transmission belting on first cost without considering the operating conditions lowers the profits of the organization, because every loss of power through the inability of the belt to convey the unit of energy required creates a waste of fuel and steam and a weakening of the capacity of every machine in the plant with a corresponding curtailment of production.

The effect of correct belting regardless of price on the profits of an organization is shown conclusively by the graphic chart in Fig. 1. The left-hand side of the chart presents its effect on plant operation; the right, on production. In discussing the effect on operating costs and production, it is obvious that the right belt in the right place as to type and size will give correct transmission if it is based on an analysis of mechanical and atmospheric operating conditions by experienced engineers through applied testing and knowledge. This will result in more power being delivered by fewer types and brands because the selection is made for a specific purpose.

It requires power to make a belt slip over a pulley, and stretch is the foundation of slip; therefore, the right belt reduces this factor to a minimum and less power is required for the drive. Excessive slippage and the wrong type of belt for the atmospheric conditions involved, such as acid, heat, steam or moisture, causes premature failure which results in high belting costs. The selection of type almost entirely governs the life of a belt and when this is based on a scientific knowledge of the material resistance of the various belting substances, reduced consumption is the result.

Stretch and premature failure are the cause of high transmission maintenance costs because stretch necessitates frequent belting adjustments and premature failure calls for labor in replacing the destroyed power medium. Correct transmission also depends on correct belt joining, which in itself has a great effect on belt maintenance costs.

Lower operating costs by virtue of the scientific and intelligent selection and installation of power belting reduce overhead expenses and deliver a unit of production at a lower figure.

Correct belting has just as much effect on plant *production* as it has on plant *operation* because from a power standpoint they cannot be separated. If economy can lower operating costs through the mediums mentioned, it can lower production losses through less idle equipment, resulting in increased income from plant investment; less idle production labor, resulting in increased income from operating investment; and increased output, resulting in maintaining maximum production. Increased production based

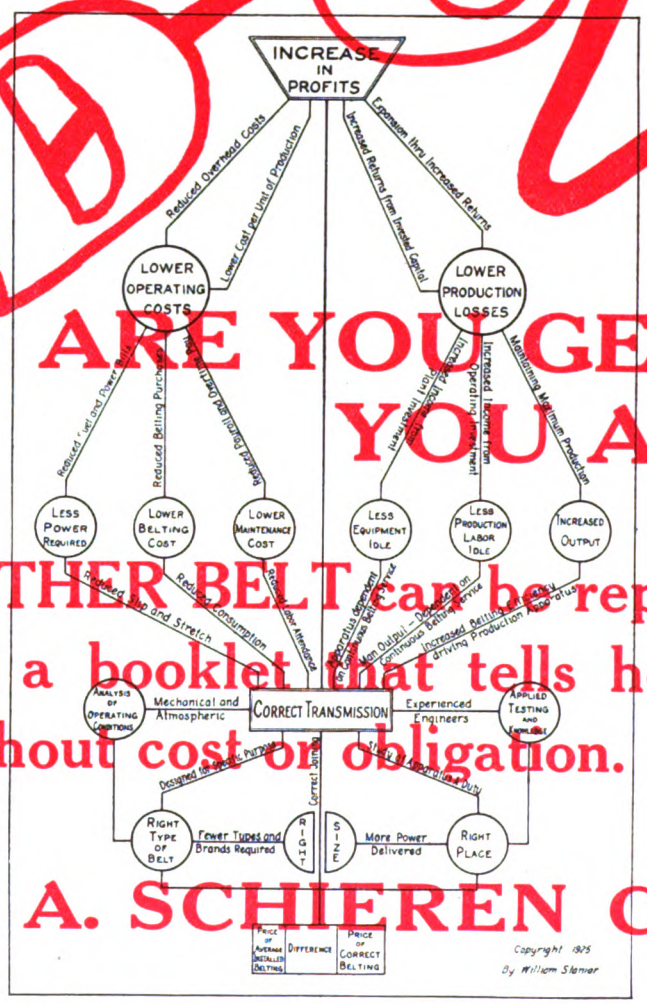


Fig. 1. This chart shows graphically the far-reaching effect of correct belting upon profits. The left-hand side traces the effects on operation; the right, on production.

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tions sometimes it would be perfect and sometimes it wouldn't, but what protection are specifications if there is no experienced man to check the belting against these specifications! The average man in the plant knows "piping" of a leather belt when he sees it, but that signifies nothing because first quality back-bone centre stock leather may "pipe."

Leather has held its place in the belting world for years as the best transmitter of power known and no doubt this is true when intelligently selected and properly applied, but there are other types of belting which are splendid power transmitters and possess qualities of resistance to gases, heat and moisture that are in many instances lacking in leather, therefore it will pay to investigate their characteristics and attributes.

It is obvious from the foregoing that belting deserves attention and respect if it is to serve you profitably, but regardless of the attention given belting, the transmission installation around which it operates must not be neglected, as there is nothing more disastrous to the economical transmission of power than poorly designed and neglected shafting and pulley layouts.

The economical arrangement of shafting, bearings, pulleys and clutches is absolutely necessary for the production efficiency of any plant, because they are closely allied with belting as the one without the other is worthless. Power wasting transmission installations are prevalent in many cases due to the gradual growth of a plant. Addition after addition is added and the power taken from existing sources, until finally you create a complicated mass of power transmitting apparatus which requires real money to rotate it and real money to maintain it.

The business of transmitting your power mechanically is just as important to you as the business of any other part of the organization. Control it by systematic methods supervised by engineers who understand the principles of the mechanical transmission of power and who are familiar with the various types of belting and transmission machinery on the market. Each drive or battery of drives should be studied and the results standardized and scheduled for practical use. Each transmission arrangement should be tested for power and the possibility of eliminating superfluous shafting, bearings and pulleys considered.

Notwithstanding the fact that all manufacturers and industrial corporations aim to give service and place on the market products of merit and quality, their fundamental business is to pay dividends.

These dividends are generally estimated and based on sales, but do profits entirely depend on sales? Selling prices are very often fixed by competition, therefore, savings which are profits, must be found to some extent in the purchasing and manufacturing ends by buying with knowledge the commodities needed and installing and operating them intelligently.

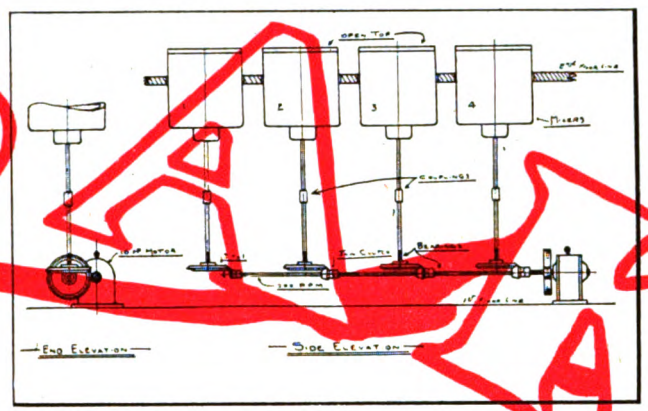


Fig. 8. This money-wasting, nerve-wracking arrangement had been running as shown for years. It required $850 annually to maintain it, owing to the impractical arrangement of the drive. This drive was revised as shown below.

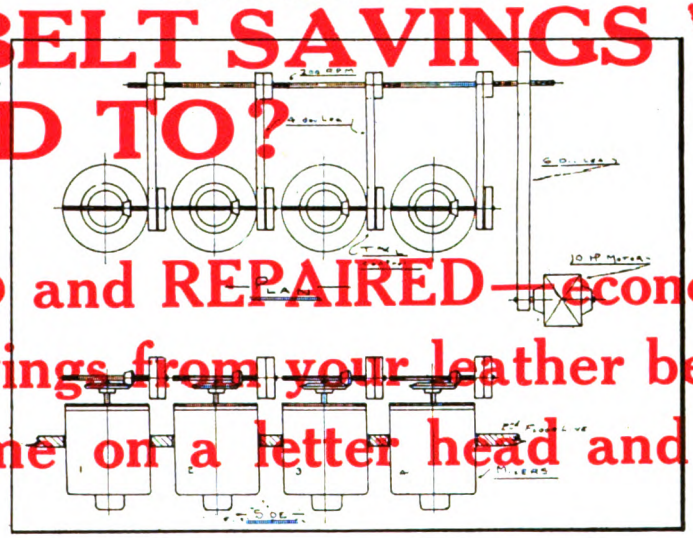


Fig. 9. The total cost of making these changes, including all material and labor, came to $1100. The new arrangement saved $174.72 per year in power and $850 in maintenance charges, or a total of $1024.72. A first-class investment.

Your transmission of power by belting is a hit or miss proposition capable of consuming money rapidly if you have no system of belt selection and installation control. Many plants keep card records of belting performance, but if they are not comparative records of one type over another for the same operating conditions and the results standardized for use, they are worthless. Remove the control of your mechanical power transmission from the hands of men who consider horsepower too much for them and control it by a definite system. Engineers control your coal, your steam and your electric power transmission, then why leave the actual connecting link between these power generators and production to chance?

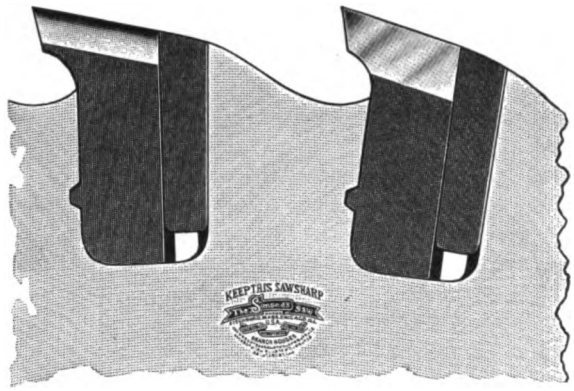
The wasteful installation is not necessarily the complicated one. Frequently the simplest apparatus to drive will cost the most, because no thought has been given as to the most economical driving method possible.

As an example of this, Fig. 8 shows a money wasting, nerve racking and dangerous arrangement that had been running as shown for years. This small unit required $850.00 annually to maintain it owing to the mis-use of direct connection and the impossible arrangement of the drive. Fig. 9 shows the method employed to eliminate this waste and the figures given prove that attention to transmission arrangement pays

Editor's Note: This is the first of six articles by Mr. Stamar, on the subject of mechanical power transmission. The second article will appear in October.

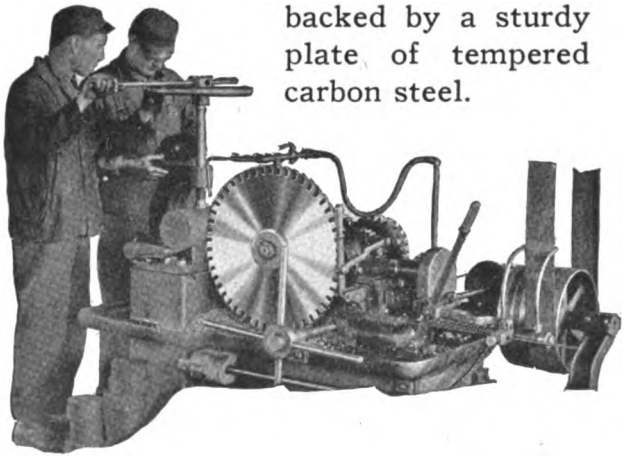
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It's The Teeth That Tell In Metal Sawing

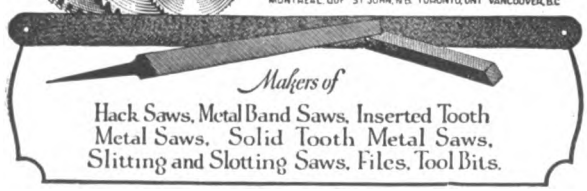
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The Ball Team as a Factory Advertising Medium

By M. S. Rossy

AS the factory is not inclined to favor retail selling, it does not usually have recourse to advertising among the public, but there are times when it needs this publicity to promote its interests and regrets having tried to preserve its dignity by an unwise shyness. When business conditions are good and a scarcity of labor prevails over a former scarcity of jobs, then it is the factory which is best known and best liked that draws the most applicants to the employment office. It is the indirect advertising that the factory can accomplish in popular ways that counts under such circumstances.

Some of these methods of advertising have been decidedly expensive, if the benefits obtained are figured in terms of the costs. Ordinarily, the factory is desirous of limiting expenditures as much as possible, so the advertising should aim toward the most success obtainable when economy must be practised. On account of its far-reaching effects through its appeal to the masses, the industrial baseball team may be recommended as a cheap, but effective, method of advertising.

A factory that promotes a baseball team among its employes figures prominently in the newspapers. No matter whether the team wins or loses, a report of the game will gladly be added to the daily sport news. Furthermore, there is usually a crowd of "rooters" that will accompany the team on its travels, so other towns and cities will become aware that there is a wide-awake factory of this name in existence.

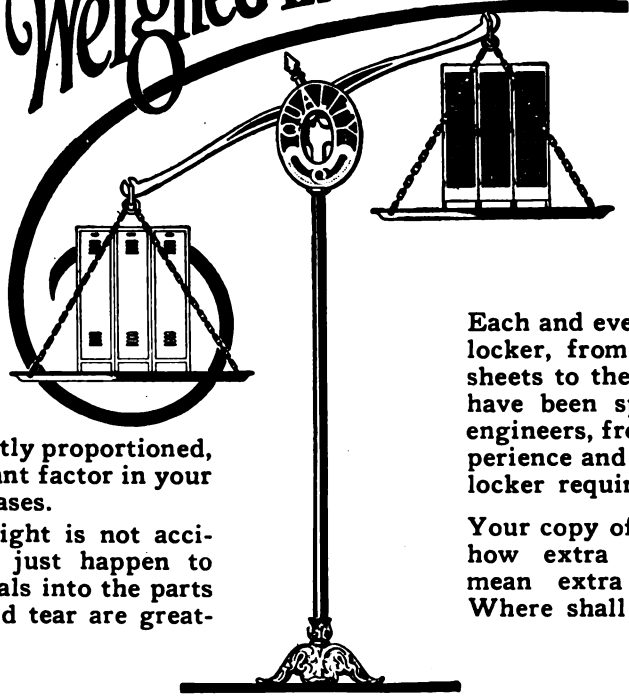
If the manufacturing concern wants to send forth a team that is a credit to its progressive spirit, it will provide neat, correct uniforms for the players. Here again, there is a chance for advertising, for the shirts of the players should appear with the name of the factory, or the initials, emblazoned across the front.

Suits cost a considerable amount, when a complete equipment is provided for each of eleven or twelve men. Bats are necessary, as well as many balls, catcher's gloves, etc. If the factory does not want to spend this money,—really a small consideration when the amount of advertising accomplished is estimated,—it is not difficult to raise a sufficient sum among the employes by promoting dances or parties to which tickets at a nominal price may be offered. It should be understood that the equipment, including suits, is merely loaned to the players and must be returned to the factory at the close of the season; such an arrangement materially reduces the expenses of the second year.

A baseball team aids greatly in creating a "factory spirit" among the employes, for girls as well as men become interested in the games and enthusiastically cheer their co-laborers on to victory. More than that, however, a crowded line of applicants for employment is always a good asset to a factory, as a wide range of selection is offered, so the industrial baseball team, serving as a good publicity agent, is a factor that the progressive concern will not overlook.

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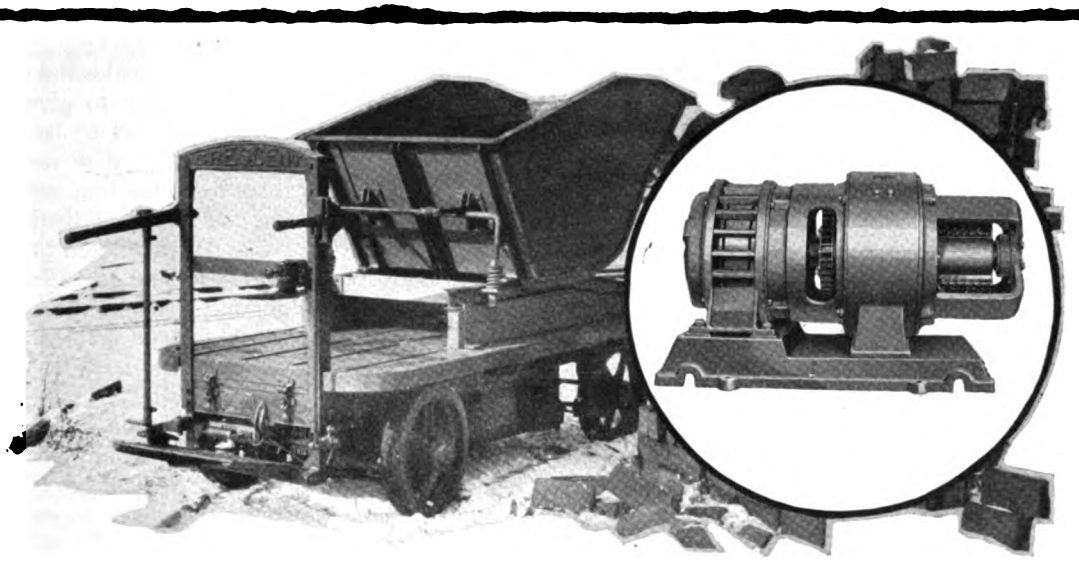
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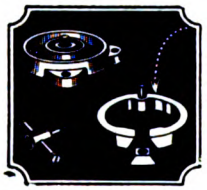
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The Employe's Eat Shop as a Help to Better Work

By Warfield Webb

THE employes who are compelled to eat a cold lunch at their work benches during the noon hour, are not nearly so likely to become or to remain efficient workers, as those who are given—purchased, of course—a warm meal, well prepared, and that can be eaten in an inviting place, where the surroundings are calculated to make them relish the repast with real pleasure. It is a well known fact that the worker who becomes the most valuable to his employer is he whose environment is such as to act as a continual source of inspiration.

Plants where the industrial restaurant has been installed and conducted along intelligent lines, have been rewarded by more contented workers, and more efficient work as well. The cost of conducting these eating places has been kept at a minimum, where it has been under the management of an experienced and capable man. It has acted as a greater incentive for effort.

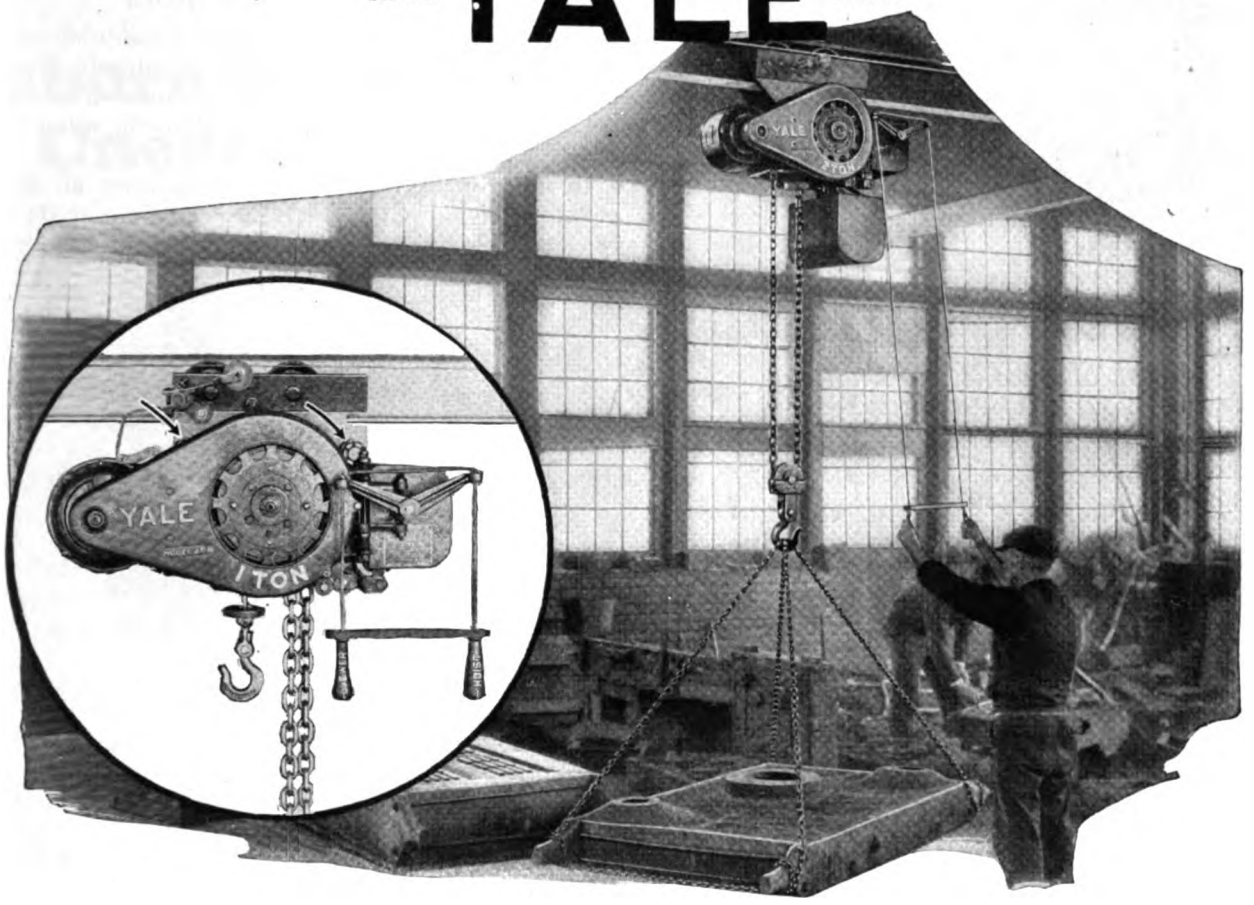
Here is an instance. The plant was large, well located on the outskirts of the city. The environment was ideal; it rather resembled a public park. The building was ideal in point of construction. The restaurant was in keeping with the other parts of the operation. It was on the second floor, where light, air and sunshine made it absolutely sanitary. It was an inviting place, and though the nature of the work was making machine tools, the restaurant was fit for the office employes, or even the owners, in the matter of appointment.

The idea, however, was to make the men feel that it was the desire of the company to give them the best. Their work demanded care, and to be well fed at the noon hour, amid surroundings that were inviting, was an inspiration for them to do the best work possible. Instead of eating their cold lunch at their benches, where the grime and dust was not calculated to help their appetites, they could come here, and for a little outlay buy a meal that was delightfully prepared and served in a way that gave them a relish for the edibles set before them. Of course if an employe desired he could send upstairs and purchase hot coffee, sandwiches, fruit and other things to be eaten where he chose, but many came to the restaurant and there enjoyed their lunch in a satisfactory manner. The cost was trivial, for it was a rule that the company must not make a penny profit of the restaurant, and when the same did make its appearance the employes benefited by a larger and better meal for the same money.

There were other attractions, too, and the noon time was spent in an enjoyable manner. The employes met and conversed with each other. They had moving pictures, an orchestra and sometimes talks during the noon time. It was a practical reason for an increased efficiency. If the workers are satisfied without being impressed with the idea that they are objects of charity, it will be noted that the result will prove of value in many ways.

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Chain Blocks, Electric Hoists } For Lifts
I-Beam Trolleys, Industrial Trucks } For Shifts

Yale Material Handling Equipment includes Ball Bearing Spur-Geared Chain Blocks, Screw-Geared and Differential Chain Blocks, Ball Bearing Electric Hoists, I-Beam Trolleys, Overhead Crane Equipment, and Electric Industrial Trucks, Tractors and Trailers.

Factory Locking Equipment—To acquire locking control, security and convenience throughout the factory, use Yale Master Keyed Locks

This 2-ton Yale Ball Bearing Electric Chain Hoist, Model 20B, with its slow speed, 3-phase A.C. motor proves an ideal piece of handling equipment for heavy foundry service—or any service requiring careful, accurate work.

Its smooth, positive action and sensitive control give the operator special facility in the careful placing of heavy loads such as the foundry cope, or its removal, without disturbing the intricate sand molds.

All working parts are fully enclosed and protected from dust and dirt, yet easily accessible for inspection at any time.

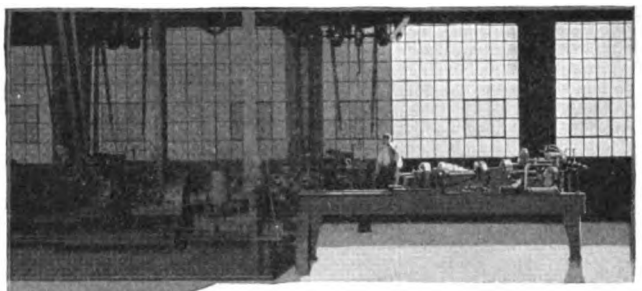
The Yale Model 20B Electric Hoist, compact and readily adjustable for headroom, lift and I-Beam flange, has the Yale ball-bearing load sheave for efficiency, and steel plate trolley with hardened and ground steel roller bearings for easy travel.

The Yale Model 20B is the latest development in electric hoisting equipment. Write for the Yale Bulletins.

The Yale & Towne Manufacturing Co.
Stamford, Conn., U. S. A.
YALE MARKED IS YALE MADE

YALE Hoisting and Conveying Systems

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Try It at Our Risk!

Just "SKYBRYTE" a Section of your Dirtiest Glass ~

and you'll be amazed at the results

Select the dirtiest sash or skylight around your plant—makes no difference where nor how grimy.

Apply a few brushfuls of SKYBRYTE, the National Glass Cleaner. The hardest crust of rust or carbon scale immediately begins to dissolve.

Then flush off with water (using hose where practical)—and the glass is perfectly clean—with the cheerful daylight streaming in.

Workers feel better. The curve on your Production Chart bends upward sharply. Spoilage and accidents decrease. Electric light bills promptly drop.

Thousands of foundries—steel and iron mills—great manufacturing plants—railroad shops and roundhouses—now keep glass clean with SKYBRYTE, the National Glass Cleaner. And regardless of how badly it is encrusted with dirt. They first tried SKYBRYTE—at our risk. Now they use it regularly (large orders) and are enthusiastic in their reports.

The cost to you is less than 3/4c per sq. ft., including labor. And we will prove it to you at our risk—Fair enough, isn't it? Just use the coupon below.

The SKYBRYTE Company
1195 Keith Bldg., Cleveland
Chicago Branch, 104 S. Michigan Avenue

Skybryte CLEANER (LIQUID)

No-Risk Trial Offer

The SKYBRYTE Company,
1195 Keith Building, Cleveland, Ohio.

You may ship us five gallons of Skybryte on trial and one regular 75c Skybryte brush FREE. We will use enough to make a thorough trial—enough to clean several hundred square feet. If we are not fully satisfied we will return the balance to you within 30 days return charges collect and you will cancel invoice. Otherwise we will pay your invoice for five gallons Skybryte at $3.00 per gallon. F. O. B. Cleveland. Skybryte in bbls. $2.50 per gallon freight allowed.

Company .....

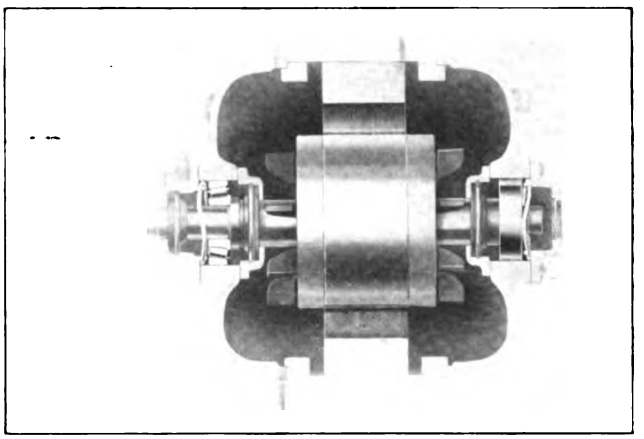
Street .....

City .....

Automatic Rotor Re-centering Bearings for Electric Motors

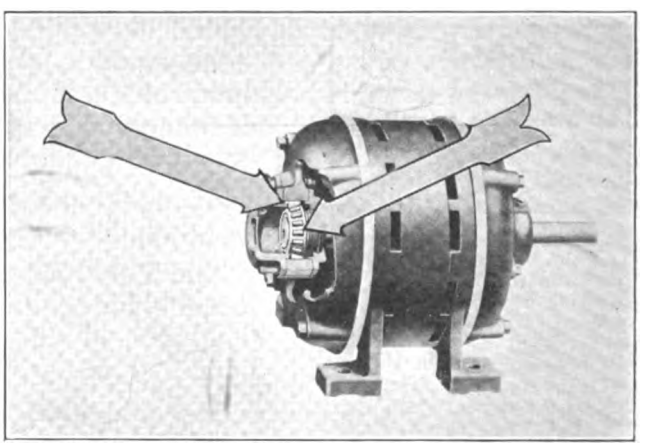
IT has been stated by many practical operating men of electric motors that 95% of motor trouble may be traced to bearing failure. Many of these troubles are the result of bearing wear so as to allow the rotor to rub on the stator.

In order to insure a continuous uniform air gap in motors, the Howell Electric Motors Co., of Howell, Michigan, has brought out a complete line of motors with



anti-friction bearings, in which any looseness in the bearing, caused by wear or otherwise, is instantly and automatically taken up, so as to keep the rotor of the motor continually centered with a uniform air gap. This is accomplished by the use of a Timken tapered roller bearing, shimmed with a fluted wire spring

The inner race or cone of the Timken bearing is fitted on the shaft with a light press fit. The outer race or cup is fitted into the housing of the motor end bell with a sucking fit which allows creeping of the outer race. The spring is held tight against this outer cup by the outer grease cap, pushing the cup tightly against the rollers, and keeping the bearings tight at all times.



This type of bearing is put in each end of the motor and accomplishes the following:

(1) Keeps the rotor automatically centered at all times, keeping the air gap uniform.

(2) The spring allows for any lateral expansion of the shaft which might occur due to heat.

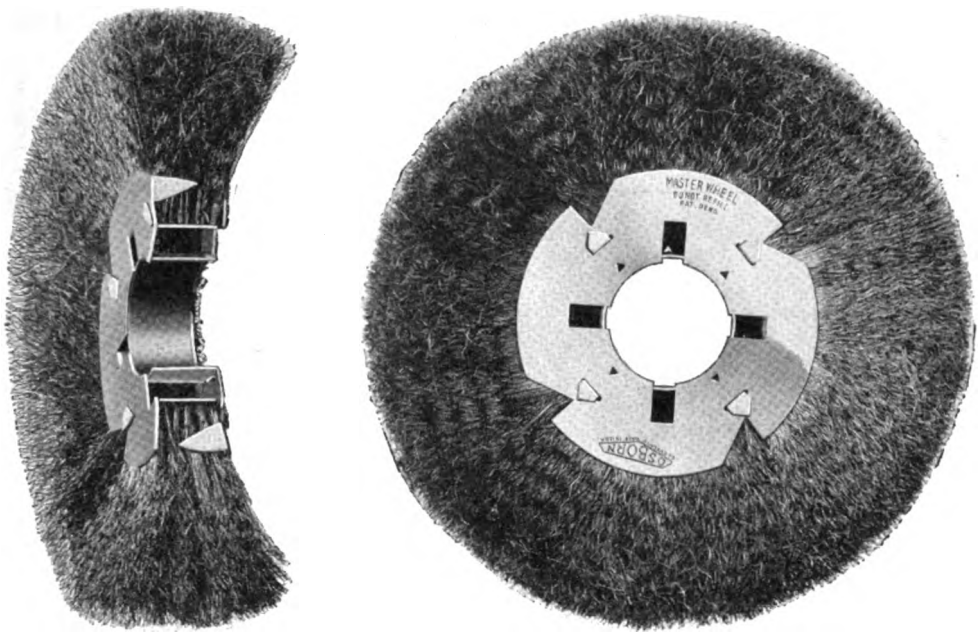
(3) The spring keeps the bearings tight at all times: bearing does not need to be adjusted for wear or any other looseness.

(4) Causes bearing to run more quietly.

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OSBORN

Osborn Master Wheels and Adapters Unexcelled for Utmost Economy



Master wheels are made in sizes ranging from 8" to 15" in diameter and all sizes have a standard 2" opening. The adjustment to fit any size shaft is made by the use of Osborn Adapters. A set of adapters to fit your size of arbor will be furnished with each wheel.

Osborn originated the Master Wire Wheel and Adapters.

In addition to using special, long-wearing wire, added life is further increased through the special method of construction.

The wire sections are assembled between two steel face plates, fastened with eight clamping members under 7,000 pounds pressure. The wheel is guaranteed to stay together during its entire life.

One of the outstanding features of this wheel is to enable the dealer to purchase adapters carrying any size hole desired. This overcomes the necessity of carrying in stock wheels with many size arbor holes.

THE OSBORN MANUFACTURING COMPANY
INCORPORATED

5401 Hamilton Ave. Cleveland, Ohio

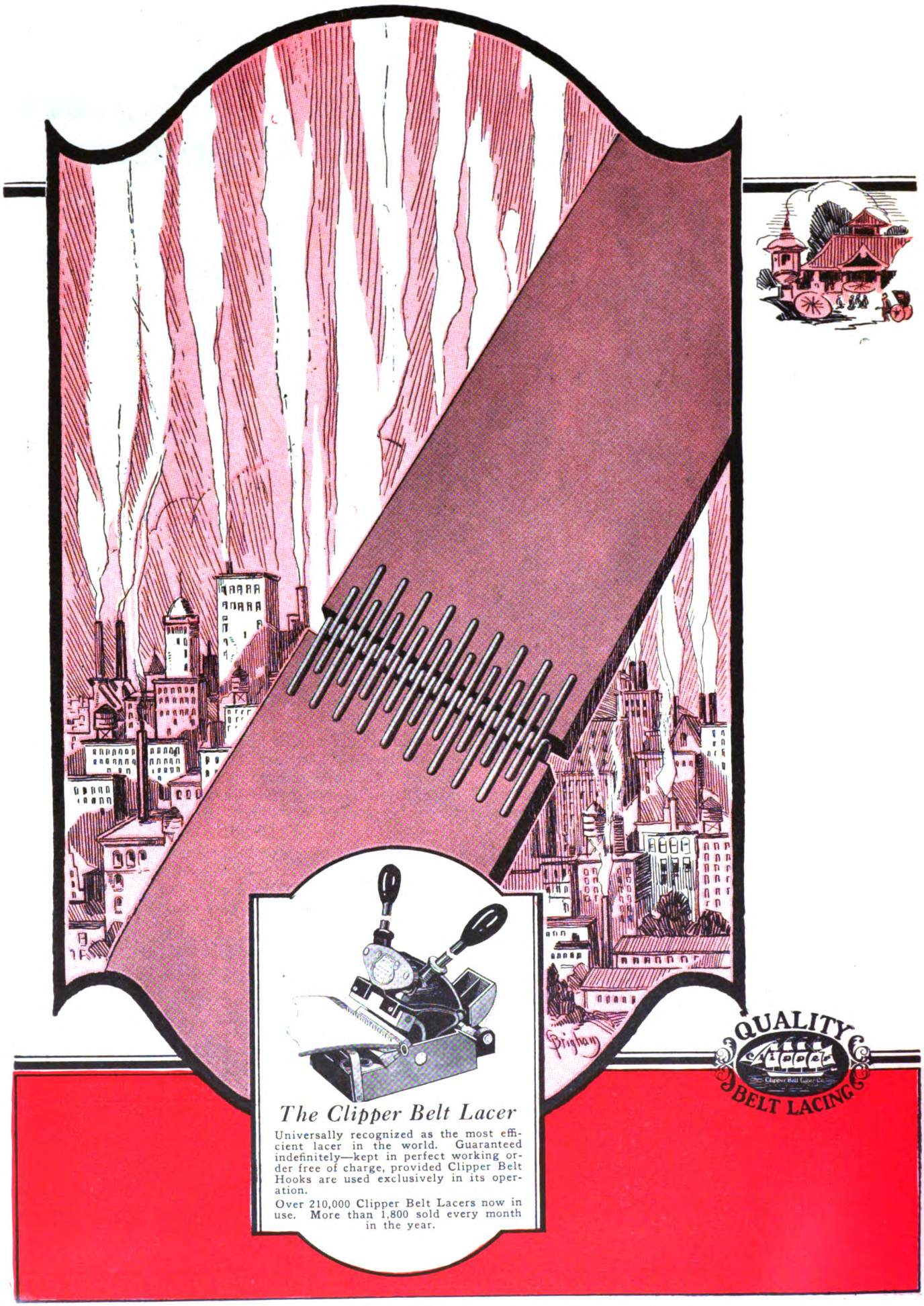


Adapters for Master Wheels

Osborn Brushes

A BETTER WEARING BRUSH FOR EVERY USE

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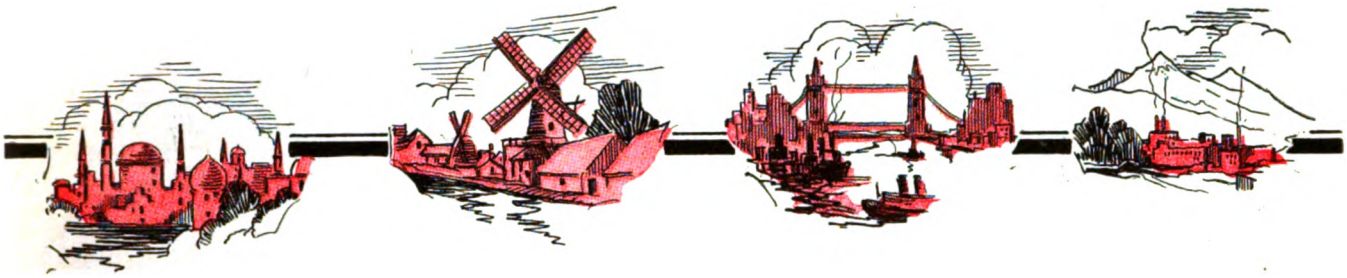
The Clipper Belt Lacer

Universally recognized as the most efficient lacer in the world. Guaranteed indefinitely—kept in perfect working order free of charge, provided Clipper Belt Hooks are used exclusively in its operation.

Over 210,000 Clipper Belt Lacers now in use. More than 1,800 sold every month in the year.

For products not advertised in this issue write Industry Illustrated

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Clipper Products Are Used Throughout the Manufacturing World

IN every section of the world, wherever factories hum and wheels go round, belts are being held securely and efficiently with Clipper lacings.

One third of the enormous daily production of 4,000,000 Clipper Belt Hooks is exported over seas and into foreign lands. A large part of the world's belting is fastened with Clipper Hooks.

It is evident that Clipper Belt Hooks must sell at very reasonable prices in order to meet foreign competition in foreign countries. These reasonable prices are possible only because of large scale production.

But price is not the only reason for the popularity of Clipper Hooks. They are produced with the utmost care, of the best fatigue-resisting steel to withstand the greatest strain. High grade special machinery is employed to make each hook as mechanically perfect as possible.

Clipper Pins are the best we know how to make.

Clipper joints have a staggered double grip, thus distributing the tensile strength over a wide section of the belt.

Clipper Belt Lacers are sold under a perpetual guarantee that they will be kept in perfect working order free of charge provided Clipper Belt Hooks are used exclusively in their operation.

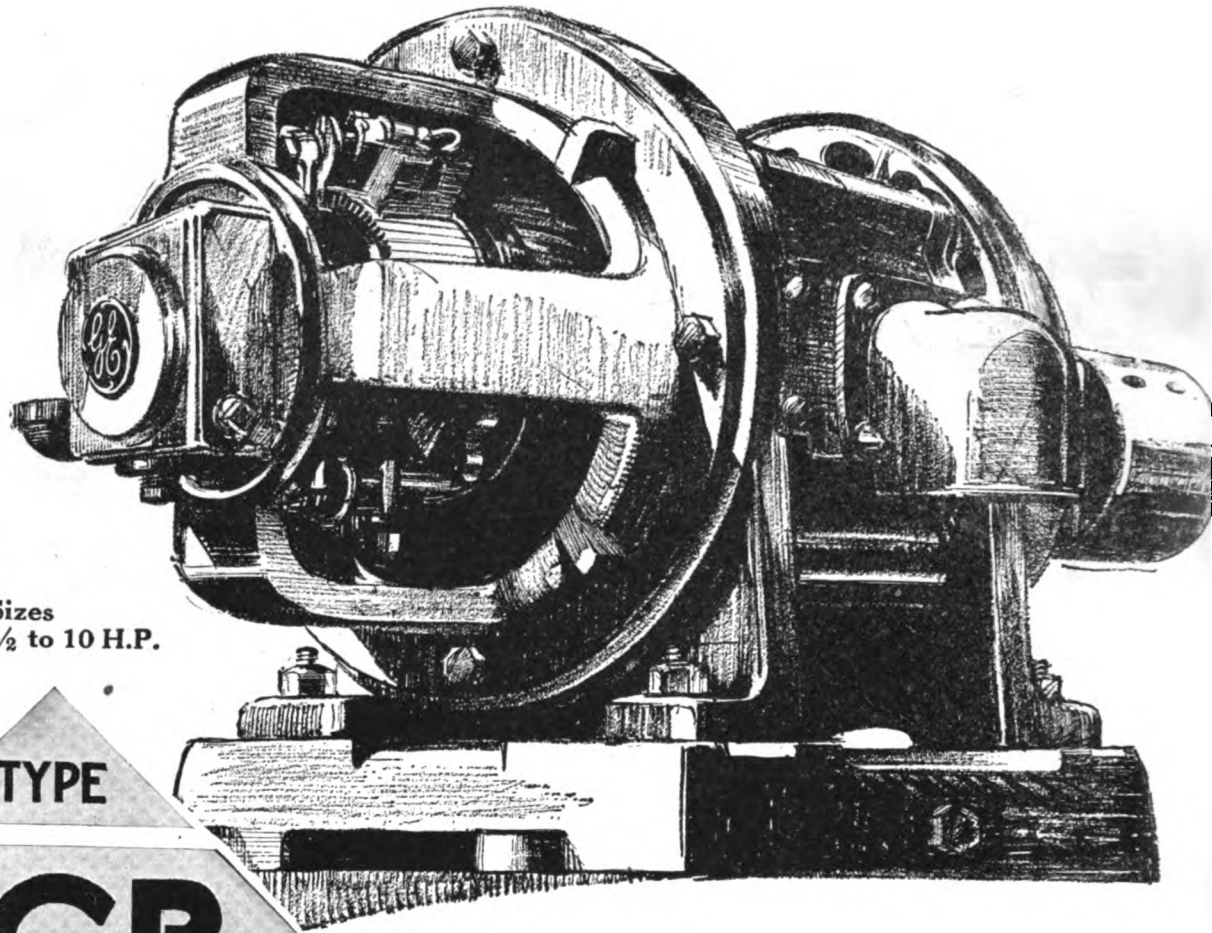
Standardize on Clipper—for increased production, economy, quality and satisfaction.

Clipper Belt Lacer Company

GRAND RAPIDS MICHIGAN

Clipper

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Sizes
½ to 10 H.P.

TYPE
SCR
MOTOR

Characteristics:

High Torque
—Start
—Acceleration
—"Pull Out."
High Efficiency
High Power Factor
Low Starting Current
Low Heating
Excellent Commutation
—Overload Capacity;
—Speed Regulation.
Quiet
—Starting
—Running
Positive operation
on low voltage

The single-phase motor you can depend upon!

If your single-phase applications require reliability in the driving motor—

If you demand "lastingness" and bull-dog tenacity on your power job—

If you want the latest and best single-phase motor—

Specify the type SCR!

GENERAL

GENERAL ELECTRIC COMPANY, SCHENECTADY, NEW YORK

For products not advertised in this issue write Industry Illustrated

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What Users Say—

Nash Engineering Company
South Norwalk, Conn., U. S. A.

February 20, 1925.

General Electric Company,

West Lynn, Mass.

Gentlemen:

Attention of Mr. Fred M. Kimball,
Mgr. Small Motor Dept.

I wish to take this opportunity to compliment the men in your organization who developed and are building the SCR motor.

The simple and practical principle of operation of this motor appealed to the writer when it was first shown to him at Pittsfield when it was being developed. From the tests I saw at that time I was convinced that the motor was far ahead of anything that we had yet seen for single phase work, and we placed an order for 1300 motors, which I believe was the first large order the General Electric Company had for these motors.

We have now had an opportunity to check up the performance of SCR motors over a period of almost two years on the severest service where the motors are started frequently by automatic control in locations where they receive very little attention. These motors have proved in every way equal to our expectations.

We have had to take care of a good deal of trouble with other types of single phase motors prior to the development of the SCR, and it is a pleasure to put out our pumps with a single phase motor which gives practically no trouble at all.

Yours very truly,

THE NASH ENGINEERING COMPANY,

President.

ICJ-wvl

EXCERPTS FROM OTHER LETTERS

"The pump that fills the new swimming pool of the Country Club is driven by an SCR Single Phase Motor and believe me when I say that this new type motor is a 'Cracker Jack.' The motor was selected too small for the job and is carrying 120% load without having a bit of trouble and with absolutely black commutation. This new motor is wonderful."

"We are using the SCR motor on our Campbell No. 1 Improved Floor Sanding Machine. We are pulling full load all the time, very often in rooms of high temperature, when the weak points in a motor very soon show up. We have been using these motors for nearly two years and have not found any weak points in them yet."

"The application to reciprocating automatic refrigerating machinery is as severe a duty as any motor can have. We have over 1,000 SCR motors of various sizes in service and have had no complaints. They start a very severe load with ease—run exceptionally cool—and are life savers of belts and the machinery in general. You have produced a motor second to none."

ELECTRIC 7D-4
SALES OFFICES IN ALL PRINCIPAL CITIES

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The New



Every Part Hardened

Ettco

Eight Good Reasons for Using the New Ettco.

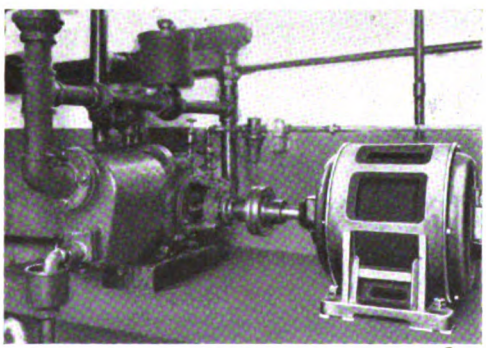
1. Lighter in weight.
2. All Hardened Body.
3. Keyless.
4. Hand Operated.
5. Ball Bearing.
6. Continuous Grip.
7. Self Centering.
8. Simple Construction

Send us your old drill Chucks. We will allow 15% on the exchange.

No. 1A	Ettco—0 to ¼ in.	$ 5.50
No. 2	Ettco—0 to ⅜ in.	6.50
No. 3A	Ettco—0 to ½ in.	9.00
No. 3½A	Ettco—⅛ to ⅝ in. ...	11.00

ETTCO Chucks Increas the Value of Your Electric Drills

EASTERN TUBE & TOOL COMPANY, Inc.
594-602 Johnson Avenue, Brooklyn, N. Y.



DIEHL ALTERNATING CURRENT MOTOR DRIVING CITY GAS COMPRESSOR

A LARGE biscuit and cracker manufacturer in New England uses a Diehl 10 horsepower alternating current motor to drive a compressor for increasing the pressure on their supply of city gas used for oven heating. When large quantities of biscuits or crackers are in the ovens the heat must be maintained at the right temperature. This is very important. This Diehl motor is depended upon for unfailing service and it has not been found wanting.

Send for descriptive bulletin—now

DIEHL MANUFACTURING CO.
ELIZABETH, N. J.
Atlanta Boston Chicago Detroit New York Philadelphia

DIEHL

BUILDERS OF ELECTRICAL APPARATUS SINCE 1888

Seeing the Other Man's Viewpoint

By E. O. Whyte

I WAS talking to the owner of a large manufacturing concern, the name of which, for obvious reasons, is withheld.

"Just why," I asked, with a confidence born of life-long friendship, "did you drop M—— from the staff?"

"M," a man of energy, resourcefulness and learning—a man whom outsiders had considered an invaluable asset, had held one of the highest places of trust in the organization—invested with the authority of hiring (and firing) a vast number of employees.

The "Big Boss" whom I was interviewing, made a deprecating gesture.

"I let him go," he answered with slow deliberation, "because he was so insufferably conceited!"

"I should think," I rebelled, "that conceit would be the last thing in the world of which one could accuse M——."

My companion smiled imperturbably.

"Well," he admitted, "it goes a little deeper than that, but I think I can prove my point. Do you know of anyone who could be more critical of others than M——?"

That fault I admitted quite readily.

"But I thought," I answered, puzzled, "that that was one reason for his success—it takes a critical man to manage a staff the size of yours!"

"Yes, it does—to a certain extent," he modified. "But when it goes beyond that extent there is something fundamentally wrong with the 'higher-up.' The man who fills that niche in my organization has to have clear powers of comprehension—clear enough to enable him to put himself in the other man's place, and see things from his viewpoint. For, after all, a man's actions depend entirely upon the point from which he views life—and an intolerant foreman smothers the initiative of every man on the force.

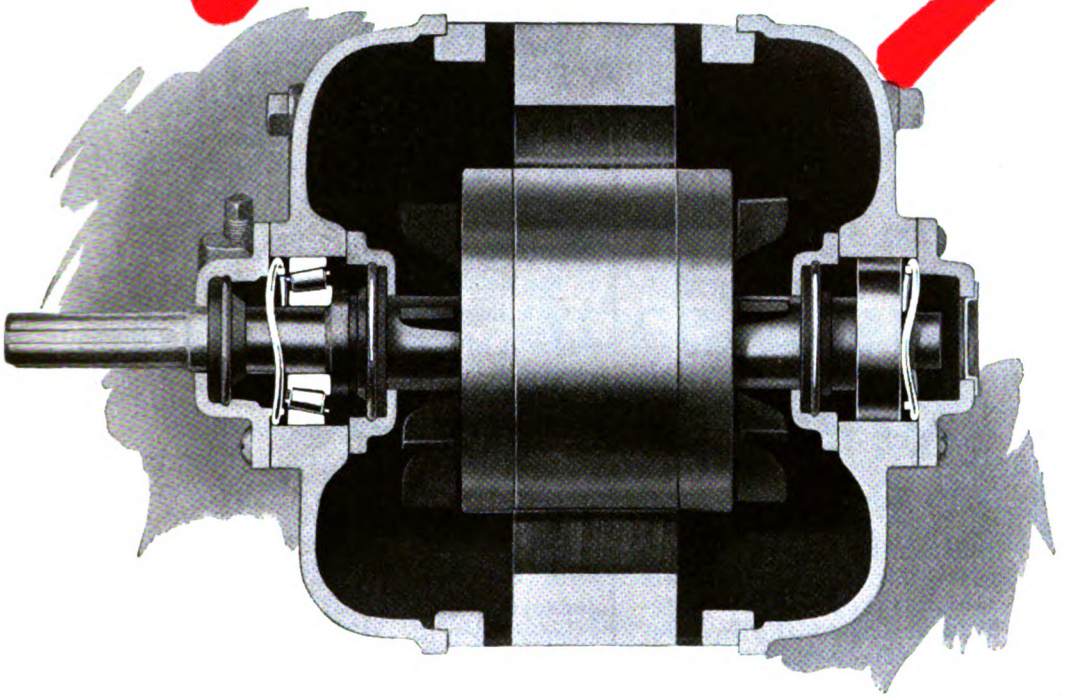
"Of course, it takes a bottomless depth of knowledge of human nature to know just when to quit being tolerant—but that is just what M. lacked. He held to his own viewpoint absolutely. He lacked the faculty of being able to project himself onto the plane of the other men. His will was just a little too inexorable. I know how hard it is to know just where to draw the line—but it's the man with a perception just a trifle finer than the ordinary one that can hold down a job like that one, anyway. Outsiders wonder just why So-and-So, who really seems quite ordinary, is so successful in his particular line—well, he happens to possess that invisible thread that so many of his fellow creatures lack."

"Just one thing more," I begged, still puzzled—"I can't see what this all has to do with conceit!"

"The man who is overly critical," came the answer, "is possessed of conceit in its lowest form—his intolerance in dealing with others, proclaims with startling clearness, the fact that he holds his own opinions beyond criticism. One cannot have such complete assurance of himself unless he is so completely lost in self-absorption that he considers himself absolutely perfect—and we don't have room for perfect people in this organization!

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Give Red Bands your hard jobs



Now—more dependable —more staunch than ever!

Howell Red Band motors, always known for their ability to master hard jobs, are now even more dependable—more staunch than ever with the new Howell Method of bearing application.

Timken Roller Bearings and ***the Howell Automatic Bearing Adjuster*** (patents pending) remove practically all chances of bearing failure, automatically keep the air gap uniform and bearings centered at all times—and the bearings will last the life of the motor.

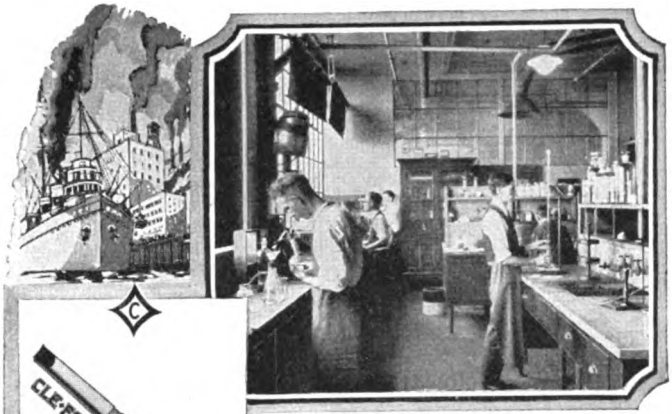
Howell Red Band Motors cost no more than ordinary motors. They are carried in stock and sold by Howell branch offices in all the principal cities.

Howell Electric Motors Company, Howell, Michigan

Howell RED BAND ELECTRIC Motors

(73)

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You Don't See This Room

when you commence to use a Cle-Forge High Speed Drill — but it's there just the same!

FOR, here in the Chemical "Lab", is done much of that careful inspection and testing of raw materials which we regard as absolutely essential to the maintenance of the "CLEVELAND" standard of quality.

And here, too, is done a part of the perpetual research and development work which makes it possible for us constantly to offer "CLEVELAND" users increasingly better tools.

Visitors frequently express surprise that we maintain so large a Chemical Laboratory — and we explain that we cannot afford to compromise the standing of our products. *They* MUST be as nearly perfect as men can make them.

The Chemical "Lab" is another of those *hidden* factors which add to production cost — but the twist drills and reamers it helps to produce have *performance* records which more than justify its extra cost.

The CLEVELAND TWIST DRILL COMPANY CLEVELAND NEW YORK CHICAGO LONDON

Manufacturers of

Carbon and Cle-Forge High Speed Drills for every purpose; "Mezzo" Super-Carbon Drills; Hand, Jobbers' and Shell Reamers; "Peerless" High Speed Reamers; "Paradox" Adjustable Reamers; "Quick-Set" Reamers; "Spirex" Machine Taper Pin Reamers; Chucking Reamers for Turret Lathes; Counterbores; Countersinks; Sockets; End Mills; and the "Ezy-Out" Screw Extractor.

What a Lost Time Accident Means to the Employer

By Hilton E. Wright

IN large industries an employe might be badly injured and still only a very small percentage of the employes working there would know of the accident. Every day in industry accidents are costing both employer and employe large sums of money. The employe loses the difference between his compensation allowed by the law and his earnings; while the loss to the employer cannot be so readily defined. The loss to the employer is made up of several items:

First, there are the fixed charges for all accidents, such as the doctor's and nurse's salaries and salary of any clerical help in the hospital; hospital maintenance and supplies, and time lost from work by the injured when visiting the plant hospital or doctor. Every time an injured employe leaves his job to go to the hospital, it represents a loss to the employer.

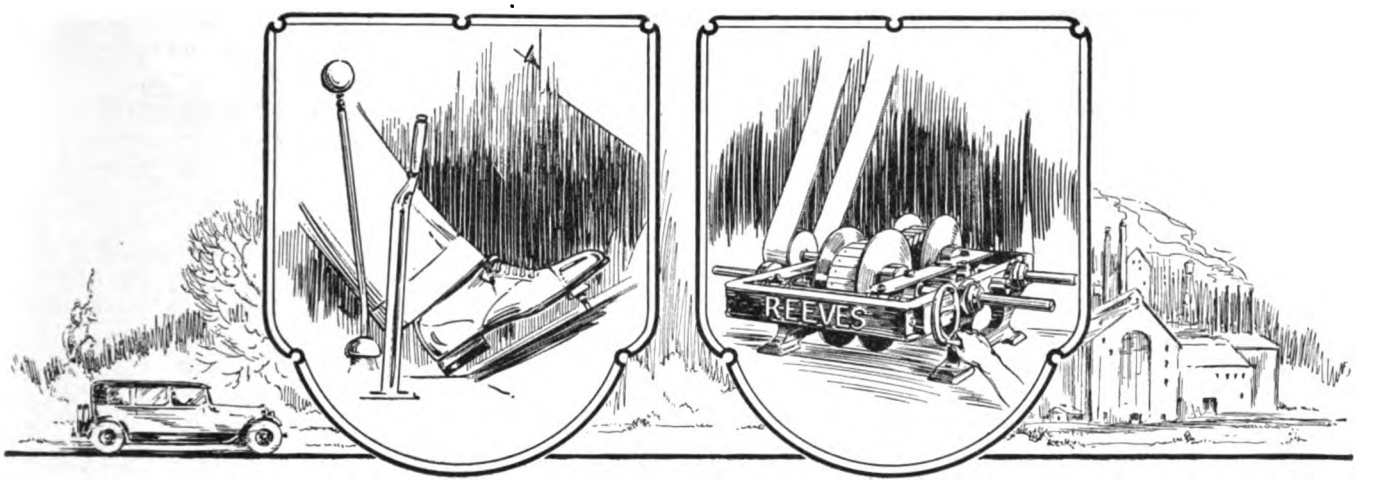
Second, there is the cost that can be charged directly to Lost Time Accidents. In this group we can include additional medical expense, doctors' bills, hospital expenses for X-Ray and board of the patient, and then the actual compensation paid to the injured employe. Some employes will feel that they are not receiving enough compensation for their injury and will make claim to the State Compensation Bureau. For this must be added the costs of adjusting claims in court, such as legal fees, witness fees and other court charges, and loss of time of employer's witness in the courtroom.

Lost Time Accidents have other costs to the employer, that cannot be so readily applied and reduced to figures. An important factor is the psychological effect an accident has on the other employes in the department. Employes will stop work and talk to one another regarding an accident. Then there is the idle machine to be considered. When an employe is injured, his machine remains idle until another employe is transferred to that machine, or a new man hired, or the injured returns. Idle equipment costs money.

Very often it is necessary to hire a new man to take the injured's machine until the latter is able to work. Here we have the usual expense attached to hiring employes. The new man must be obtained by the employment department, through some city or state or private employment bureau, or a man may apply at the office. In any instance, the new man must be interviewed by the Employment Manager. The new man must then be examined, in factories where physical examination is a requirement. He must then be instructed by the foreman, taking the foreman's time from his work. Then there is the factor of lower production because the new man is unable to produce the same quantity as the older and experienced man. The new man is subject to an increased exposure to injury because of his being unfamiliar with the work.

After first aid has been administered to the injured, the hospital prepares a report which is sent to the foreman. This requires the foreman's time to investigate the cause of the accident and fill in the report. A fur-

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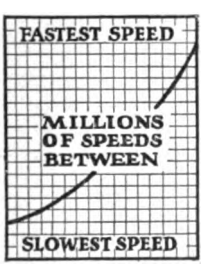
Like the Accelerator of Your Motor Car

FROM four to sixty miles an hour—you can speed up or slow down your motor car at will—just by pressing or releasing the accelerator.

From four to sixty revolutions per minute—you can speed up or slow down the production machines in your plant—just by turning forward or backward the control wheel of the REEVES transmission.

The REEVES gives a wide speed range to your production machines and conveyors just as quickly and easily as the accelerator controls your motor car. Speed-changing smoothness, hair-line accuracy, absolute speed control! You can get instantly the exact speed necessary for best production results on any machine or conveyor that is REEVES-equipped, regardless of any differences in operating conditions.

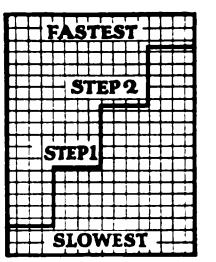
Millions of Speeds at Your Command!



Get this

ORDINARY speed changing devices give just *steps* in speed—but steps are not *exact* enough for best results. Often the speed you need is *between* the steps, and the REEVES Transmission is the only way of getting the "in-between" speeds accurately. You get literally *millions* of *speeds* with the REEVES—*any* speed between fastest and slowest, even to the smallest fraction of a revolution. Write today for catalog L-66 and full information.

REEVES PULLEY COMPANY
Established 1887
Columbus, Indiana

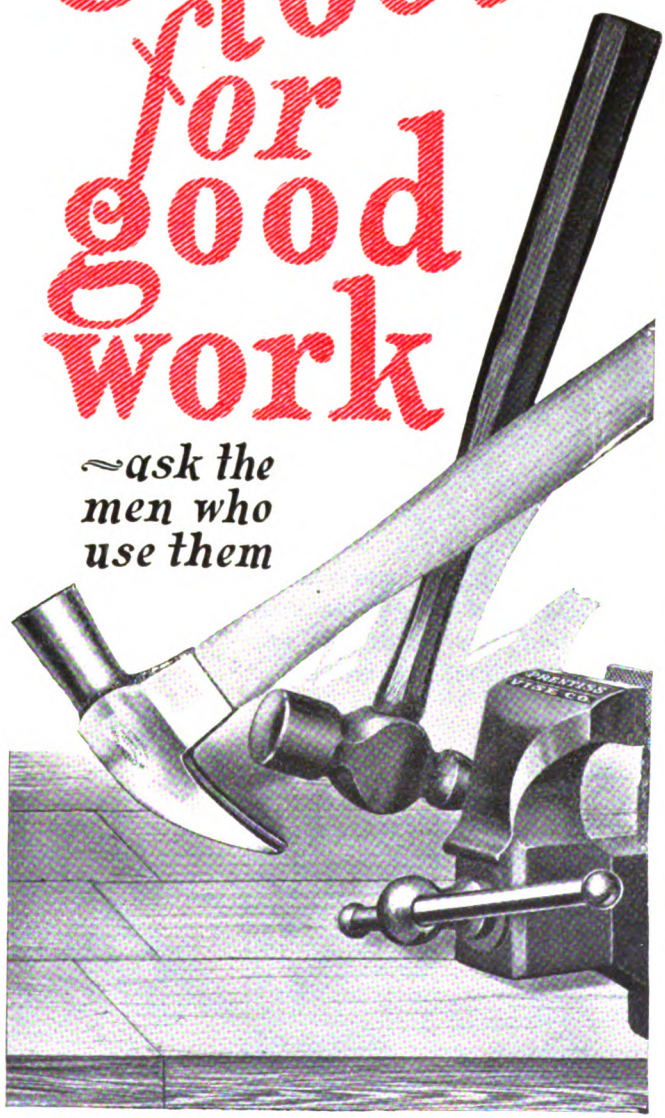


Not this

REEVES
Variable Speed Transmission

INDUSTRY COMES TO REEVES FOR ACCURATE SPEED CONTROL

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TOOL
Cheney hammers
STEEL
good tools for good work
—ask the men who use them

9020
PRENTISS VISES
PRENTISS
106 - 110 LAFAYETTE ST. NEW YORK CITY
VISE CO.
CHENEY HAMMERS

ther investigation is conducted by the office or Safety Department, to determine the cause of the accident and who is to blame, but principally to determine if a re-occurrence of the same accident can be prevented. Some accidents are of such a nature as to require investigation by the Safety Committee; or the management may require a committee be appointed to investigate. Time would have to be allowed for the committees making the inspection. This expense is warranted if an accident costing several hundred dollars can be prevented.

Another cost factor is the keeping of records required by State laws, and the adjusting of claims that do not go to court.

The cashier's time for paying compensation cannot readily be reduced to dollars and cents.

Taxes on each accident for the maintenance of State clinics is another item to be considered.

The purpose of preparing this article is that you may know how many items of expense enter into the cost of an accident, and that you may see for yourself why industry is interested in preventing accidents.

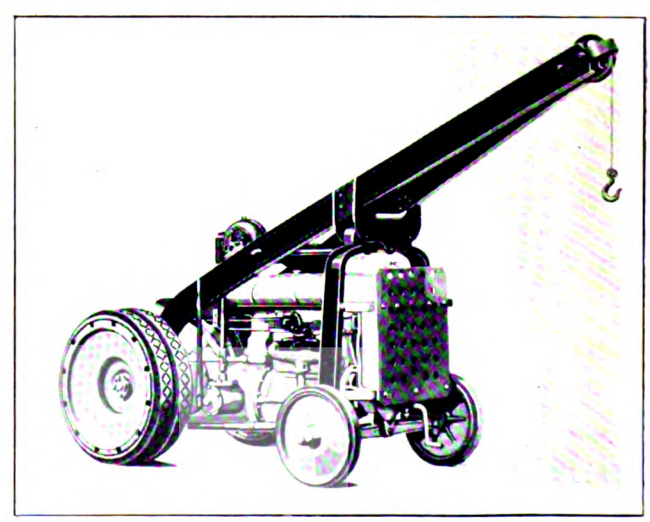
Every employer has another interest in the prevention of accidents other than the cost factor, and that may be cited as the humanitarian interest. There is no employer who is so great an executive, that an accident to one of his men does not register within him a feeling of sorrow.

New Tractor Crane

WHITEHEAD & Kales Co., of Detroit, have recently placed on the market the 1-ton Fordson Crane shown in the accompanying illustration.

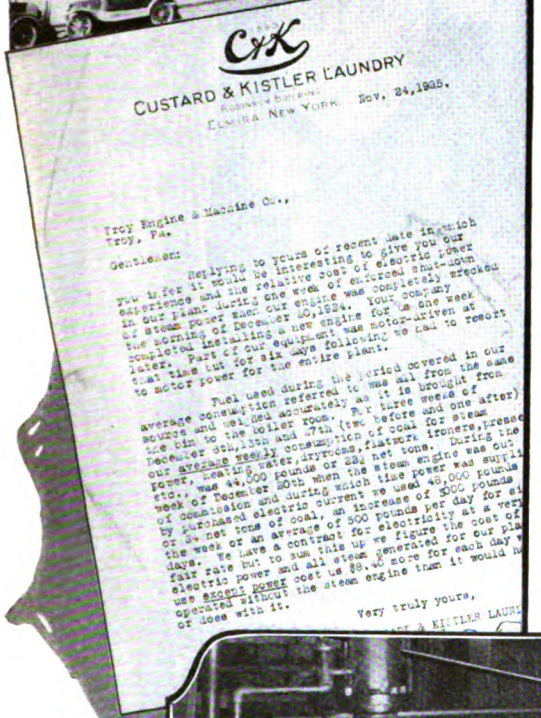
This has been developed to fill a need existing in the industrial field for a light, fast, portable crane capable of handling 1-ton loads and yet flexible enough to be maneuvered readily in congested areas.

The friction cone clutch permits a gradual application of power and a sensitive control. One lever is used both for lifting and lowering and a self-locking worm holds the load suspended at any point, doing away entirely with a brake.



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ONLY STEAM ENGINES GOOD ENGINES ONLY

Saved $2500 per Year in this Plant

This letter from Custard & Kistler is of great interest to those who use steam for heating, drying, steam generation or other industrial purposes. It proves once again that a good steam engine drive is far more economical than purchased power.

Read the letter yourself:

CUSTARD & KISTLER LAUNDRY
Robinson Building
ELMIRA NEW YORK

Nov. 24, 1925.

Troy Engine & Machine Co.,
Troy, Pa.

Gentlemen:

Replying to yours of recent date in which you infer it would be interesting to give you our experience and the relative cost of electric power in our plant during one week of enforced shutdown of steam power when our engine was completely wrecked the morning of December 20, 1924. Your company completed installing a new engine for us one week later. Part of our equipment was motor-driven at that time but for six days following we had to resort to motor power for the entire plant.

Fuel used during the period covered in our average consumption referred to was all from the same source and weighed accurately as it is brought from the bin to the boiler room. For three weeks of December 6th, 13th and 27th (two before and one after) our *average weekly* consumption of coal for steam power, heating water, dry-rooms, flatwork ironers, presses, etc., was 44,000 pounds or 22½ net tons. During the week of December 20th when the steam engine was out of commission and during which time power was supplied by purchased electric current we used 48,000 pounds or 24 net tons of coal, an increase of 3,000 pounds for the week or an average of 500 pounds per day for six days. We have a contract for electricity at a very fair rate but to sum this up we figure the cost of electric power and all steam generated for our plant use *except power* cost us $8.40 more for each day we operated without the steam engine than it would have or does with it.

Very truly yours,
CUSTARD & KISTLER LAUNDRY, INC.
(Signed) Per S. B. Kistler, V. P.

Troy Engines are good engines because they have 35 years of engine building experience behind them and they are built in a plant where engines only are the products manufactured.

Built in sizes up to 200 H.P. in Vertical and Horizontal Types.

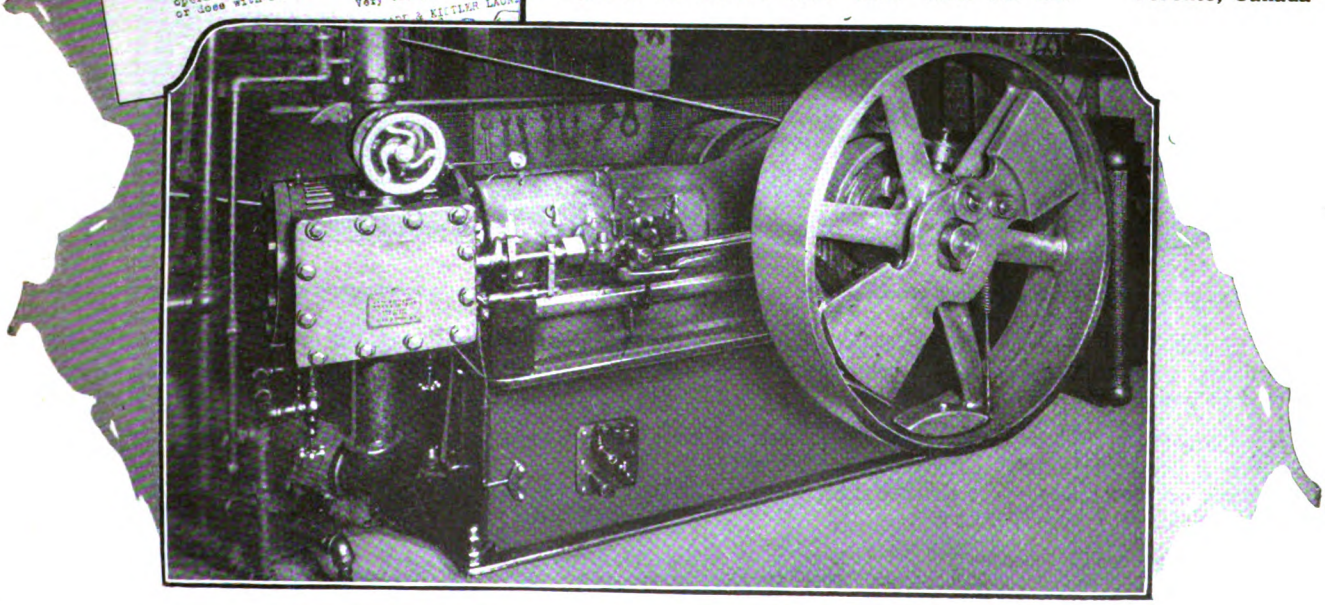
TROY ENGINE & MACHINE CO.
TROY, PA.

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Chicago, Ill.

Distributors for Canada

Riley Engineering & Supply Co., Ltd.
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Toronto, Canada

The Troy Throttling Self-Oiling Engine Type S-H is particularly adapted to stoker, fan and pump drives. See this engine at the Midwest Power Show. Booth No. 221.

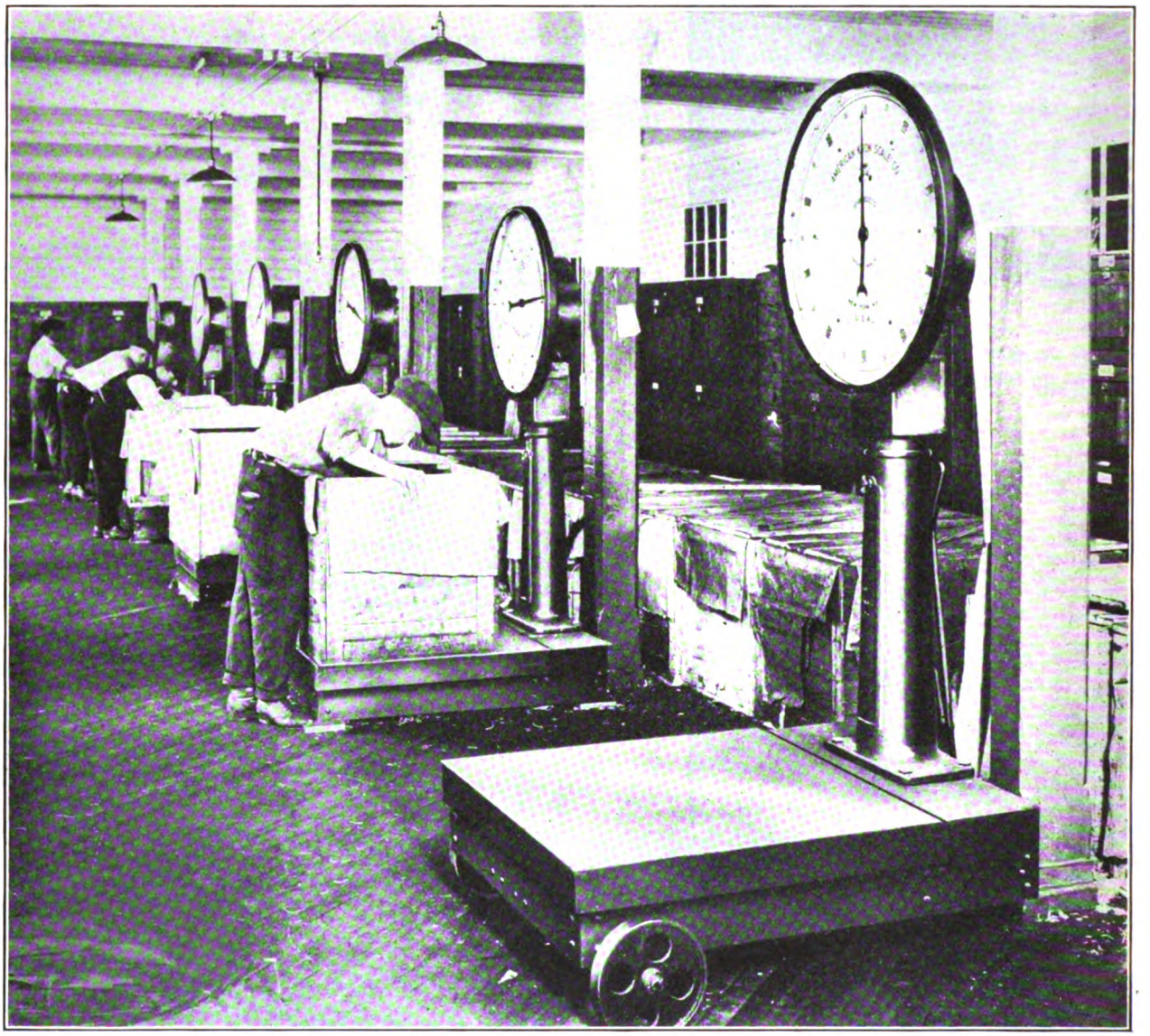


Dependable Power **TROY ENGINES** ***Absolute Safety***

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KRON SCALES

Weigh it While You Move



Fifty KRON SCALES expedite the shipping of finished products in this plant, because no time is lost in weighing.

The empty boxes are placed on the scales and as soon as they are loaded sufficiently the weights are shown on the dials. Another example of **Load and Look.**

Kron Scales will weigh anything instantly, accurately and automatically. Remarkably simple in construction—no weights to juggle—no beams —no springs. Simply load and look.

Write for a copy of our 62 page catalog describing all the various types.

KRON SCALES

The American Kron Scale Co.
430 East 53rd Street New York City

For products not advertised in this issue write Industry Illustrated

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WHITING

Electric Crane *for a Foundry Yard*

THE large foundries almost universally recognize the economies possible with a Whiting Electric Yard Crane and Magnet. Many smaller plants can also use such equipment to cut handling costs but perhaps have never analyzed all the elements involved.

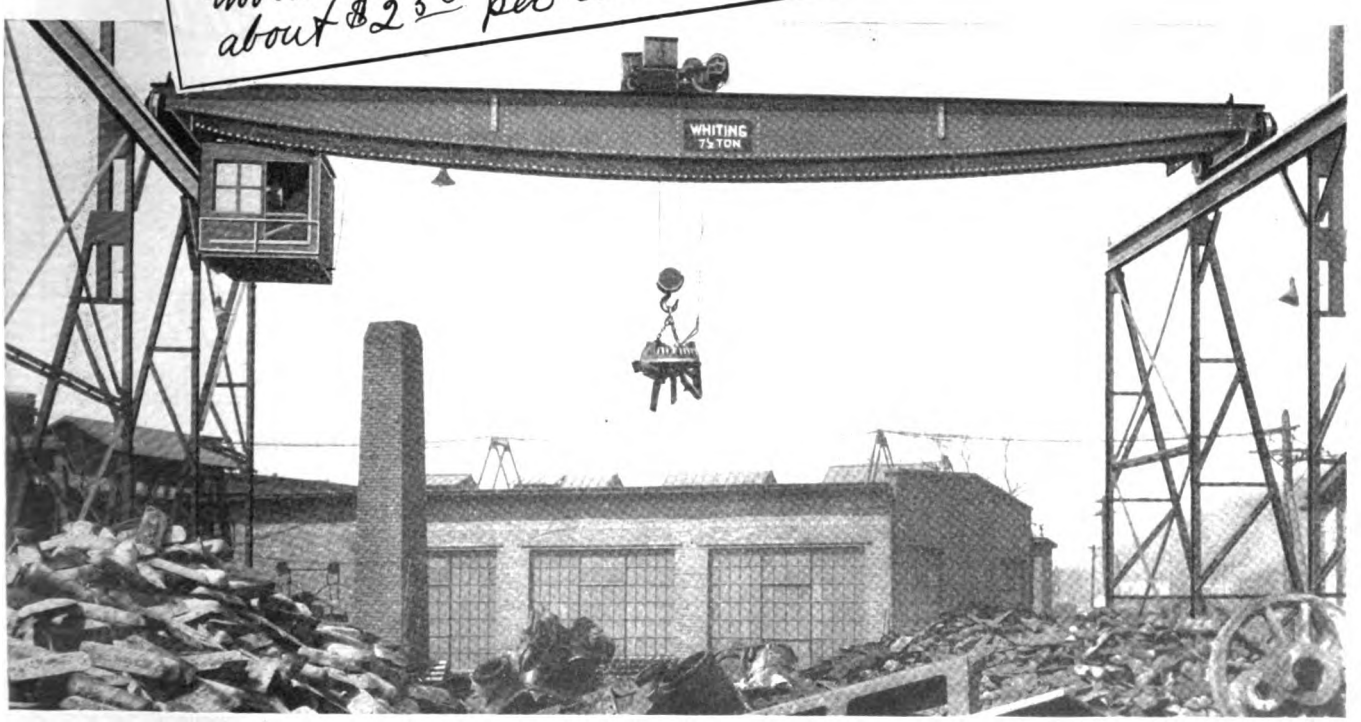
Whether you operate a foundry or have some other material handling problem, why not make a competent engineering study of your conditions? We'll be glad to put our accumulated experience in crane application at your service. No obligation involved. Catalog No. 200 on request.

Whiting Corporation
15651 Lathrop Avenue
Harvey, Illinois
(Chicago Suburb)

Leaves from an Engineers Note Book

Client -
Problem - Yard Lay Out for new 35-Ton Foundry
Assume Hand Labor for Unloading Pig, Unloading and Breaking Scrap.

Three men required at say 50¢ per hour. Time required to unload a car of pig or scrap say 6 hours. Might mean holding cars and consequent demurrage when foundry was busy. Total charge, say $19.00 for a 40 Ton car.
Assume Overhead Traveling Crane with Lifting Magnet. One man required for operating crane. 45-inch magnet can unload 40 ton car of pig in say ½ hour. Total unloading cost including labor, interest on investment and operating charges, about $2.50 per car.



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More than 100 Uses

Lakewood made the first Tier-Lift Truck.

That was in 1918. Since then improvements and perfections have been made in the truck, and myriad uses have been discovered.

Models have been developed for lifting only a few inches; others for lifting 8 ft. high. Lakewood, alone, builds *standard* trucks giving such a lifting range.

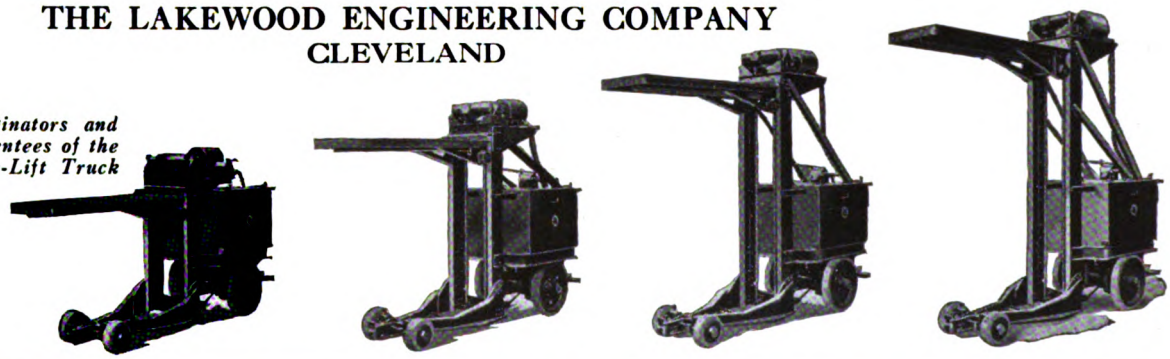
Some have platforms, others are equipped with forks, yokes, cranes, rams and specially shaped arms for lifting and carrying all kinds of objects and materials.

Models are built in 2 and 4 wheel steer, with standard or extra sharp turn. Capacities range up to 6,000 lbs.

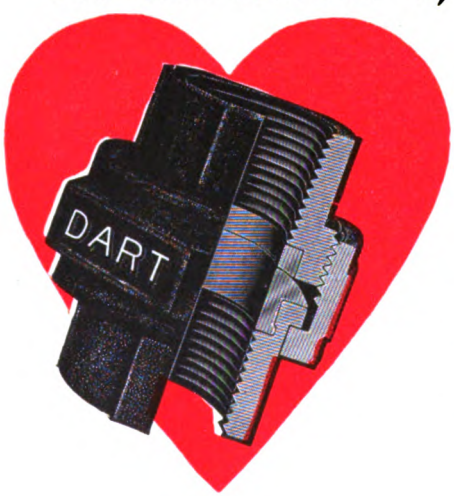
The Lakewood Tier-Lift adapts itself to nearly a hundred uses. With auxiliary appliances, such as platform skids, dump body skids and roller platforms, there are well over 100 uses for this portable power plant.

THE LAKEWOOD ENGINEERING COMPANY
CLEVELAND

Originators and Patentees of the Tier-Lift Truck



At the Heart of



DART UNOINS

you will find the reason for the long life and their ability to stand up under severe service. Here are the bronze-to-bronze seats, they require no packing, they cannot corrode.

The Dart Guarantee ~

Every Dart Union is guaranteed against defective material or workmanship—two for one.

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Providence, R. I.

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DART UNIONS

Century
TRADE MARK REG. U.S.PAT. OFF.
BRASS WORKS INC.



Sanitary Ice Cooled Drinking Fountains for industrial plants are for year around use, and particularly in hot weather they promote and maintain the efficiency of workers.

Many leading corporations are installing this type of fountain to replace circulating ice water systems. Their experience should mean much to you.

Century Fountains are equipped with the patented non-squirting, adjustable bubbler head, a great water saver. The fittings are cast brass, heavily nickel plated. The coils are made of heavy copper tubing, tinned inside and out. The water does not come in contact with the ice. No danger of contamination.

Under actual working conditions Century Coolers have been shown to require less than one pound of ice a day per person. They are made in a large variety of sizes. Let us assist you in determining the correct size coolers for your plant. Send for new catalogue, just off the press.

CENTURY BRASS WORKS, Inc.
401 N. Illinois St. Belleville, Ill.

For products not advertised in this issue write Industry Illustrated

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Check Up the Kind of Pulleys

Seems like a small matter—pulleys—but you should be careful what kind are on the machines you buy—or what kind you get for replacement. You'll find it pays to insist that the equipment be fitted with

PYOTT RED FACE PULLEYS

PYOTT
Pulleys
Gears
Sprockets
Sheaves
Flywheels

They are the recognized standard the country over as perfect pulleys. In the tight and loose ball bearing types no oil can be spattered for they are grease tight, absolutely no power-wasting drag.

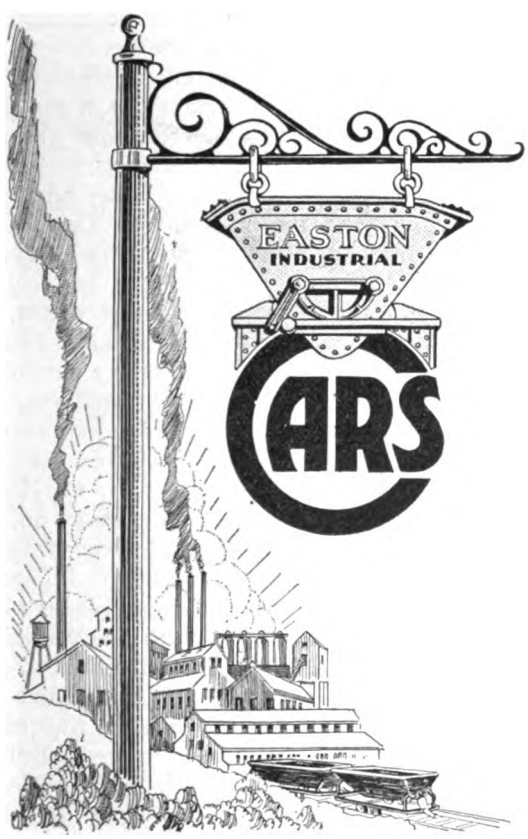
In the cast iron types the inbuilt uniformity, balance, and true-running qualities make them economical of expensive power and belts.

REDFACE PULLEYS

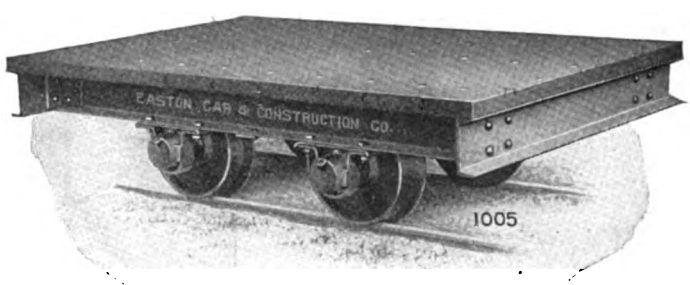
If you want better power, ask for Pyott Catalog. It's Free

PYOTT FOUNDRY CO.

332 N. Sangamon St., Chicago, Ill.



EASTON



Any capacity 1 to 100 tons
Any gauge 24 in. to 4 ft. 8 1-2 in.
Any length or width, wood or steel floor
With or without stake pockets or sides
Hand pushed or drawn by locomotive
Brass bearing or any kind of roller bearing
In fact any and every kind of platform car

EASTON CAR & CONSTRUCTION COMPANY

211 Scarritt Arcade
Kansas City, Mo.

Hilton St.
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FOR EVERY INDUSTRIAL PURPOSE

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The MORSE High Speed Forged Type Drills



with the oversize shank will meet the demand of production jobs for drills of the staunchest character

When ordering High Speed Forged Type drills specify MORSE

MORSE
TWIST DRILL & MACHINE CO.
NEW BEDFORD, MASS., U.S.A.

Morse High Speed and Carbon Drills, Cutters, Reamers, Taps and Dies sold by reliable dealers everywhere.

The Life History of a Leather Belt

By Louis W. Arny

Secretary, The Leather Belting Exchange

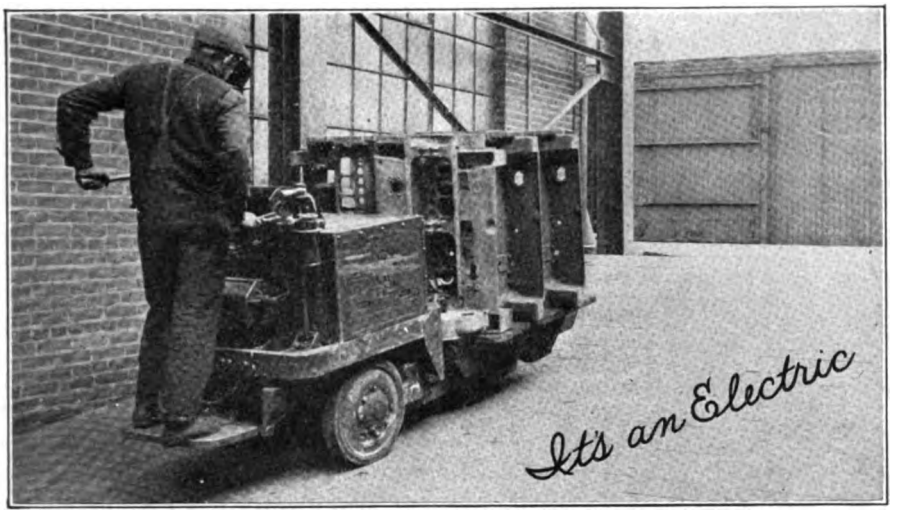
THE Bernon Mills, located at Georgiaville, R. I., now owned and operated by the Manville-Jenckes Co., manufacturing cotton goods, has contributed some very valuable information regarding the transmission of power by belting, through the life history of an old leather belt, which recently they have discarded. This belt, 130 ft. long, 42 in. wide, three ply, said to be the first wide three-ply belt ever made, was used as a main driver on a George H. Corliss double horizontal type engine, and was installed in November, 1876, and has run continuously on this drive until a few months ago, subject to the usual vicissitudes incident to such a drive. During the life of this belt there was one period of six months in 1885, when the mill was not operated (and there have been numerous periods when it made overtime), and on two different occasions it was necessary to remove the belt because of threatened high water. In 1911, when the belt had run 35 years, it was thought desirable to remove the ply which had been next to the pulley, and to add a new ply to the outside of the belt, but aside from this no other repairs have been made. A few months ago a broken main shaft on the engine necessitated the removal of the belt, which had been operating in an entirely satisfactory manner up to that time, inasmuch as the company had idle another belt of the same general dimensions, at one of its other mills, it was thought wiser to substitute the idle belt, and to bring the service of this old belt to a close, though it probably would have run several years more.

There has been discussion among engineers as to what may be expected from belts of various types, and under various conditions, but here is a concrete case where the performance of the belt has been accurately measured.

This belt runs over a 30 ft. driving pulley on the engine to a 7 ft. pulley on the main shaft. Originally it was installed to transmit 500 horsepower, with the engine operating at 45 r.p.m., but after the belt had run some years there was a demand for more power, and the steam pressure was increased, and the speed of the engine increased to 61 r.p.m., and the larger part of the life of the belt has been under the latter conditions. The belt speed is 5,740 ft.p.m., and under its normal load the driving tension is 110 lbs. per inch of width.

It will be observed that the tension on this belt is higher than that usually considered desirable, and the load carried consequently is 10% to 20% larger than that recommended by the various authorities on belt transmission. It also will be noted that the speed is very high, 5,740 ft.p.m., in consequence of which the centrifugal tension is 2,520 lbs. It also will be seen that the center distance, relatively, is very short for a belt of this size, and that there are only 13 feet between the rims of the two pulleys; also that the pulley ratio, more particularly because of the short center distance, is unfavorable, the belt driving from a very large pulley, 30 ft., to a relatively small pulley, 7 ft. Therefore, giving due consideration to the centrifugal tension, the unfavorable short center distance, the unfavorable pulley ratio, and

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THERE are times when much greater demands than usual are made upon the battery in your electric trucks. An extra-heavy load, a steep ramp—how does your battery rise to the emergency? Below, you will read what it should do.

No pause for steep ramps *or stiff loads*

WHEN there's an Exide-Ironclad in the battery box of your electric industrial trucks, they breeze right ahead regardless of steep ramps or extra-heavy loads.

They do this because this remarkable battery always carries plenty of power in reserve for the times when extra power is needed. If necessary an Exide-Ironclad can deliver current many times faster than its normal discharge rate.

Plenty of speed all day long

And best of all, after the emergency is over, this battery keeps its pep and its speed all day long, over level floors, up grade and down, through the yard.

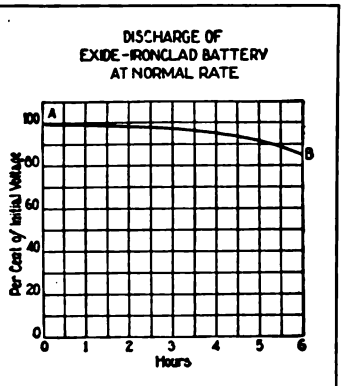
There is a good reason why this is true. The speed a battery develops depends upon its voltage. When the battery voltage is high the speed is good. The Exide-Ironclad is so constructed that its voltage keeps high right up to the end of discharge. Hence a truck driven by this battery zips along at a rapid rate all day long.

Stays out of the repair shop

You will also find that an Exide-Ironclad rarely if ever spends any time out of service. It stays out of the repair shop because it is ruggedly built. Thirty-eight years' experience in building storage batteries has taught us how best to make it that way.

An Exide-Ironclad is efficient on charge—taking current quickly, easily, and using it sparingly. Its first cost is reasonable and its life long. It will pay you to know more about this wonderful battery that has cut handling costs in so many prominent manufacturing plants. The names of just a few of these plants are printed on this page.

Send now for a free copy of our valuable booklet, "15 Points of the Exide-Ironclad Battery." It can save you a lot of money.



This chart shows how the voltage of an Exide-Ironclad does not drop 'way off as it is discharged, but remains high clear to the end of its discharge period.

Exide
IRONCLAD
BATTERIES

A few of the many companies that use Exide-Ironclads

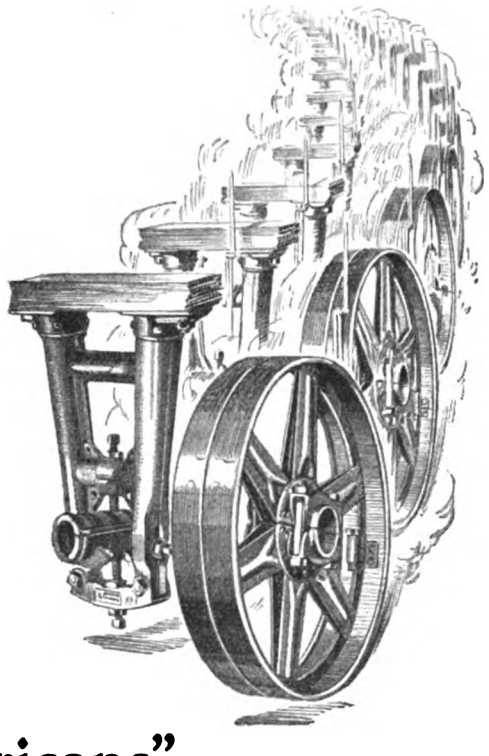
Remington Arms Co., Bridgeport, Conn.
B. F. Goodrich Co., Akron, O.
U. S. Playing Card Co., Cincinnati, O.
Cadillac Motor Co., Detroit, Mich.
Cleveland Automatic Machine Co., Cleveland, O.
Fisher Body Co., Detroit, Mich.
The National Cash Register Co., Dayton, O.
Dodge Bros., Inc., Detroit, Mich.
American Motor Body Co., Philadelphia, Pa.
Crane Company, Chicago, Ill.
J. G. Brill Company, Philadelphia, Pa.
Eagle-Picher Lead Co., Joplin, Mo.
Delco-Light Co., Dayton, Ohio
Buick Motor Co., Detroit, Mich.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

Exide Batteries of Canada, Limited, 153 Dufferin Street, Toronto

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Victrola TRADE MARK



"Americans"
help make Victrolas

WHEN the Victor Talking Machine Company began its extraordinary work of pioneering in registering and reproducing sound, it had to blaze new standards of mechanical accuracy. Equipment for its plant was selected for accuracy, reliability and adherence to uniform standards—the essential requisites for its own product.

That long ago it chose American Steel Split Pulleys to transmit power from lineshaft to machine.

Since that time the development of Victor Records and Victrolas has been a matter of continuous progress, built upon unrelenting standards.

Incessant work and unrelaxed accuracy finally brought forth the marvelous Orthophonic Victrola, ushering in a new epoch in the mastery of sound reproduction.

The new manufacturing task exacted increasing mechanical accuracy, a standard to which, however, "American" Pulleys were entirely adapted because of their balance, their freedom from excess weight and their rigid construction that transmits power smoothly and efficiently without vibration.

The American Pulley Co.

Manufacturers of Steel Split Transmission Pulleys, Pressed Steel Shaft Hangers, and Pressed Steel Shapes

4200 Wissahickon Ave. Philadelphia

Literature explaining the advantages of "American" Pulleys and "American" Pressed Steel Hangers will be sent promptly on request.

Nearest distributor listed in MacRae's Blue Book

AMERICAN
PRESSED STEEL HANGERS | STEEL SPLIT PULLEYS
PATENTED PATENTED

the heavy load, it will be seen that this belt has been operating at considerable disadvantage, and yet under these conditions it has had a life of something more than forty-eight years.

This belt cost in 1876 $1,317.03. In 1911 a new ply was added, as stated, at a cost which now is not definitely known, but which can be estimated at $600, making the total cost of the belt $1,917.03. When the belt was discarded it was sold for $300, and the total cost of the belt therefore has been $1,617.03, or a cost of $33.73 per annum, making the total cost of transmission at about 4.2c per horsepower per annum, a cost so small as to be almost ridiculous and unbelievable.

During its lifetime this belt has travelled 9,387,200 miles. Its pulleys have been large, so that the flexure of the leather has been small. At the same time, each particular fibre of this belt has flexed to conform to its pulleys some twelve million bends per annum, and during its lifetime each particular part of the belt has been bent forward and back some five hundred million times. The belt originally was made of a high quality of leather, probably not any better and possibly not so good as the best belt leather available today, though much superior to the poorer qualities, and during the last 42 years of its life it has had very careful treatment by Mr. W. H. McAbee, who has been steadily in charge of this power plant for that period, and to whom some considerable part of the credit for the long life of the belt, in its freedom from accidents, must be attributed.

To determine the depreciation which has occurred in the quality of the leather of which this belt was made, some samples of the original belt have been taken at random and tested with the following results:

Minimum strength of six specimens—1,870 lbs. per sq. in.

Maximum strength of six specimens—2,850 lbs. per sq. in.

Average strength of six specimens—2,400 lbs. per sq. in.

New material of the same high quality has a breaking strength of 5,000 to 6,000 lbs., so the material in this belt has depreciated 50% to 60% from what probably was its original strength, but its present strength still is many times the greatest tension that can be applied to it today as a belt. A striking illustration of the salvage value of the leather belt is that this belt, after it had run 48 years, was sold for $300. It has been cut up into smaller belts, and into straps, washers, etc.

This old belt, and the engine on which it runs, have outlived everybody connected with their manufacture and installation. George H. Corliss then was at the apex of his glory as the builder of the great Centennial engine, but he, and the makers of the belt, and the owners of the mill, and the engineers and superintendents in the plant, all have been gathered to their fathers, and the old belt and engine have outlived them all.

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Handling Material The Modern Way

GENERALLY speaking, Baker electric tractors, trucks or cranes will go wherever hand trucks have gone in the past, carrying 5 times the old load at 4 times the old speed.

Their economy and service-ability are shown by the fact that 60% of all Baker sales go to concerns that have already demonstrated their worth by actual experience.

THE BAKER-RAULANG COMPANY
Cleveland, Ohio

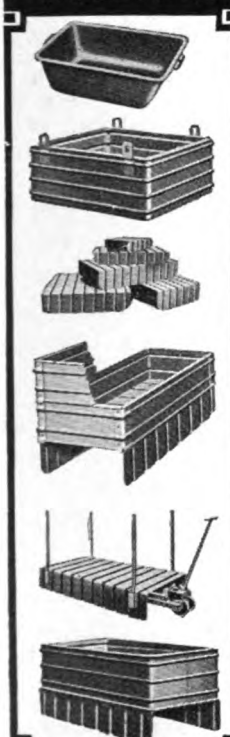
ELECTRIC TRACTORS AND TRUCKS

TRADE-MARK REG. U.S.PAT. OFF.

Baker



POWELL
PRESSED STEEL
MATERIAL HANDLING EQUIPMENT



Minimize Handling

THE cutting of one or two handling operations will not only decrease costs, but will speed production and promote greater efficiency all through your factory.

Powell Pressed Steel Equipment will help you to simplify your material handling problems.

Literature and Prices upon request.

The **POWELL**
PRESSED STEEL CO.
HUBBARD, OHIO
Suburb of Youngstown

Proving How Good a Blade Should Be



VICTOR SPECIAL FLEXIBLE BLADES

A hack saw blade that is really flexible and is able to cut tough stocks, cables, conduits, etc., cutting again and again with the same reliable keenness that is characteristic of the Victor Special Flexible Blade, proves beyond doubt how good a hack saw blade can be.

Let us send you free samples of this Wonder Blade

VICTOR SAW WORKS, Inc.
MIDDLETOWN, N. Y.

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Keeps a Perpetual Inventory of 1500 Parts and Assemblies

With the McCaskey System

BEFORE the Victor Adding Machine Company, Chicago, installed two McCaskey Registers to keep a record of their stock, they had difficulty in checking up materials at inventory time. In some cases, the physical inventory was as much as $5,000 out of the way. But since the McCaskey System has been in use, they know daily the stock on hand of over 1,500 parts. Let Mr. Peter J. Fischer, Production Manager, tell you how the McCaskey System simplifies inventory and stock keeping.

"Two McCaskey Registers are keeping a perpetual inventory and stock record on our 1500 parts and assemblies. The registers replaced our old ledger system in the summer of 1925, when greatly increased production made the old system too cumbersome.

"McCaskey gives us a quicker and more accurate method of keeping records, with the additional advantages of greater visibility. The quarterly McCaskey inventory is also more accurate than the annual physical inventory. In the January, 1926, inventory, in 40 cases where differences were shown the McCaskey record was proved correct. On one item the physical inventory was nearly $5000 out of the way.

"For inventory purposes, a cardboard master under the clip for each part shows minimum, dates, quantity, and order number of requisitions, also dates and quantity received. Three McCaskey requisitions slips are made at one writing—one each for register, stock room, and department requisitioning. McCaskey slips on material purchased outside are also written in triplicate—one each for receiving clerk, stockkeeper, and purchasing department.

"Stock on hand and received gives the perpetual inventory on each of the 1500 items. The slips indicate whether orders are filled 'partial' or 'complete,' and show unit costs for parts, and cost of assembly, labor and overhead for assemblies.

"All material requisitioning and perpetual inventory work is done by the production manager, who has more time for assisting the cost department and running down discrepancies.

"We have been well repaid by our investment in McCaskey Registers."

Get the Facts About the McCaskey System

If you will simply clip and mail the coupon, we will send you complete information about the McCaskey System. This System enables you to know at all times how much stock of each item you have on hand. It speeds up production. It cuts the time clerks work to a minimum. It reduces tool expense and eliminates petty thievery. It is saving time and money for hundreds of plants. Write for our bulletins showing how the System is used in plants in your own line. This coupon is for your convenience.

Use the Coupon

The McCaskey Register Co.,
Industrial Division 246,
Alliance, Ohio

Please send more information about the McCaskey System showing how firms have applied your methods.

NAME .....

TITLE .....

FIRM .....

ADDRESS .....

McCASKEY ONE WRITING SYSTEMS

THE McCASKEY REGISTER CO.
INDUSTRIAL DIVISION 246 · ALLIANCE, OHIO.
GALT, CANADA

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Machine Charging of Cupolas Saves Labor

One Man Handles 220 Tons Daily

PNEUMATIC charging of foundry cupolas is a recent step toward reducing labor costs and offsetting the scarcity of reliable common labor.

The accompanying illustrations are from a large midwest foundry, where four cupolas are all served by pneumatic charging machines. Two cupolas are operated per

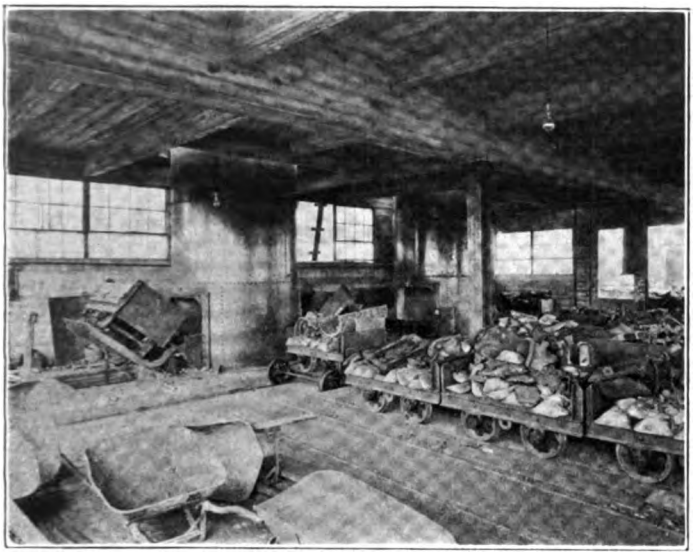


Fig. 1. The wheelbarrow gang has disappeared from the charging floor in this foundry. Note the arrangement of tracks, transfer car and pneumatic charging machine.

day and 220 tons are melted daily with but one man on the charging floor. The total charging cost per ton, including yard storage and unloading, is about 19 cents per ton of melted iron.

To secure the greatest benefit from machine charging, the entire system of receiving, unloading, storing and rehandling materials should be carefully planned so as to reduce labor to a minimum.

An ideal condition is to have the material storage yard

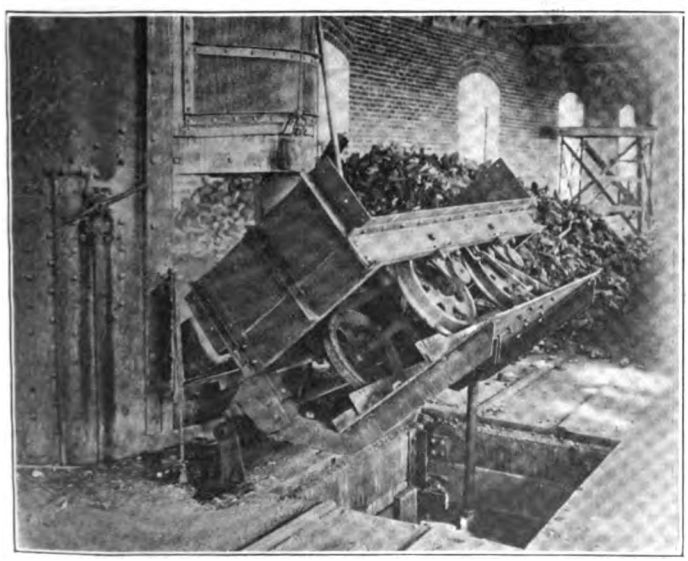
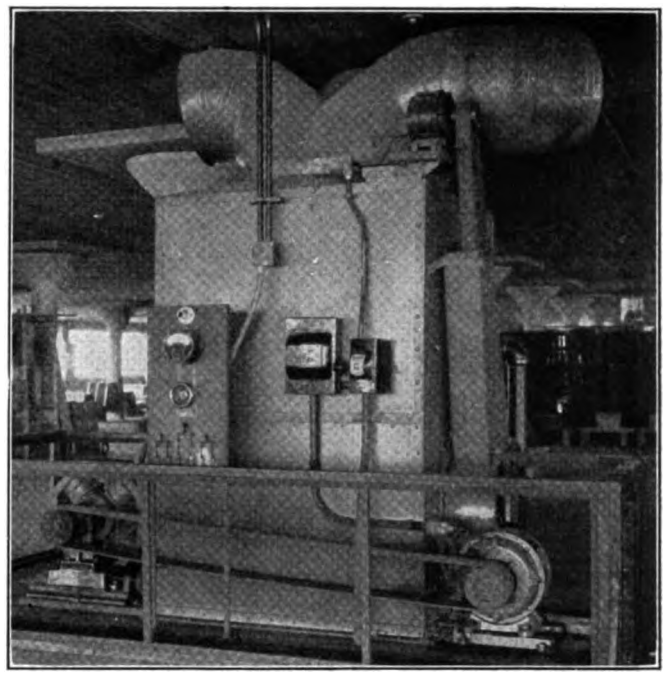


Fig. 2. This cupola charging machine works on somewhat similar principles to those employed in freight car tipping machines, the idea in both cases being to accomplish a lot in a little time.



Where Valley Motors have saved non-productive hours

EIGHTY Valley Ball Bearing Motors at the big new plant of the Columbia Can Company, St. Louis, operate line shaftings, heavy duty punch presses, elevators, blowers, pumps, heating systems, and perform a number of other duties.

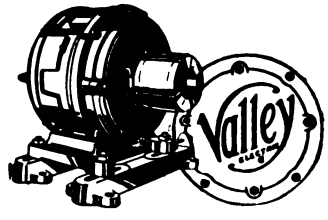
In two years this diversified installation has cost $16.00 in repairs and $4.00 for oil—an average of 8 cents a year for each motor for repairs and 2 cents a year for each motor for lubrication.

Besides saving money on maintenance, these motors have increased earnings by eliminating the expensive non-productive hours which pile up while a motor is idle for repairs.

This is only another demonstration of the fact that the delivery of continuous power with unusual operating economy is all in the day's work for Valley Ball Bearing Motors.

Before you buy or recommend another installation of motors, it will pay you to get all the facts about Valley Ball Bearing Motors. Write for Descriptive Booklet No. X.

Motor Division
VALLEY ELECTRIC CO., ST. LOUIS, U. S. A.
Branches in Principal Cities



Valley Electric

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Fatigue Is Costly!

Unnecessary fatigue cuts productive efficiency. It causes mistakes, accidents, and delays. All of which can be prevented.

Proper seating banishes mid-afternoon fatigue—preserves morning energy throughout the day. Thorough tests have convinced many executives that Do/More Chairs quickly pay for themselves in keeping workers healthier, happier and better able to maintain the pace of top production. Let us send you facts and new low prices.

WRITE TODAY

DO/MORE CHAIR COMPANY

Dept. 4 **Elkhart, Ind.**



adjacent to the cupola house and served by an electric overhead traveling crane, arranged to operate both a magnet and a singleline bucket. The main switch tracks are located so that incoming cars of pig, scrap, coke and flux may be unloaded with the crane and placed in storage.

A system of narrow gauge tracks is provided throughout the storage yard for transporting the loaded charging cars to the cupola house. Iron and coke charges are weighed up in the yard on an electric scale transfer car which transfers the loaded cars to elevator tracks.

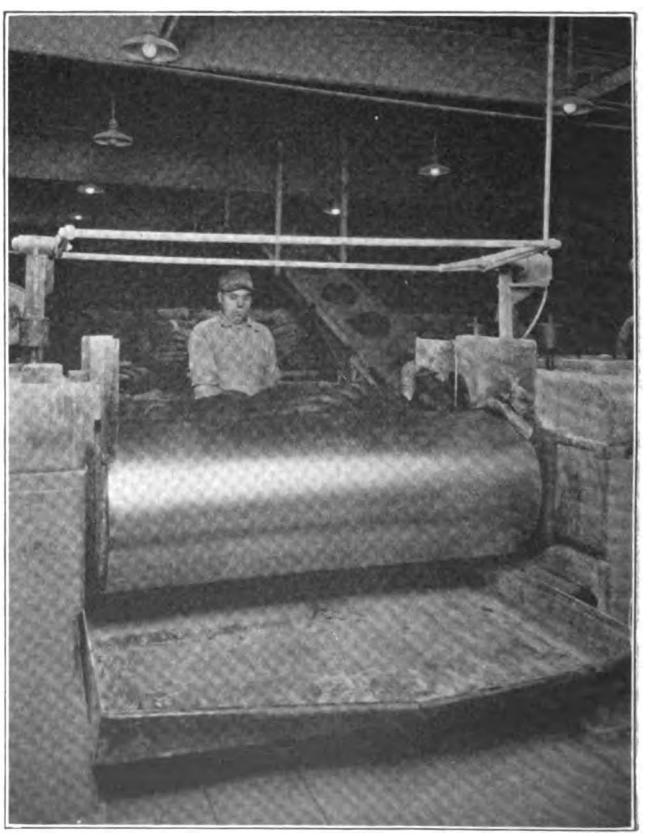
At the cupola house a suitable electric or pneumatic elevator lifts the loaded cars to the charging floor, taking back the empties when it goes down.

The charging floor is of ample size and arranged with tracks and turntable, the elevator being on the side opposite the cupolas. A transfer car in front of the cupolas and running at right angles to the tracks, allows the attendant to place the loaded cars at any point desired.

A sufficient number of coke and iron charging cars is provided and the floor made large enough to permit making up charges beforehand.

A Step in the Making of Rubber Covered Wire

THE sulphurizing mill shown in the accompanying illustration is one of the machines used in the process of working rubber at the Bridgeport plant of the General Electric Company. After the rubber has been thoroughly rolled and the sulphur added, it is cut from the roller to which it adheres, put through another



similar mill, worked, cut from the roller in strips, coiled and placed on the conveyor, which appears in the background. It then goes to the mills, where the various sizes of wire and cable are insulated.

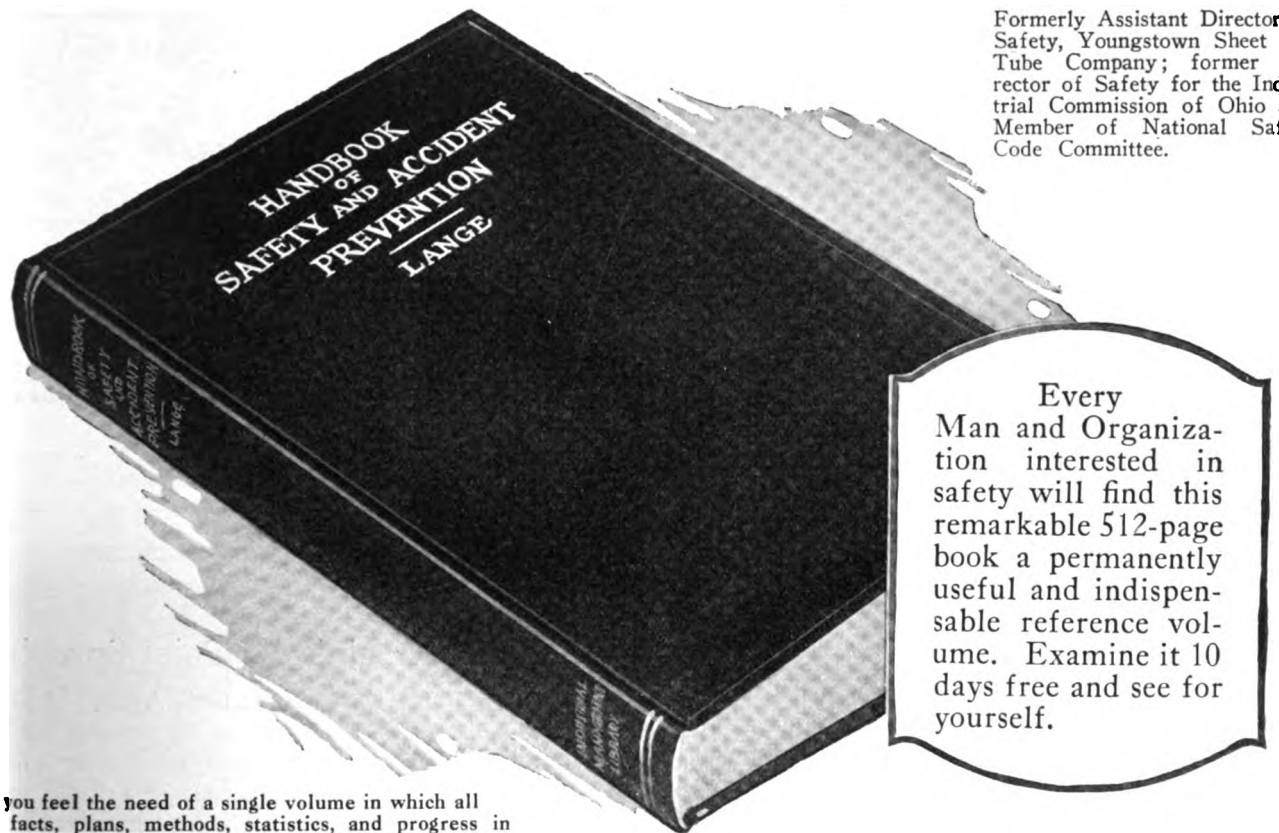
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Just Off the Press!

HANDBOOK
OF
SAFETY AND ACCIDENT PREVENTION

Written by Fred G. Lange

Formerly Assistant Director of Safety, Youngstown Sheet and Tube Company; former Director of Safety for the Industrial Commission of Ohio and Member of National Safety Code Committee.



Every Man and Organization interested in safety will find this remarkable 512-page book a permanently useful and indispensable reference volume. Examine it 10 days free and see for yourself.

Do you feel the need of a single volume in which all the facts, plans, methods, statistics, and progress in safety and accident prevention work are given? Lange's Handbook, just published, will answer your requirements —completely, thoroughly, and authoritatively.

The Only Complete Up-to-date Book on Safety

HERE at last is a book that thousands actively engaged in safety work or interested in its development have long awaited. The author with years of actual practice in safety behind him, has gathered together all the essential facts and data on safety and compressed the whole absorbing story within the pages of his book. That he has admirably fulfilled his purpose in preparing a real handbook on this all-important subject has already been acknowledged by all who have read his work. Unquestionably it will go down as a notable contribution to the safety literature of the day. The matured safety engineer will find this volume a ready and convenient reference to otherwise scattered material. Foremen, safety committee men, superintendents, and factory managers can readily learn from it all the essential elements of effective safety work. The engineer can gain from it a clear insight into accident hazards and sources which will enable him to design structures in which safety is inherent. In short, this handbook will prove invaluable to every industrial plant, whether it be a plant which has already made marked progress in safety measures or whether it be one in which little or nothing has been done in this direction. The cost of the book, $5 postpaid, cannot be considered an expense. Rather it is an investment which may easily pay incalculable dividends now and in the years to come.

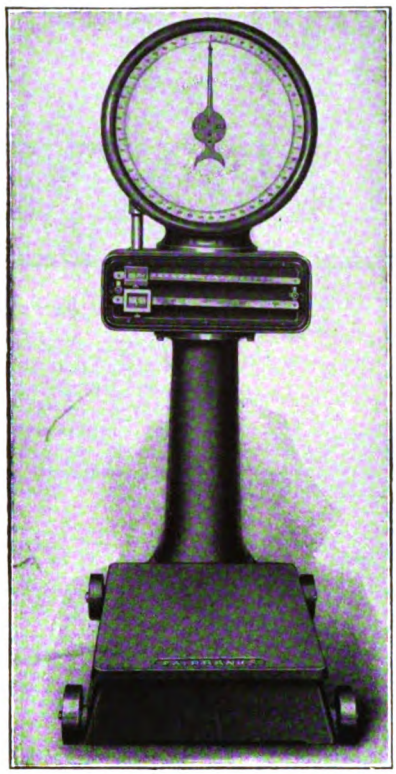
10 Days Free Examination

Before buying the book, test its value. Ask us to mail it to you for 10 days' free examination. Return it if you don't want it. Mail your check if you do.

THE ENGINEERING MAGAZINE COMPANY
120 West 32nd Street New York City

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FAIRBANKS SCALES



Accuracy and Speed in Weighing

The Fairbanks Automatic Dial solves the problem of quantity weighing with accuracy and speed. The dial is so arranged that the weight is read without additions or calculations.

Weights are read at a glance and errors are practically impossible. Fairbanks Scales represent the highest development of almost a century of specialized experience. In hundreds of applications they are giving flawless service—are speeding up production, eliminating errors, saving labor, paying for themselves in countless ways.

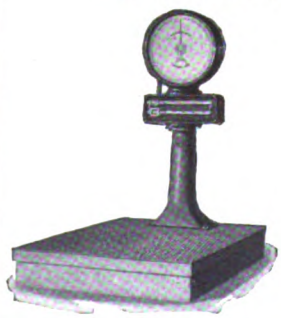
Write for bulletin information on the various types of Fairbanks Scales.

FAIRBANKS SCALES

NEW YORK
Broome and Lafayette Sts.

CHICAGO
900 South Wabash Ave.

And 40 other principal cities —each with a service station.

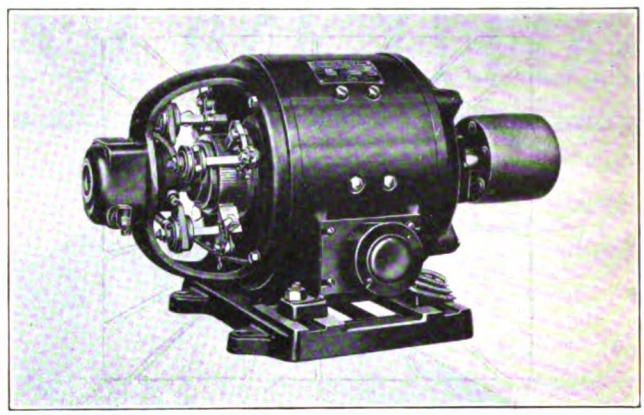


Embody 90 years of Scale Making



New Line of Direct Current Motors

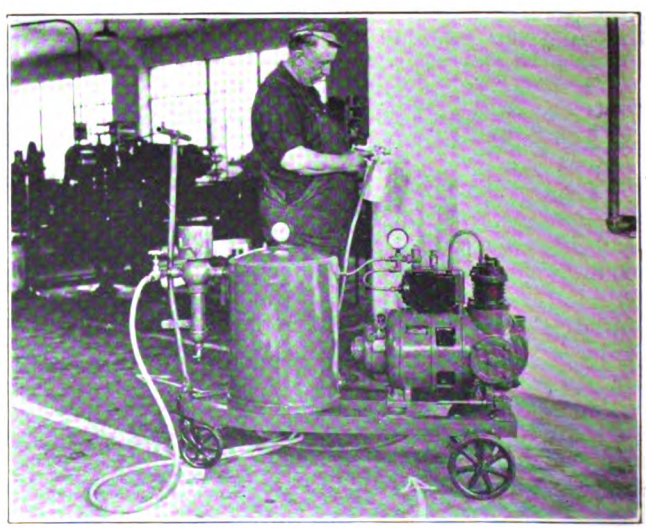
THE Louis Allis Company has developed a new Direct Current Motor, known as their type N. A. This is a per cent. rating general purpose motor with heavy overload capacity. The new series is interchangeable, rating for rating, in all essential dimensions with the Louis Allis Polyphase Motors.



Improved design and ventilation insures uniform cooling throughout the windings. The bearing chamber is designed to hold an extra quantity of oil, making frequent renewals of oil supply unnecessary. Entire elimination of oil trouble is claimed by virtue of a new design incorporated in the bearing.

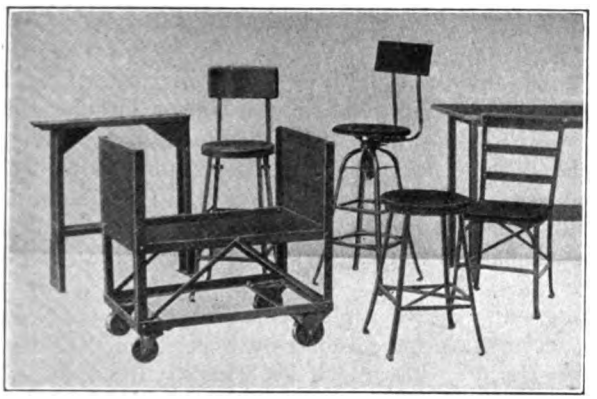
Portable Air Unit for Paint Spraying

HOBART BROTHERS COMPANY, of Troy, Ohio, have recently developed the portable air compressor unit shown in the accompanying photograph. Its capacity is 8 cu. ft. per minute with 85 lbs. per sq. in.



maximum pressure. It is especially designed for paint spray work on auto bodies, machinery, furniture, etc., and for maintenance painting of ceilings and external and internal walls.

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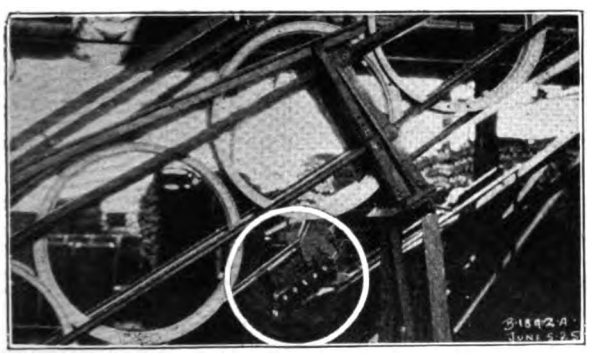
Standardize on Hughes Furniture and Equipment for Greater Production

Hundreds of large factories in every industry have now adopted Hughes Chairs, Stools, Tables, Bench Legs and Factory Trucks.

Frames of all-steel securely riveted together, they are guaranteed for long life and dependability. Hughes Shop Furniture are made to meet modern requirements and aid in giving better working conditions—thus assuring greater production. ¶ Write for illustrated catalog.

Hughes Steel Equipment Co.
Allegan, Michigan

Chairs Stools Trucks
Tables Bench legs



Counting tire rims, Firestone Tire and Rubber Co.

Cut Down Waste!

Waste cuts sharply into profits. A dependable means of reducing waste—in time, men and machines—is an accurate count of the output of each machine, each operator, daily and monthly.

Productimeters at each production unit tell you at a glance what is being done.



Send for the Productimeter Catalog and facts on how to use them for better production records.

DURANT Manufacturing Company
608 Buffum St., Milwaukee, Wis.

The Productimeter
The Speedometer of Industry



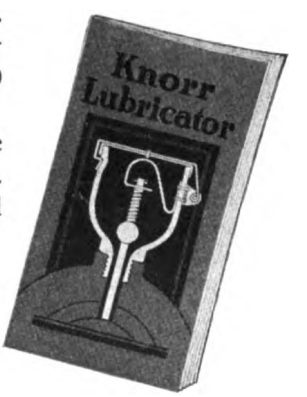
The Knorr Lubricator is placed directly over bearing. A patented metering pin extends through and rests on the shaft, screws in like an oil cup and pumps in lubricant ***only*** while machine is **running.**

Each Bearing Costs You

about $1.25 per year —You can cut this to 10 cents and less

The average bearing in your plant—on machines, shafting, etc., costs about $1.25 each annually. This includes replacements, lubricant, labor, etc. Think what it would mean to cut this to 10 cents per bearing. But that is just what the Knorr Lubricator does. One factory manager reports: "This Lubricator (the Knorr) is operating 2000 to 3000 hours with one filling. Formerly it was necessary to screw the ordinary grease cup down every fifteen minutes." . . . "It now costs $0.02¼ per bearing a year against $1.50 under the old method."

The Knorr is a sure-fire low cost lubricating system. Widely adopted as standard equipment.

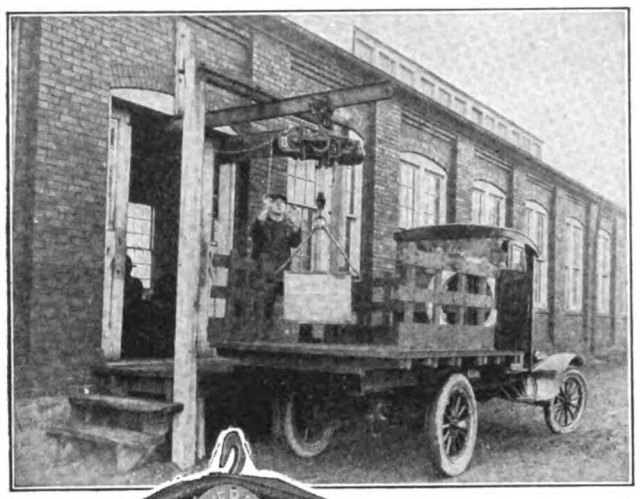


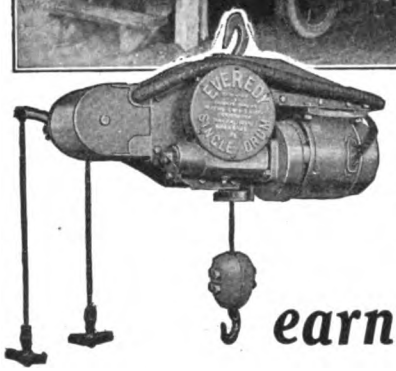
The advantage of proper lubrication is explained in this book. Write for a copy.

MALCOLM H. SMITH CO., Inc.
839 PARK SQUARE BLDG., BOSTON, MASS.

KNORR POSITIVE LUBRICATOR

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Trucks earn nothing while they wait to be loaded

The way to get the most out of your equipment outside of the plant is the same way that you get the most out of the machines inside—keep the wheels turning.

Trucks that spend hours each day standing idle while they are being loaded or unloaded are losing valuable time and much money for their owners. It is remarkable how few men study this phase of their business. Two or three laborers sweat, pull, strain at heavy loads, wasting precious hours that could be turned to more profitable investment if only a simple arrangement like that shown in the photo above had been installed. The cost is small, the saving in labor and time is valued as several thousand dollars a year.

Write today for complete information on the necessary Reading Overhead Equipment that will put your plant on a really efficient basis as regards its materials handling problem. To do this in no way obligates you.

READING C AND B CHAIN

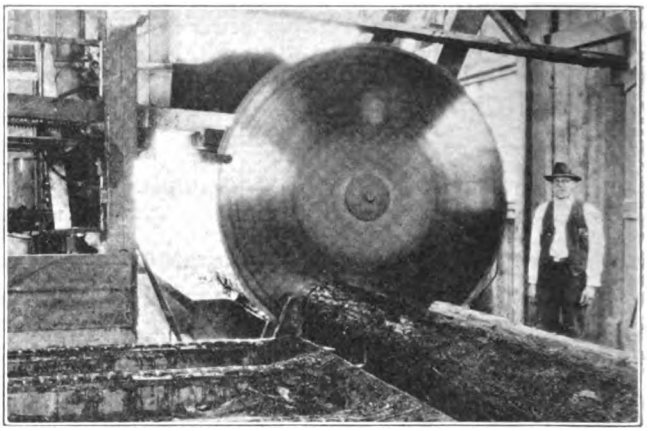
Reading Chain and Block Corporation
READING, PA.

Performance of World's Largest Circular Saws

SOME months ago we published in INDUSTRY ILLUSTRATED a description of the biggest circular saw in the world, a 110-inch Disston cut-off saw. This was installed in a new mill erected by the Weyerhaeuser Timber Company at Everett, Wash. The performance of this saw and its twin, which is used alternately with it, during the first twelve months of operation is of interest.

The big western timber companies like the Weyerhaeuser concern have found by experience that there is a very decided advantage in bringing the logs to the mill in as long lengths as possible. When the logs reach the mill they can be cut into shorter lengths by the large cut-off saws to correspond to the requirements of the mill and the orders on hand much more closely than when the mill depends on the woods sending it the lengths to fit the order.

The saving of labor in the wood also is an important item. A great deal of the cutting of the logs in the woods is done by piece work and a fair average would be 50c a thousand for bucking. It would be safe to esti-



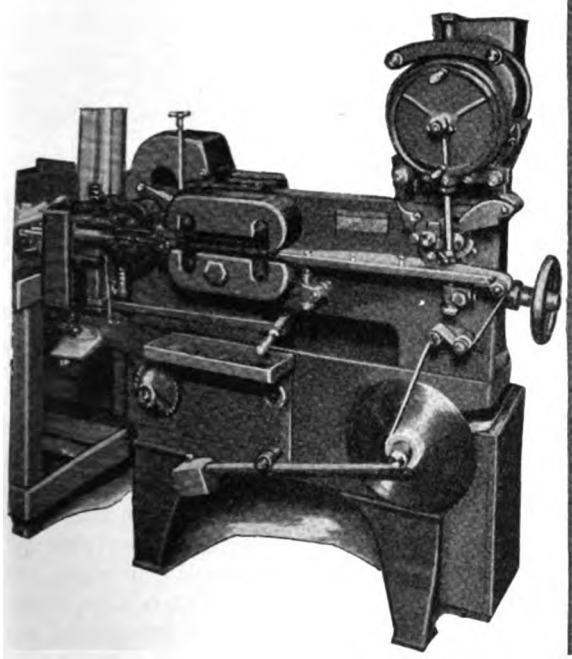
This photograph was taken while the saw was in operation, with the rim traveling at a speed of 10,000 feet a minute, and shows the saw just completing a cut through a small log. This saw cuts logs up to 40 inches in diameter and averages a cut every 50 seconds during the working day.

mate that 50 per cent. of this bucking is saved by the use of these big cut-off saws at the mill, or around $40 a day on a run of 160,000 feet. In the course of a year the saving will aggregate not less than $10,000 to $12,000 on this item alone. There is no way to figure the saving through the more economical cutting of the lumber to correspond with the orders, but it probably would be much more than that saved on the bucking.

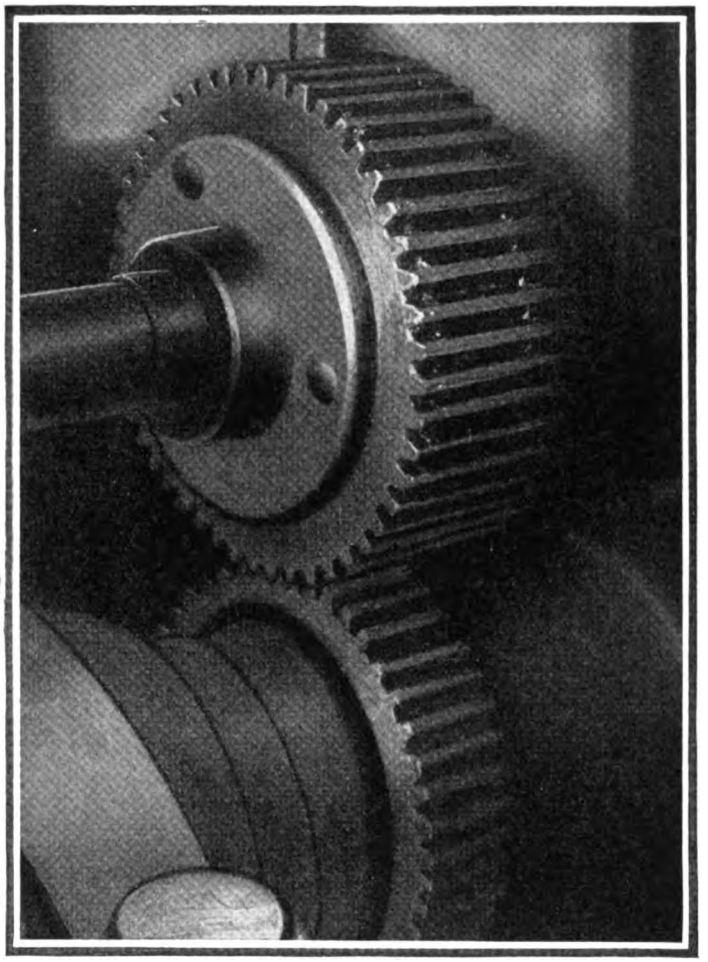
Every stand of timber on the Pacific Coast contains a certain percentage of hemlock, and in order to log economically it must be taken out with the rest of the timber, although hemlock lumber does not have the same commercial value for most purposes as that cut from other kinds of timber.

The Weyerhaeuser Company, after a thorough study of the situation, decided that the close grain and even texture of the hemlock ought to make it an excellent lumber for flooring. Tests showed that such was, indeed, the case and that hemlock flooring is superior to fir. Therefore, a mill at Everett was constructed primarily to cut this hemlock into strips for flooring.

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This Fabroil Gear (upper gear in illustration) is installed in one of the Ivers-Lee wrapping machines. Fabroil Gears have made it possible for Ivers-Lee to increase the production of their machines without adding to their operating costs.



Fabroil—the Leader

Of all non-metallic materials used for gears, Fabroil is the strongest, the most enduring, the most resilient, and the most silent.

The Fabroil Gear pictured herewith has been in service for six years in one of the Ivers-Lee wrapping machines. Says Mr. H. H. G. Schever, Chief Engineer of the Ivers-Lee Company:

> *"* *gears made of this material enable us to run the machines faster, giving us more production with no extra upkeep."*

More production at the same cost is desired by every manufacturer. Greater machine output is possible with Fabroil Gears because they permit higher pitch line speed with quietness.

Full particulars and courteous service at your nearest G-E office.

Distributors for G-E Non-Metallic Gears

Boston Gear Works, Norfolk Downs, Mass., with branches in Boston, New York, Cleveland, Chicago, and Philadelphia
Chicago Rawhide Manufacturing Co., Chicago, Ill.
Cincinnati Gear Co., Cincinnati, Ohio
Wm. Ganschow Co., Chicago, Ill.
Horsburgh & Scott Co., Cleveland, Ohio
Johnson Gear Co., Berkeley, Cal., with branches in Los Angeles & San Francisco
The Medart Co., St. Louis, Mo.
Philadelphia Gear Works, Phila., Pa.
Pittsburgh Gear and Machine Co., Pittsburgh, Pa.

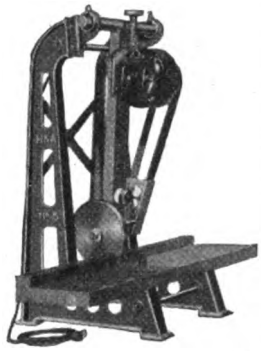
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GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN ALL PRINCIPAL CITIES

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Portable Units that Save Labor Time and Trouble



No. 5 Swinging Cut-Off Saw

You may have labor saving, production speeding machinery but if you allow any worker to saw, plane or do jointing by hand you are still wasting a lot of time and it is costing you too much in labor costs.

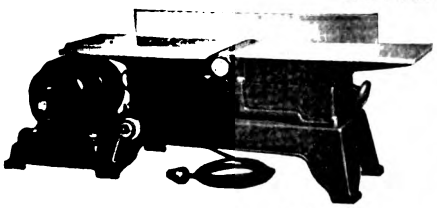
Many firms now know real economy. They have installed

H & A
Portable Electric
SAWS
and
JOINTERS

for all the woodworking jobs in the foundry, shipping rooms, pattern shops, packing rooms, machine shops, etc. They are portable, self contained units that get their power from any lamp socket. And they are very reasonable in price.

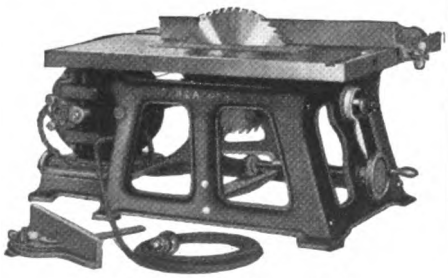


No. 1—14 inch Portable Electric Band Saw



No. 6 Portable Bench Jointer

Write for prices, descriptive circulars, etc.



No. 8 Portable Saw Table

Heston & Anderson
613 W. Depot St.
FAIRFIELD, IOWA

Saw by Power and Reduce Your Power Bill

The mill has a capacity of 160,000 feet in eight hours. It consists of a Double Cut head rig, two gangs and a band resaw. The logs are brought into the mill on a regular chain log haul, which brings them into place to be cut into two or three lengths. After cutting they are rolled onto the log deck, which has storage space for about 50 logs. An average of 355 logs a day is handled and the saw makes 500 cuts in eight hours, or a cut every 50 seconds during the working day. The logs average about 30 inches in diameter, but run up to 40 inches, hence the need for the big saws.

The saw, instead of being mounted in the usual manner, is suspended above the log and is drawn back and forth across it. Each saw weighs 675 pounds and has 190 inserted teeth of a spiral type. The rim travels at a speed of 10,000 feet a minute. The saw is driven by a 50 hp. motor, this mill being the first sawmill ever operated exclusively by electricity. Current is generated by the company at another mill and transmitted over a high tension line.

The only operating expenses are the current for this motor and the wages of one man at $5 a day. Maintenance expenses for the year consisted solely of two sets of new teeth.

There has been no time lost on account of the saws during the entire year that the mill has been operating. A duplicate saw was purchased and the two saws are used alternately a week at a time.

These two record-breaking saws were made from saw steel of special composition, free from any defects, uniform in hardness and with great tensile strength. Ingots of this steel weighing 1,310 pounds each were hammered into slabs, which in turn were rolled into plates, one for each saw. From these plates the blanks were cut. These were made ready for the insertion of the teeth, hardened and tempered, and given the correct tension for operating at the terrific speed at which they must run.

In addition to these two 110-inch saws, the Disston Company has built four 108-inch saws, which are used for cutting giant cedar logs into shingle bolts at the mill of the Eureka Cedar Lumber & Shingle Co., Hoquiam, Wash.

Rope in Short Lengths

THE Columbia Rope Company, of Auburn, N. Y., has found it a practical merchandising short cut for themselves and a customer convenience, to cut certain sizes of cordage in definite lengths, for the use of those who may have quantities of packages of the same size to tie up. The ends of these lengths are dipped in paraffine to prevent ravelling.

Patrons may indicate lengths which they desire, and standard packages are also kept on hand. This enables the patron to purchase exactly the amount of heavy twine or rope required, saves wastage and time in cutting, and disappointment as to wrong estimates. It is a short cut for factory and user.

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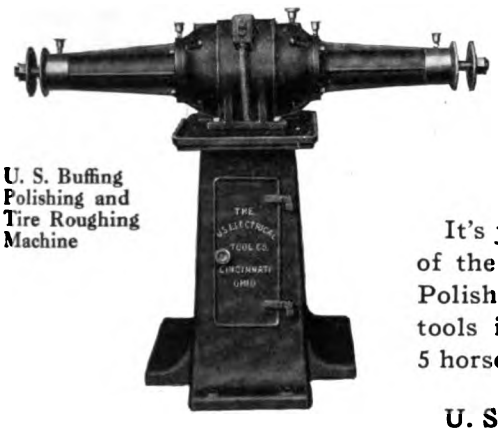


Mr. L. B. Hershey

General Manager,
Safe Padlock & Hardware Co.,
Lancaster, Pa.

Says This:

"We are very well pleased with the electrical buffing machines purchased from you, and have already placed an additional order through your local representative. Machine produces an absolute uniform speed, which, together with the smoothness of operation, results in a very accurate and satisfactory production."



U. S. Buffing Polishing and Tire Roughing Machine

PERFORMANCE

It's just such performance that has led 10 of the largest manufacturers of the country to standardize on U. S. Electrical Drills, Grinders and Polishers in the past few weeks—the oldest and broadest line of electrical tools in the world. One manufacturer recently purchased sixty-two 5 horsepower and 7½ horsepower U. S. Polishers in a single order.

U. S. Electrical Grinders and Polishers are built to withstand continuous production service under the most severe conditions. No second-class results—and no distressing shutdowns for repairs or replacements.



Imagine the performance of these machines in *your* plant: Motors of 40 degree centigrade rating with momentary overload capacity of more than 100 per cent. Four heavy duty SKF ball bearings enclosed in dust-proof housings. Heavy one-piece nickel steel spindle. Remote control which assures motor protection under all conditions—control located in base of machine, with overload cutout and no voltage release. Several other features in addition. The rugged construction eliminates vibration at all speeds—and assures long and first-class service.

Before you buy electrical tools, get a line on U. S. Electrical Drills, Grinders and Polishers.

Write for Catalog "E"

U.S. Portable Electric Drills Grinders–Polishers

The United States Electrical Tool Co.

Oldest Builders of Electrical Drills and Grinders in the World

Cincinnati, Ohio, U. S. A.

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Manufacturers' Bulletins and Catalogs

Helpful new literature for the man who selects and directs industrial equipment

Materials Handling Equipment

Catalog No. 65, containing 284 pages of illustrations and description of Materials Handling Equipment, is the Robins Handbook which has been issued by the Robins Conveying Belt Co., of 15 Park Row, New York.

Water Backs

Foster Water Backs are illustrated and described in Bulletin 261 which has been issued by the Power Specialty Co., of 111 Broadway, New York.

Power Factor Improvement, Automatic Voltage Regulators, Capacitors, and Steam Turbine-Generators

"Power Factor and Means for Its Improvement" is the title of a 33-page illustrated booklet which has been issued by the General Electric Co., Schenectady, N. Y. This is a practical treatise on power factor with the mathematics reduced to simple arithmetic. Automatic Voltage Regulators are illustrated and described in Bulletin No. GEA-123. Another booklet issued is descriptive of Capacitors. This is known as GEA-352. Curtis Steam Turbine-Generators are illustrated and described in a 44-page catalog, No. GEA-54, also issued by the company.

Shop Furniture

Shop furniture, including Pressed Steel Bench Legs, Frictionless Bench Drawer, All-Steel Bench Drawer, Adjustable Shop Tool, Tool Racks, Vise Stands, etc., is illustrated and described in a catalog which has been issued by the New Britain Machine Co., New Britain, Conn.

Portable Electric Tools

Catalog No. 32 containing 48 pages of illustrations and description of "Hisey" Portable Electric Tools has been issued by the Hisey-Wolf Machine Co., Cincinnati, Ohio.

Corrugated Pans and Pails

A 20-page illustrated booklet describing Witt Corrugated Cans and Pails for all uses, has been issued by the Witt Cornice Co., Cincinnati, Ohio.

Wrenchless Chucks and Vises

Foster-Barker Wrenchless Chucks and Vises are described and illustrated in a 16-page booklet which has been issued by the Foster Machine Co., Elkhart, Ind.

Pulverized Fuel Unit System and Forced Draft Stokers

The C-E Unit System for Burning Pulverized Fuel by the direct fired method, is described and illustrated in Catalog U-1, issued by the Combustion Engineering Corp., Broad St., New York. Another catalog issued is descriptive of Green Forced Draft Stokers, which is also illustrated, and which is known as Catalog GFD-1.

Electrical Drives and Static Condensers

Motor Application Circular 7381, containing 24 pages of illustrations and description of Electrical Drives for Power-Plant Auxiliaries, has been issued by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa. A 24-page booklet has also been issued which describes Static Condensers for power factor correction.

Buckets, Skid Excavators and Dredges

Booklet No. 625, containing illustrations and description of Hayward Buckets has been issued by The Hayward Co., 50 Church St., New York. Another piece of literature, Bulletin No. 665, which describes and illustrates Hayward Skid Excavators and Dredges, has been issued.

Electric Truck Handbook

The 1926 Electric Truck Handbook with route maps, ferry time-tables, etc., has been issued by the Automobile Bureau of The New York Edison Co., 130 East 15th St., New York. With sixty charging stations in New York City and approximately one hundred within a fifty mile radius, this book makes it easy for operators to locate the nearest electric truck garage or emergency charging station.

Bar Work

A series on Modern Tooling Methods for Turret Lathes, is contained in a 50-page illustrated booklet which has been issued by the Warner & Swasey Co., of Cleveland, Ohio. This series has been written by M. E. Lange, Production Engineer of the Company.

Pneumatic Conveying Installation

The "Dracco" Pneumatic Conveying Installation for elevating and conveying Litharge and White Lead in a paint manufacturing plant, is described in Bulletin No. 513, which has been issued by the Dust Recovering and Conveying Co., Cleveland, Ohio.

Variable Speed Transmission

Lewellen Variable Speed Transmissions and Controlling Devices are illustrated and described in Catalog No. 20, containing 32 pages. Data on performance and design are also included in this booklet which has been issued by the Lewellen Mfg. Co., of Columbus, Ind.

Self-Lowering Jacks

Duff Governor-Controlled Self-Lowering Jacks are illustrated and described in a folder which has been issued by the Duff Mfg. Co., Pittsburgh, Pa.

Air Preheater

The Ljungström Air Preheater is illustrated and described in a booklet which has been issued by the Air Preheater Corp., of 25 Broadway, New York.

Revolving Shovels

A 34-page illustrated bulletin which describes the Bucyrus 120-B Steam or Electric 4-Yard Full Revolving Shovel, for ore and rock has been issued by the Bucyrus Co., South Milwaukee, Wis.

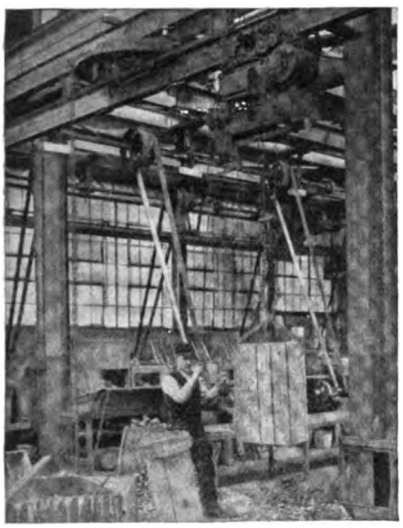
"Engineering and Management Phases of Oxwelded Construction"

is the title of a booklet which contains a series of published articles and addresses which have been reprinted from engineering periodicals by The Linde Air Products Co., 30 East 42nd St., New York.

Cutting and Welding Torches

A 12-page booklet illustrating and describing Milburn Cutting and Welding Torches has been issued by the Alexander Milburn Co., Baltimore, Md.

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Satisfied With Their 70 Euclids

In the plant of the largest manufacturers of electrical appliances in the world, 70 Euclids play an important part in maintaining their production schedules.

The following excerpt from their letter tells its own story:

"The results from the installation of Euclid Hoists, crane and conveyor, were so satisfactory that we have made similar installations in various departments."

Westinghouse Electric & Mfg. Co.

Solve your transportation problem with Euclid Equipment. There is a Euclid Crane or Hoist that will save you time, labor and money. Write today for catalog.

The Euclid Crane & Hoist Co.
103 Chardon Rd. Euclid, Ohio
Offices in all principal cities

CRANES EUCLID HOISTS



Hang it wherever you are now using a Chain Block

Light in weight, but substantial and highly efficient is this ROEPER Type "R" Hoist. It has very few parts. Spur Gear and Worm Driven, with the difficulty of adjustment between worm and gear eliminated.

It has a totally enclosed Dust Proof Frame and all parts automatically lubricated.

Capacities 500 to 4000 lbs., inclusive. Write for complete description.

ROEPER CRANE & HOIST WORKS, Inc.
1728 N. 10th St., Reading, Pa.
TRAVELING CRANES ELECTRIC HOISTS TROLLEYS

The Best Portable Watchclock

DETEX PATROL

Watchclock System

This is the latest and finest of all portable watchclock systems. Just a few reasons why:

1. So absolutely interchangeable and unlimited that one watchman could register at 100 or more different stations—or 100 or more watchmen could register at one station, in a night. (This is not possible with any other portable watchclock system.)
2. Registers numerals, letters, or any combination desired.
3. No wear on clock—practically none on recording keys.
4. Adaptable to smallest and largest plants. Grows with plant, without change.

Let us send you literature more fully describing this wonderful system

DETEX WATCHCLOCK CORPORATION
77 Varick Street NEW YORK | 4148 Ravenswood Ave. CHICAGO | 24 Beach Street BOSTON

One night of faithful watching may prevent months of non-production. DETEX Watchclocks insure faithful watching every night

Other DETEX Watchclock Systems

NEWMAN Portable—The best known and most exclusively used watchclock system in the world. 1 to 30 stations.
ALERT Portable—Ideal for plants requiring up to 30 stations. Initial cost moderate—maintenance extremely low.
ECO Portable Most accurate watchclock. Records practically to minute. Important in some cases. 1 to 20 stations.
BOSTON (Magneto Type)—For large plants desiring records of a number of watchmen on one dial. Any number can register simultaneously and each record will show separately.



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Moto Industrial Thermometer

As Easy to Read As A Clock

One glance at a Motoco Thermometer and you know the *exact* temperature. The red pointer stands out in strong contrast against the bold, black figures on the white dial.

No danger of errors in reading. No risk of damaged goods or processes gone wrong.

Even when you wish to know the temperature at a dark or inaccessible point, the Motoco can be easily read because the dial can be mounted in the light as far as 50 ft. from the sensitive bulb at the other end of the capillary tubing.

The Motoco is guaranteed to be unfailingly accurate and embodies many features found in no other thermometer.

Yet it costs about the same as glass-tube thermometers of the better grade.

Furnished with tubing or rigid stem for temperatures between minus 40° and plus 750° F.

Ask for our Catalog No. 10


Boyce Moto-Meter

The MOTO METER CO., Inc.
Industrial Thermometer Division
10 Wilbur Avenue
LONG ISLAND CITY, N. Y.

Manufacturers of Industrial Thermometers and Boyce Moto-Meters exclusively

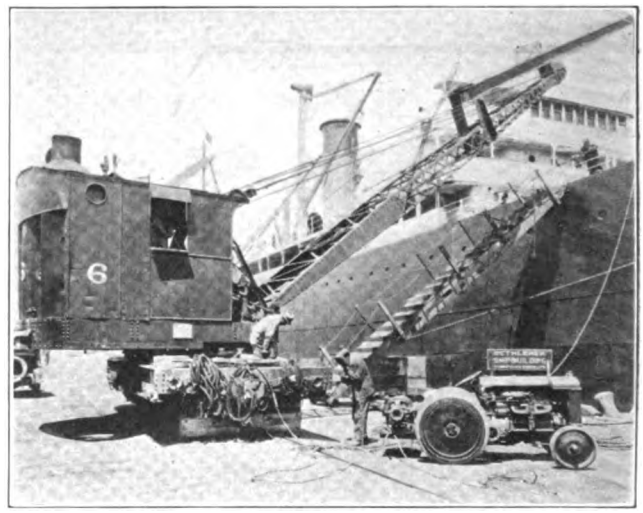
MOTOCO
INDUSTRIAL THERMOMETER

The Versatile Tractor Now Used in Ship Repairing

THE first thing that greets the eye on entering the spacious yards of the Bethlehem Shipbuilding Corporation at San Francisco is the vast area of towering steel ship frames where ocean liners are being created, from keel to mast head. It is a scene of tremendous activity and almost uncanny power. Huge traveling cranes move over their respective dry docks, carrying enormously large, heavy steel plates and beams. A veritable maze of machinery and materials are employed in this giant's workshop. Here are built and serviced crafts of every type—rowboat, barge, modern merchantman or armored dreadnaught. Equipment for every phase of shipbuilding is up-to-the-minute.

Electric welding is a major development in modern steel shipbuilding. It facilitates construction and repair work beyond estimate. Practically all electric welding must be done in the open. Only the smaller jobs can be taken to the shop. This makes the portable electric welder the preferred machine. A tractor on which is mounted an arc welder has proved highly successful in the Bethlehem Company's yards.

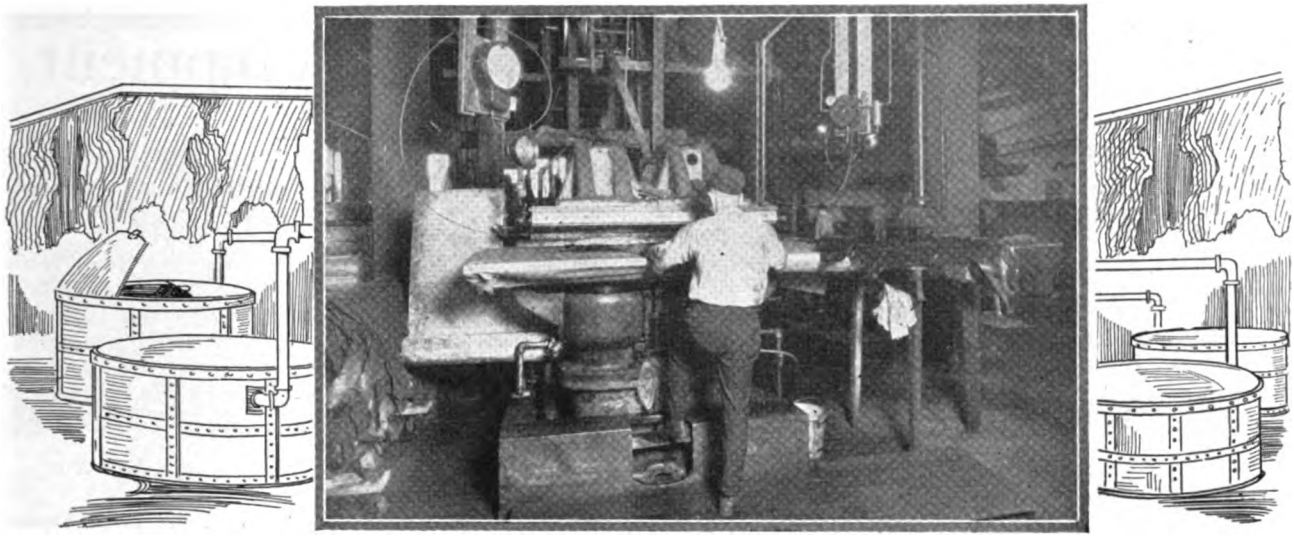
Today, when a liner arrives in port, and is in need of ordinary repairs, the tractor with the welding outfit is driven to the dock, where the ship is berthed and the necessary repairs accomplished while the vessel's cargo is being unloaded and a new one taken on. This flexibility of the tractor has been the means of saving much labor, time and money on such work. Another big feature of electric arc welding is the elimination of inflammable gases. This permits the tractor to do its work without interference on the part of wharfingers who, because of the fire hazard object strenuously to the use of gas welders on piers.



The chief advantage to the Bethlehem Company in doing welding jobs outside the plant is the mobility of this outfit. The operator drives it to the place where the work is to be done, climbs on board ship with his two lines, leaving the governor-controlled motor driving the generator which supplies the "hot juice" to the business end of the welding rod.

The same equipment, independent of any power except its own, can operate a drill, grinder and chipper simultaneously. If it is night work, it also furnishes light without interfering with other operations.

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A Variation in Temperature of 30° Reduced to 2° to 3°



Tycos Automatic

Temperature Controls for all Industries

This was one result by 5 Tycos Temperature Regulators and Recording Thermometers used on 5 hydraulic presses of a large hide and leather company in Chicago, Illinois.

These instruments were used in the final operation in the production of shoe leather—that of pressing the leather. For securing the best results, the steam heated plates of the hydraulic press should be held at a constant temperature ranging from 165 to 190 degrees, depending on the stock. If the plate is too cold work must be done over, if too hot, the quality of the leather is inferior. Before these five Tycos Instruments were installed, the temperature varied as high as 30°—now the variation is within 2 to 3 degrees.

In addition to having an absolutely uniform temperature, these Tycos Temperature Regulators and Recording Thermometers have given this company three additional advantages:

1. **Leather is turned out that is uniform in quality—an improved product.**
2. **It has eliminated the necessity of pressing any of the leather more than once—saves production.**
3. **Saves the labor cost which was required under the old method—this amounted to $936 yearly.**

This instance is a typical one. We can tell you of hundreds of others. Your factory managers no longer must worry about problems that involve temperature. Let Tycos Temperature Control regulate your heating processes. Then there will be no spoilage. Specify the temperature control that is saving management millions every year and also frees them from endless worry.

No temperature problem is too difficult for Tycos because experience from every industry has contributed to its solution. Whatever your process—there is a solution for it here at Tycos if it involves in any way the use of temperature indicating, recording and controlling apparatus. For seventy years—we have played the part of taking the control problem from the shoulders of factory management. Consult our nearest representative. There is one in every industrial center in this U. S.

Taylor Instrument Companies

ROCHESTER, NEW YORK

Canadian Plant
Tycos Building
Toronto

Manufacturing Distributors
in Great Britain
Short & Mason, Ltd., London

Tycos Temperature Instruments

INDICATING · RECORDING · CONTROLLING

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Readers' Guide to Profitable Equipment

Practical Helps for Mill and Factory Managers

Catalog and Price Lists on Steam Unions that prevent loss of steam, can be obtained from the E. M. Dart Mfg. Company. See page 88.

The Productimeter Catalog describes counting machines which aid in speeding up production. For a copy see page 99. Durant Manufacturing Co.

Descriptive Bulletins on Industrial Paints can be had by writing to the Nitrose Company. See page 116.

The "Merrick Catalog" shows how bulk materials can be weighed while conveyor handled. The Merrick-Scale Co., page 2.

"Quality Facts About Belting" contains 50 pages of belting economy. See page 68-69. Chas. A. Schieren Co.

Information on Lighting Fixtures, adjustable for any operation, is given in the catalog offered by the American Fixture Company. See page 109.

Catalog 43 Issued by the Medart Company affords a simple method of concentrating transmission machinery purchases. See page 54.

Illustrated Catalog on Positive Feed Lubricator used on all types of machinery. See page 99. Malcolm H. Smith Co., Inc.

Bulletin Describing the Portable Bench Saws and Jointers, electrically driven, is offered by Heston & Anderson, page 102.

A New Development in Factory Seating. See page 96. Do/More Chair Co.

A Free Trial Offer on Five Gallons of Skybryte and a Skybryte Brush. For coupon see page 74. The Skybryte Company.

The Hallowell Pressed Steel Bench Leg should interest every industrial executive. See page 49. Standard Pressed Steel Co.

Write for Prices on carefully machine heat treated machine screws. The Ferry Cap & Set Screw Co. See page 55.

Pyott Red Face Pulleys are illustrated and described on page 89. Pyott Foundry Co.

Brooms Expressly Built for Industrial Use are described on page 8. The Joseph Lay Co.

C-105 Is a Descriptive Booklet Offered by the Edwin L. Wiegand Company and describes heating strips for every industrial purpose. See page 65.

The New Principle Recently Added to the Howell Motor. See page 81. Howell Electric Motors Co.

The Latest System in Watchclocks. Literature describing this system is offered by Detex Watchlock Corp. See page 105.

Information on Stopping the Losses Resulting from Human and Mechanical Errors in the measurement of material is offered by The Toledo Scale Co. See page 51.

A Solution to Industrial Lighting Problems solved by Reelite. See page 111. Appleton Electric Co.

Model 20B is a Ball Bearing Electric Hoist recently brought out by the Yale & Towne Manufacturing Company. For information see page 73.

A Paper Pulley for Every Industrial Service, ready to use, is described on page 13. The Rockwood Mfg. Co.

The Quick Installation Feature of the Split Lineshaft Roller Bearing is illustrated on page 6. Hyatt Roller Bearing Co.

Fire-Proof Oily Waste Cans are illustrated and described on page 62. The Witt Cornice Company.

Catalog No. 200 shows the solution to the handling problem by means of overhead traveling cranes. See page 87. Whiting Corp.

Sheet Metal Stamping. The service offered by The Breese Bros. Co. See page 114.

Details of the Ettco Keyless Drill Chuck can be seen on page 80. Eastern Tube and Tool Company, Inc.

Bulletin No. CE719 Describes a Steel Belt Lacing that is quickly joined. See page 115. The Bristol Co.

A Paint Made Expressly for Galvanized Iron and also paints for every industrial purpose, see Inside Back Cover. Goheen Corp. of N. J.

A Vise and Machine Hammer for the Hard Work are shown on page 84. Prentiss Vise Co.

Bulletins on Various Pneumatic Conveying and Dust Collecting Systems are offered by The Dust Recovering and Conveying Co. See page 35.

Hundreds of Executives Now Realize the Economy of the "tractor-trailer method." See page 50. Mercury Manufacturing Co.

Sample Blades are Offered by Victor Saw Works. See page 93.

Five Very Interesting Bulletins on Boiler Room Economies are offered by the Wickes Boiler Co. See page 109.

"Hitting the High Spots" is the title of a book which shows ways to cut grinding costs. For a copy see page 59. Wisconsin Electric Co.

Descriptive Booklet Describing Valley Ball Bearing Motors can be obtained from the Valley Electric Company. Page 95.

Standardized Shop Furniture that Spells Economical Production. See page 7. The New Britain Machine Co.

Industrial Railway Cars for Every Purpose also portable track, switches and turntables are sold by the Easton Car and Construction Co. See page 89.

Illustrations Describing the Economical Handling of Materials are shown on page 10. The Jeffrey Manufacturing Co.

Descriptive Bulletin on Electric Motors for Industrial Use is offered by the Diehl Mfg Co. See page 80.

Catalog No. 10 Describes the Dial Thermometer, easily readable at a distance of 20 feet. The Motometer Co. Page 106.

Catalog "E" very interestingly describes an adjustable speed grinder that saves its cost in one year. See page 103. The U. S. Electrical Tool Co.

An Economical Means of Cleaning Parts is shown on page 52. Oakley Chemical Co.

A Steam Trap on 30 Days' Free Trial offered by the Sarco Company, Inc. Page 112.

Catalog No. 860 Illustrates and Describes Applications of Fans and Blowers for every kind of work. See page 109. Buffalo Forge Company.

Catalog on Boiler Feed Water Regulators. See page 64. Chaplin-Fulton Co.

An Illustrated Booklet, "More Light" on the use of factory paint is offered by the U. S. Gutta Percha Paint Co. See page 9.

The Solution to Your Paint Problem. See page 61. American Asphalt Paint Co.

A 62-Page Catalog Describing the Various Types of Scales, that indicate weights, while material is on the move, is offered by The American Kron Scale Co. See page 86.

High Speed Forged Type Drills with the oversize shank are described on page 90. Morse Twist Drill Co.

High Speed Drills for high speed production. See page 82. The Cleveland Twist Drill Co.

Seventeen Degrees of Black and Three Pencils for Copying are manufactured by the American Lead Pencil Company, makers of Venus Pencils. See page 115.

The "Quickfix" Booklet gives the solution to an important problem in the repair of factory floors. See page 115. The Master Builders Company.

The Inside Story of the Jacobs Chuck is illustrated on page 57. Jacobs Manufacturing Co.

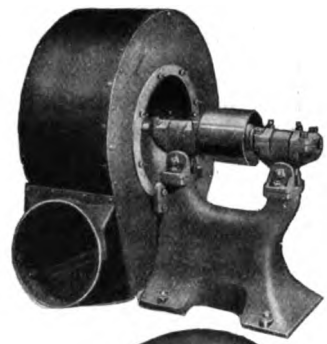
Information on Chrome Vanadium Wrenches. Bonney Forge & Tool Works. Inside Front Cover.

Lubrication as a Means to Reduce Production Costs is explained in a book entitled "Lubricators for Industrial Ma-

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Production costs can be lowered this way





In striving for lower production costs, do you take into consideration the economies that can be effected in the operation of "non-productive" equipment?

Have you checked up on the cost of operating blowers and exhausters in your plant, and do you know whether or not you're paying an exorbitant price for their service? Are you entirely familiar with what can be done with air in your plant, if it is properly harnessed?

Many large concerns find that undreamed of economies follow the overhauling of their exhaust systems. By installing efficient reliable



"Buffalo" fans and blowers



they move materials quickly and effectively at low cost.

Our experience in adapting fans to the requirements of thousands of users is yours for the asking. Just a line stating your particular problem and we'll gladly make recommendations and quotations on the necessary equipment. If you are interested in our entire line of fans and blowers ask for catalog No. 860.

BUFFALO FORGE COMPANY

440 Broadway, Buffalo, N. Y. In Canada—Canadian Blower & Forge Co., Ltd. Kitchener, Ontario



For

Delicate Hand Operations

Concentrated Light Is Necessary—



"American" patented full universal joints used on all connections in the arm.

American Lighting Fixtures permit of adjustments in any position so that the light plays directly on the work performed.

The reflector diffuses a soft, steady, non-glaring light, easy on the eyes and ideal to work with. Spoilage of products is thus greatly reduced.

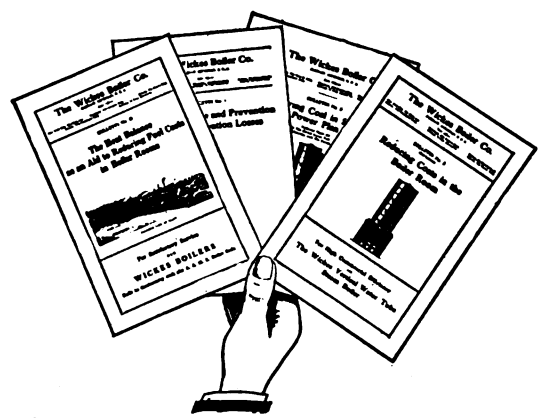
American Fixtures are used by some of the biggest plants in industry.

Write for complete information.

American Fixture Company

230 West Water Street Milwaukee, Wis.

REDUCE Boiler Room Costs!



Let these Bulletins guide you to economy—they are free—send for them.

THE WICKES BOILER CO.

Saginaw Mich.

See us at the "Power Show" Booth No. 479

Us the Coupon!

Gentlemen: Without obligation on my part I would like to read your helpful bulletins for reducing boiler room costs.

Bulletin 2. The Steam Boiler Analyst.
Bulletin 3. Reducing Costs in the Boiler Room.
Bulletin 4. Magnitude and Prevention of Air Infiltration Losses.
Bulletin 5. Saving Coal in Steam Power Plants.
Bulletin 10. Heat Balance as an Aid to Reducing Fuel Costs in Boiler Rooms.

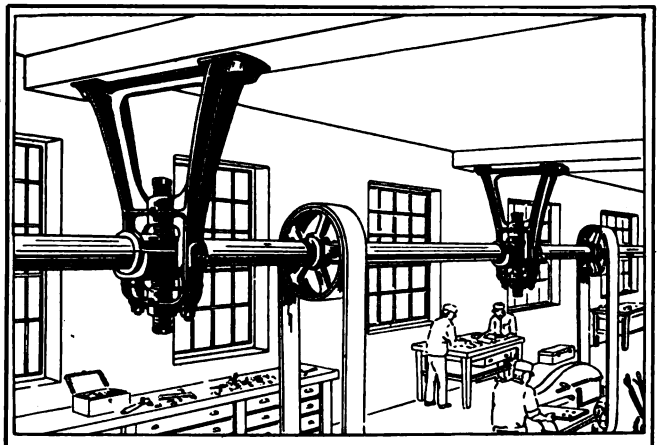
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That Hanger Overhead

Faithful, enduring, that hanger overhead gives continuous uninterrupted service requiring a minimum of attention.

Hangers are put up to stay up. Considering the length of service of a good hanger, the cost, spread over a period of years, is negligible.

Universal Giant Cast Iron Hangers are made to endure. They are ever-lasting. Once installed, they perform the tasks assigned them without trouble or attention.

Day in and day out, year after year, you'll secure satisfactory service from your power transmission if you specify the U. G. Line.

The Universal Giant Hanger provides cast iron permanence, strength and safety. Unique features of U. G. Hangers include the ball and socket movement of bearing that, combined with a most satisfactory method of vertical and lateral adjustment within the frame, permits automatic alignment of shaft.

Universal Giant Hangers are carried in stock by dealers in principal cities. There is one near you. On that next order, call him up.

Manufacturers of Power Transmission Machinery Since 1857.

T. B. WOOD'S SONS COMPANY
Chambersburg, Pa.

Cast Iron Hangers and Pulleys, Flexible Couplings, Friction Clutches, U. G. Short Center Belt Contactors—a complete line of Power Transmission Appliances.

CAMBRIDGE, MASS. **GREENVILLE, S. C.**

"You will find a welcome in Booth 415 at the International Textile Exposition and Boston Power Show, Boston, April 12-17."

chinery." For a copy see page 34. McCord Radiator and Manufacturing Co.

A New Bulletin Covering Roller Bearing, Steel and Wire Loose Pulleys is offered by the Dodge Manufacturing Company. See page 45.

Fabroil Pinions and Textolite Gears are now used in a wide range of industrial applications. For a description of these see pages 78-79-101. General Electric Company.

"15 Points of Exide-Ironclad" is the title of a booklet on Storage Battery Information. See page 91. The Electric Storage Battery Co., Philadelphia.

Catalog 21 Describes Some Valuable Suggestions for Steel Lockers. See page 71 Durand Steel Locker Co.

Booklets Describing Temperature Control are offered by Taylor Instrument Companies. See page 107.

A Bulletin on Accurate Weighing with Speed is issued by the Fairbanks Co. See pages 64-98.

A Catalog Describing Aerial Transportation Systems can be obtained from the Euclid Crane & Hoist Co. See page 105.

A Steam Trap on a 90 Day Trial also catalog. Offered by the Armstrong Machine Wks. See page 60.

A Booklet Describing Steel Bound Hand Trucks. See pages 64-98. Fairbanks Co.

Illustrated Catalog on Pneumatic Tools for all requirements. See page 113. Independent Pneumatic Tool Co.

A 52 Page Booklet entitled "Book of Illustrated Economies" shows savings in handling costs in every industry. For a copy see Back Cover. Shepard Electric Crane & Hoist Co.

The Bulletin, "Conveyor" shows many ways of coal and ash handling. See coupon page 47. Chain Belt Co.

A New Catalog on sanitary ice cooled drinking fountain. See page 88. Century Brass Works.

Catalogs Showing the Complete Line of Materials Handling Equipment are offered by the Link Belt Co. See page 120.

A Tier-Lift Truck with more than a hundred uses is described by the Lakewood Engineering Co. See page 88.

"Formula 269" is the name of a new cleaner for every industrial purpose, particularly windows. See page 117. The Gerson-Stewart Corp.

Catalog L-66 is a treatise on absolute speed control of production machinery. See page 83. Reeves Pulley Co.

A Motor with an Abundance of Reserve Starting Power. For details see page 96. The Master Electric Co.

A Factor in Preventing Shut Downs, Depreciations, and Power Losses in Machinery. See page 5. Timken Roller Bearing Co.

The Details of Construction of the Master Wire Wheel and Adapters. See page 75. The Osborn Manufacturing Co.

The Portable Elevator with the Governor Control. Barrett-Cravens Company. See page 66.

An Overhead Hanger that Combines the Most Satisfactory Method of vertical and lateral adjustment within the frame. See page 110. T. B. Wood's Sons Company.

20 to 40% Saved on Cleaning Costs. See page 56. Invincible Vacuum Cleaner Manufacturing Co.

A Two Year Guarantee Against Repairs. Also Catalog A-12 is offered by the Davis Engineering Corp. See page 55.

A Book on the Latest Milling Methods showing the experiences of over 50 users is offered by the Cincinnati Milling Machine Co. See page 15.

A Conveyor Belt that Handles Larger Tonnage than the Specifications Call For. See page 14. United States Rubber Co.

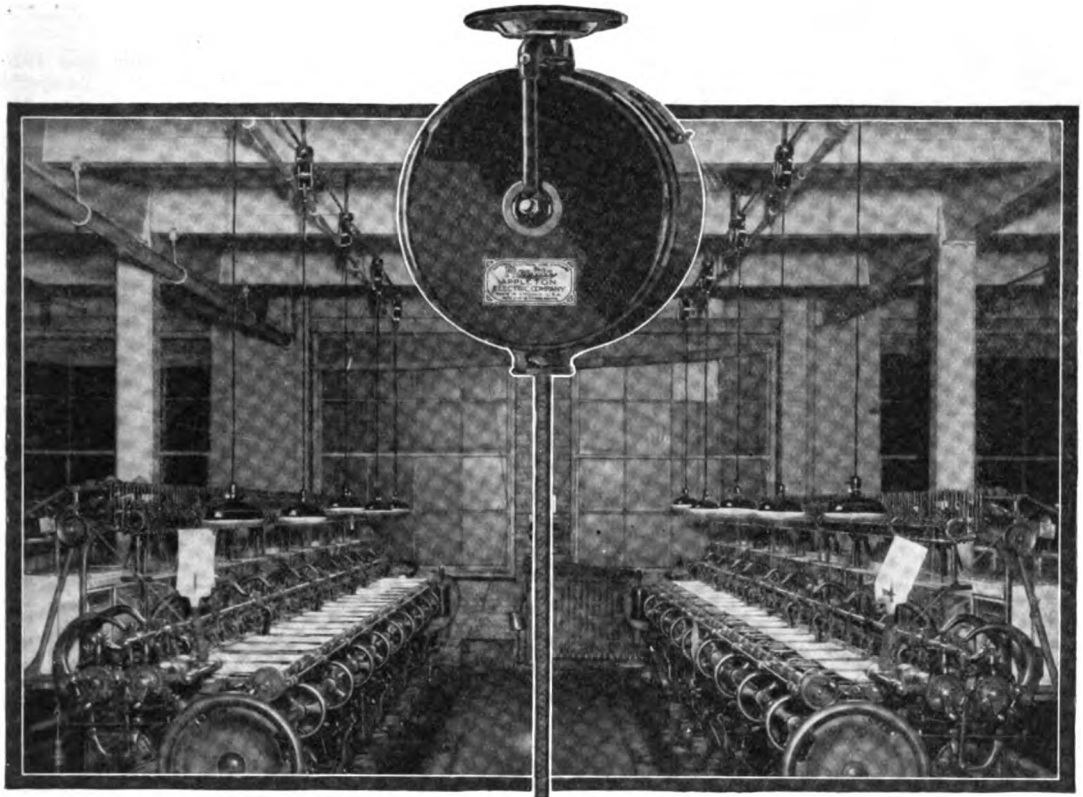
A Handy Catalog Describing a Vise with exclusive patented features. See page 72. The Charles Parker Company.

Lubrication of Machinery, an important factor in modern industry. See page 43. F. S. Bowser & Company, Inc.

An Economical Painting Method for Large Surfaces. See coupon. Page 63. The Vortex Manufacturing Co.

Steel Furniture Means Better Working Conditions in Modern Industrial Plants. For a catalog describing high quality

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200 Reelites protect Everwear Hosiery against imperfections

TINY needles, shuttling back and forth at terrific speed, are always clearly visible to the watchful eye of the operator.

Imperfections are readily seen when they occur—a flood of light is brought down *to the job* by means of Reelites.

Every machine gets perfect light yet the individual lamps are adjusted to exactly the right height so that whether the operators are short or tall the light never shines in their eyes.

Efficient light, light on the job but out of the operators' eyes, light that can be moved up or down at a touch, portable light that keeps its cord out of the way and off the floor at all times—this is the Reelite kind.

There are many places where Reelite can help produce better work for ***you.*** And save you money on cord renewals that will soon pay for the Reelites themselves. Send for full information or have one of our lighting experts call. Drop us a line.

APPLETON ELECTRIC COMPANY
1716 Wellington Avenue • Chicago, U. S. A.
New York—265 Canal Street
Los Angeles—340 Azusa Street

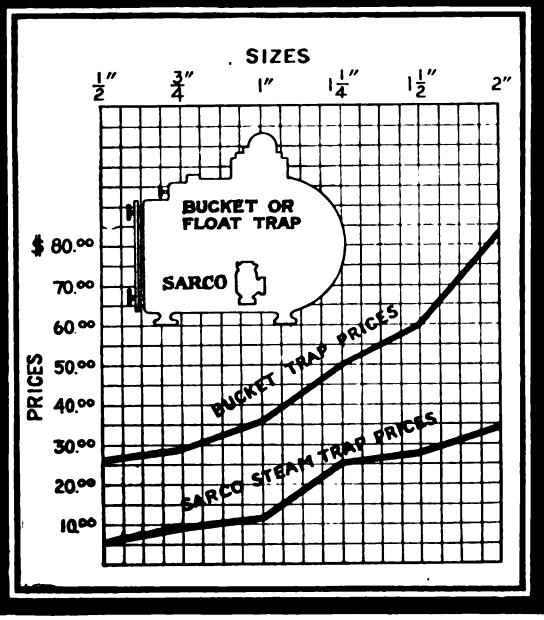


Reelite

The Handy Light on a Reel

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See What You Save on Steam trap SARCO



This diagram shows at a glance the big difference between the size and the price of the clumsy, cumbersome bucket trap and the simple, compact, Sarco Steam Trap No. 9.

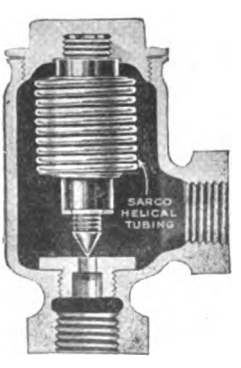
It is the larger size of the bucket trap—with its superfluous parts, such as floats, levers, valves, water gauges, bowls, toggles and packing—that you have to pay the larger price for. It is the compactness and simplicity of Sarco Steam Trap No. 9 that makes it possible for you to buy it for about one-third the price of the bucket trap.

Rated size for size, SARCO has the same capacity as the big float trap. Its efficiency is greater. It discharges condensate as rapidly as it collects, consequently doesn't need to be large. It closes promptly and prevents all loss of live steam. Its compactness permits it to be installed in many places where there would not be room for a cumbersome bucket trap.

WHY, therefore, pay the LARGER PRICE for a bucket trap when it gets neither increased capacity nor increased efficiency?

The No. 9 Sarco Trap is of the self-adjusting, balanced-pressure type, suitable for any steam pressure from 0 to 100 lbs.

Use Sarco Steam Trap and save two-thirds of your Steam Trap costs. We will send it on thirty days' free trial and let it convince you in your own plant, away from the influence of salesmen, that the SARCO is all we claim, and more.



Write for Booklet R-265.

SARCO CO., Inc.

183 Madison Ave. New York

Boston Buffalo Chicago
Detroit Cleveland Philadelphia
Peacock Bros., Ltd., Montreal

furniture of this kind, see Hughes Steel Equipment Co., page 99.

150 Practical Ideas is shown in the new 1926 catalog, describing materials handling methods. Lewis-Shepard Company. See page 37.

Bulletins on Low Cost Charging Equipment for electric trucks, etc. See page 71. The Hertner Electric Co.

A Special Saw for High Speed Steel Cutting. See page 70, Simonds Saw & Steel Co., for the construction of this.

Equipment that Minimizes the Handling of Products. The Powell Pressed Steel Co. Page 93.

"Instructions for Making Blue Prints" is a new pamphlet issued by the C. F. Pease Company. See page 53.

Catalog and Suggestions for Solving Daylighting and Ventilating Problems. Truscon Steel Co. Page 3.

A Certified Survey on Power Savings through the use of Self-aligning ball bearing hangers, is offered by the Skayef Ball Bearing Co. See page 4.

A System that Gives a Perpetual Inventory of thousands of parts and assemblies is described on page 94. The McCaskey Register Co.

Catalog No. 26 Describes New Type Reamers and also shows new lower prices. See page 11. Wetmore Reamer Co.

Literature that Explains the Advantages of Pulleys and Pressed Steel Hangers is offered by the American Pulley Co. See page 92.

Information on Heating Pumps for return line vacuum systems. Nash Engineering Co. Page 16.

A Single Phase Motor in Sizes from 1/2 to 10 H.P. The General Electric Co. Pages 78-79-101.

Information on Electric Hoists for All Industrial Departments. Roeper Crane & Hoist Works, Inc. See page 105.

Carrying Five Times the Old Load at Four Times the Old Speed, the modern way of handling. Baker-Rauling Co. Page 93.

An Overhead Conveying System that is a great time and labor saver is shown on page 33. Richard-Wilcox Manufacturing Co.

Illustrated Catalog Describing a Compact, Sturdy, Steam Engine for many industrial purposes is offered by the Troy Engine & Machine Co. See page 85.

The Daily Output of 4,000,000 Belt Hooks is the record established by the Clipper Belt Lacer Co. See pages 76-77.

Descriptive Circulars Illustrating Steel Fabricated Buildings for every industrial requirement can be obtained from the Martin Steel Products Co. See page 116.

Complete Information on the Overhead Equipment necessary to put a plant on an efficient basis to handle material. See page 100. Reading Chain and Block Corp.

Heating, Ventilating and Mechanical Draft Equipment that have 45 years of experience behind them. See page 41. American Blower Co.

Another Installation Showing the Economy of Logan Conveyors. See page 1. Logan Co.

A Motor Service to Manufacturers of Industrial Equipment is offered by the Star Electric Motor Co. See page 116.

Coatings that Cut Down Upkeep on Roofs, Floors and Walls. Choice of samples offered by L. Sonneborn Sons, Inc. See page 67.

An Improved Oven for Cores is featured by Young Brothers Company on page 12.

A Bulletin Showing a Clutch which is adaptable and standardized for many various machines. See page 114. Conway Clutch Co.

A Catalog on Flexible Shaftings for tool room, machine shop, pattern shop and foundry. See page 114. N. A. Strand & Co.

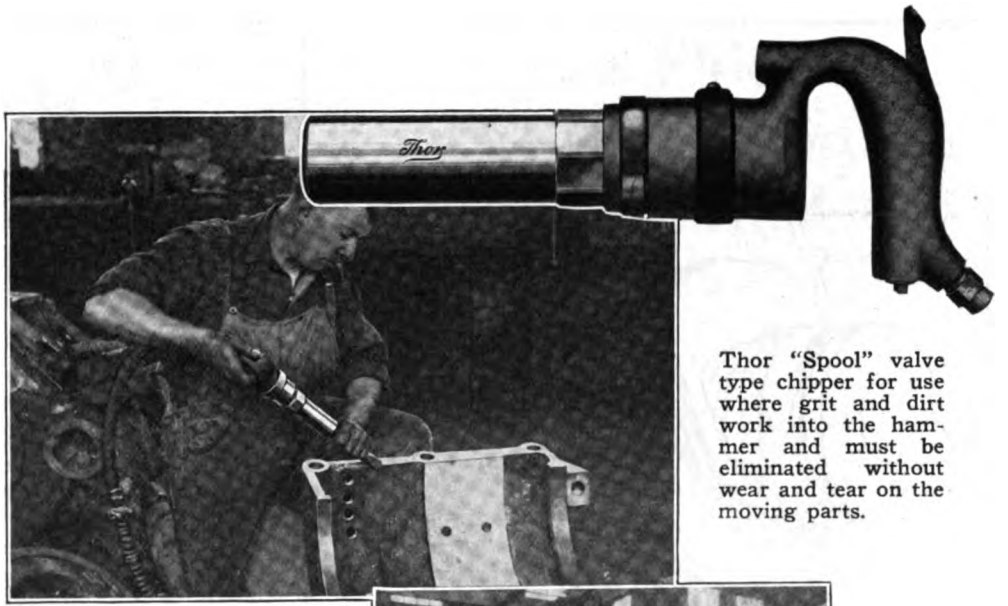
A New Track Unloader for Unloading Coal from Railroad Cars. See page 119. Chicago Automatic Conveyor Co.

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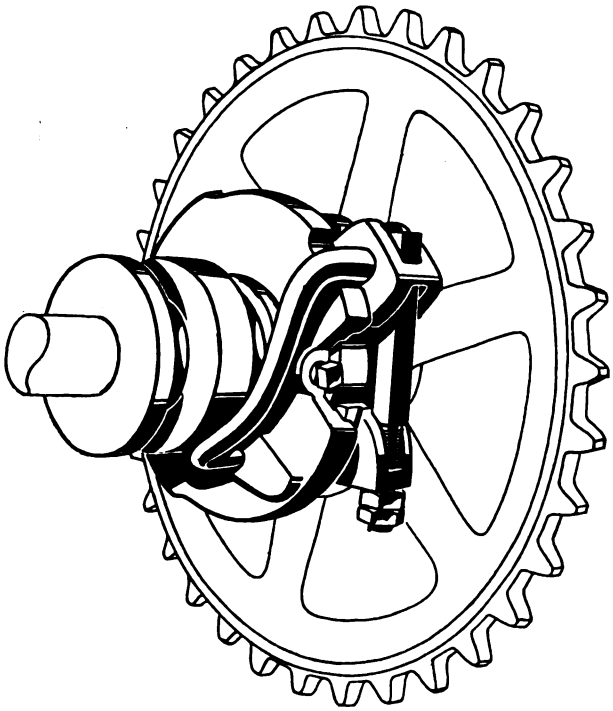
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Conway Clutches are simple, capable, dependable, and durable. Put one on your machine just for experiment's sake, you'll be delighted with its performance.

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Type MP 5
¼ H. P. Motor



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for the

Tool Room
Machine Shop
Pattern Shop
and
Foundry

¼ to 2 H. P.

Several Types and Sizes

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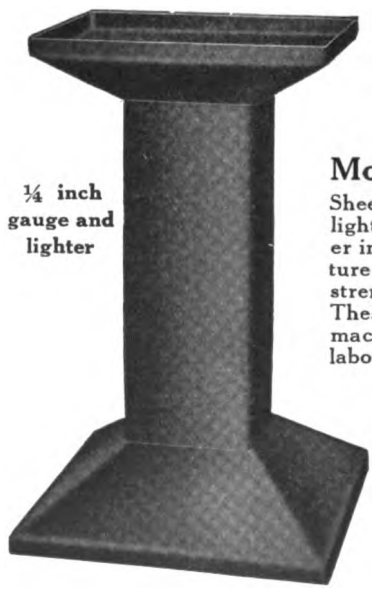
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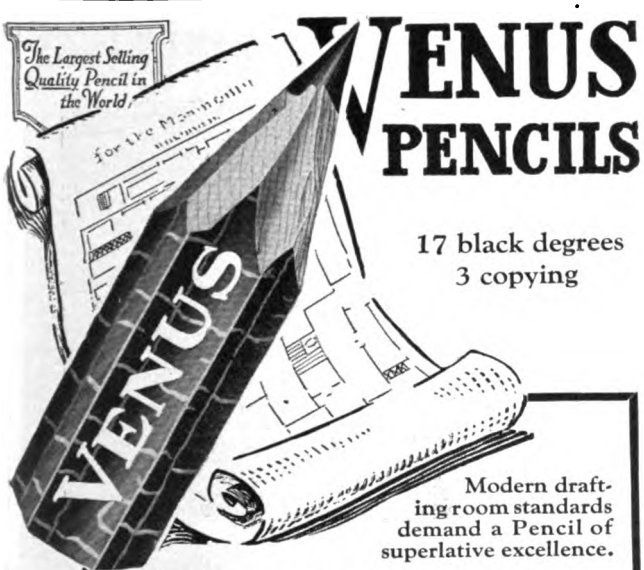


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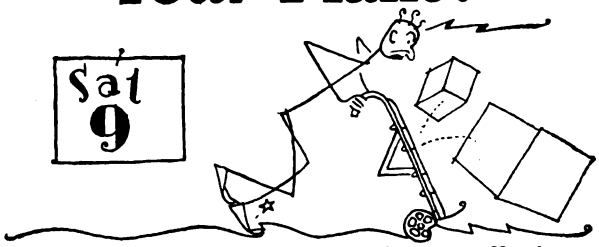
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Are the Floors a Bit "Choppy" Out in *Your* Plant?



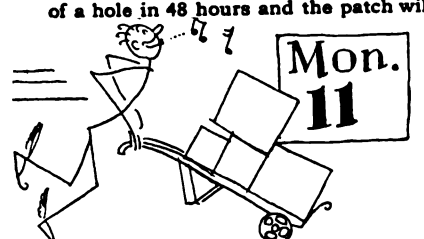
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With Quickfix you can patch up the worst kind of a hole in 48 hours and the patch will be flint hard and impervious to wear. No need to delay traffic for 10 days or two weeks as you used to with an ordinary concrete patch.



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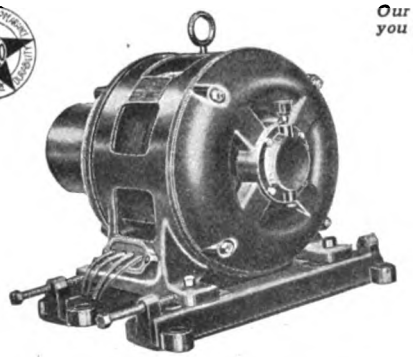
STAR Ball Bearing MOTORS

Users of hoists, elevators, cranes, pulverizing equipment, extractors or other motor driven equipment expect the motor to give steady performance. It is the motor that determines the item of maintenance cost.

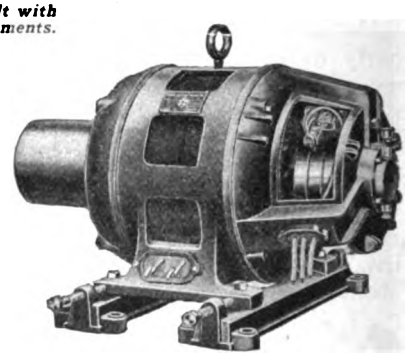
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STAR MOTORS are manufactured for all commercial purposes, both in A.C. and D.C.—in sizes from ¼ to 100 H.P. inclusive, horizontal or vertical shaft construction.

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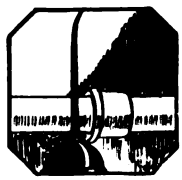
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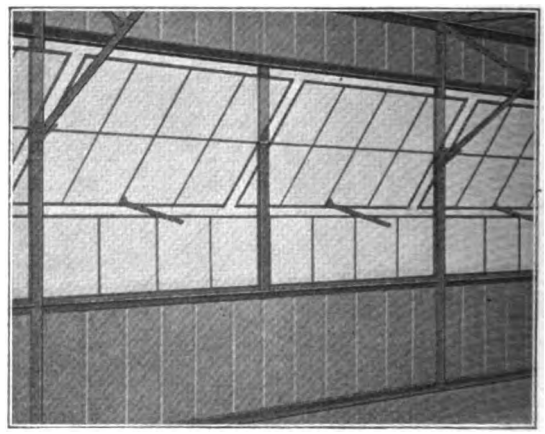
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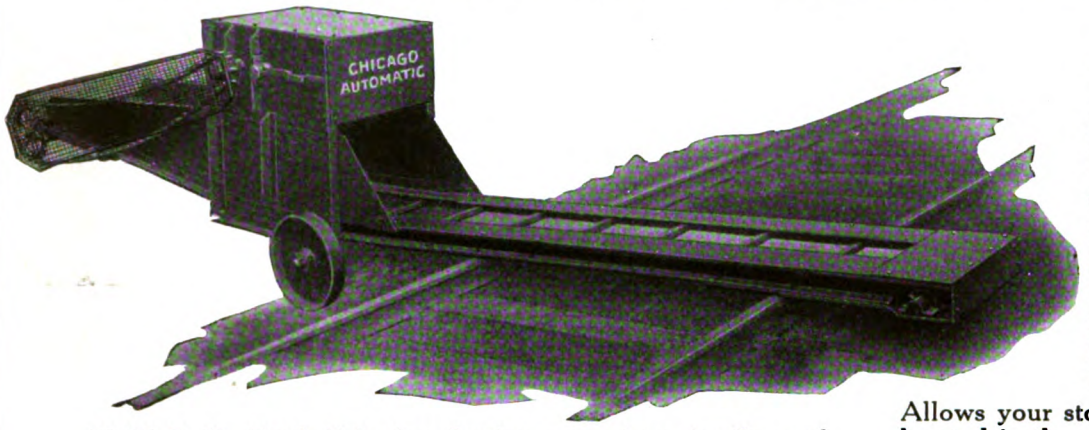
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That Lowers the Cost of Handling Industrial Coal



Model T. U., Track Unloader, showing compact construction and elevated delivery end.

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No shoveling.

Unloads a car an hour.

No pit necessary.

Goes under any car. Only 3 in. high on the rails.

Allows your storage pile to be located in the most economical spot.

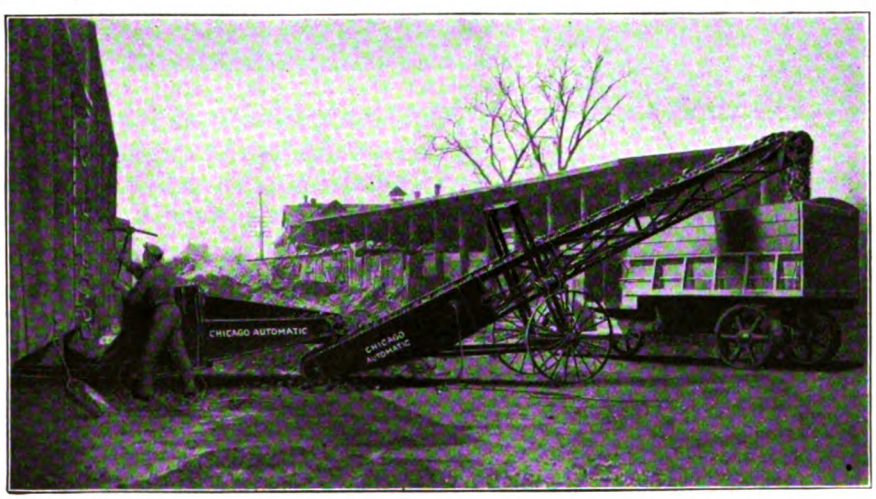
CHICAGO AUTOMATIC CONVEYORS

are making possible lower labor costs and more efficient handling of industrial coal in hundreds of the largest manufacturing plants in the United States and Canada.

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With the New Track Unloader trucks can be loaded 2 tons a minute.



Unloading from car to open storage pile in one operation.



A Popular Model of a New All Steel Trough and Drag Type Portable Conveyor.

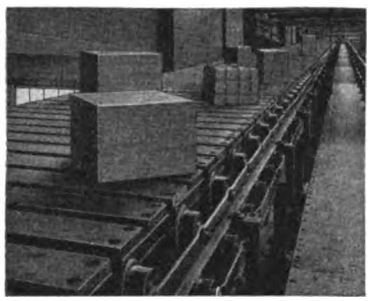
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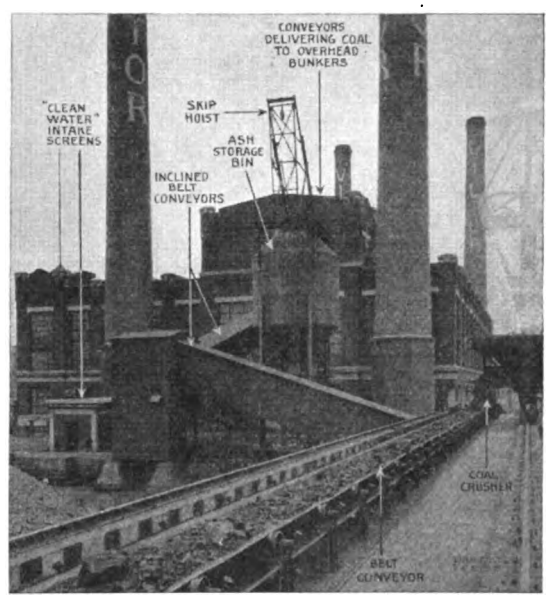
CHICAGO AUTOMATIC CONVEYOR CO.

982 Old Colony Building, CHICAGO, ILL.

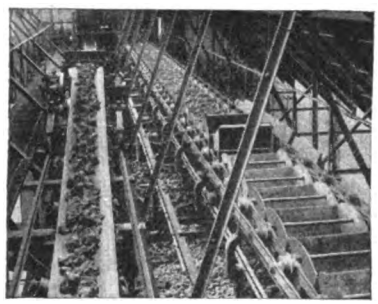
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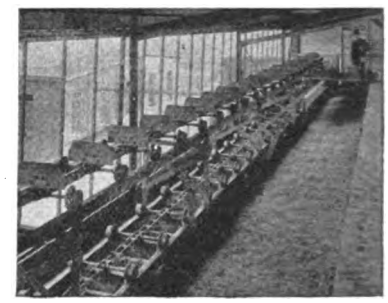
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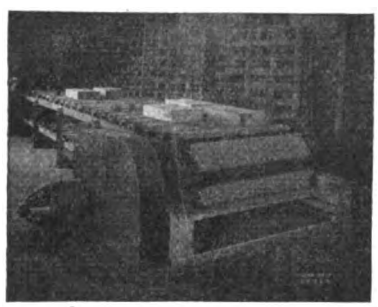


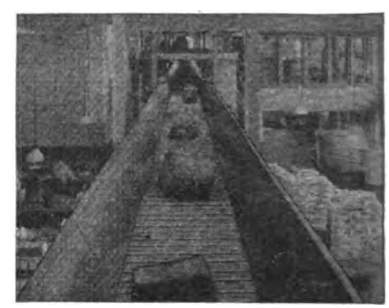




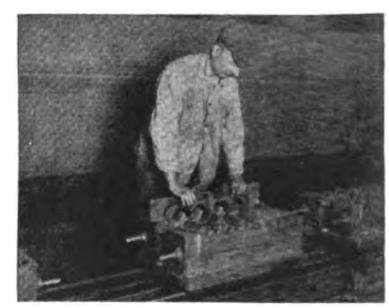












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Atlanta, 610 Citizens & Southern Bank Bldg.
Toronto 2, and Montreal, Link-Belt Limited

H. W. CALDWELL & SON CO.:—Chicago, 1700 S. Western Ave.; New York, 2676 Woolworth Bldg.; Dallas, Texas, 810 Main St.

LINK-BELT MEESE & GOTTFRIED CO.:—San Francisco, 19th and Harrison Sts.; Seattle, 820 First Ave., S.; Portland, Ore., 67 Front St. Los Angeles, 400 E. Third St.; Oakland Calif., 526 Third St.; Fresno, Calif., 215 Brix Bldg.

LINK-BELT
Material Handling Equipment

For products not advertised in this issue write Industry Illustrated

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GOHEEN

PAINT ENGINEERS

PAINT CHART

A Standard Paint for Each Specific Purpose

Every Paint is an engineering product—a result of many years of test and experiment in laboratory and service. Each paint has been designed for use in a specific, well defined field of service, and has been perfected to give the best service in the use to which it is put. This chart will help you decide which Goheen Paint will serve you best.

Galvanum FOR GALVANIZED IRON TRADE MARK	For Galvanized Iron under any conditions of service, Galvanum Paint is the only paint which can be applied directly to galvanized iron without acid wash, weathering or priming coat. It is a standard of comparison. Lasts seven to fifteen years, prevents all rusting and corrosion.
Carbonizing Coating TRADE MARK **For Iron and Steel**	For Iron and Steel, inhibitive as well as protective, this paint absolutely prevents corrosion of the metal.
Highway Red TRADE MARK A CHEMICALLY COMBINED RED LEAD PAINT **For Iron and Steel**	A chemically combined Red Lead Paint, with preservative qualities not possessed by straight Lead and Oil.
Thermokote A GOHEEN PRODUCT A PAINT FOR ALL HOT SURFACES AND STACKS **For Hot Surfaces**	A heat-resisting paint for Smoke Stacks, Boilers, and all hot surfaces, manufactured especially to stand up under high heats, and to give positive results under varying temperatures.
MILL WHITE **Interior White**	For Wood, Steel, Concrete, Brick and Plaster, designed specifically to stand up under severe conditions, and can therefore be used as a standard paint for use throughout office and factory.
Concrewaltum Paint (TRADE MARK) **For Concrete Surfaces**	For Concrete, Stucco and Masonry surfaces, dampproofs and beautifies the surface, and is made both as an Interior and Exterior Wall Paint, as well as a Floor Enamel.
Old Honesty TRADE MARK **For Wood**	A chemically combined ready mixed paint for interior and exterior wood surfaces, compounded to resist the action of Sulphur Fumes, Acids, Gases and Moisture. It is an ideal paint for Industrial requirements.

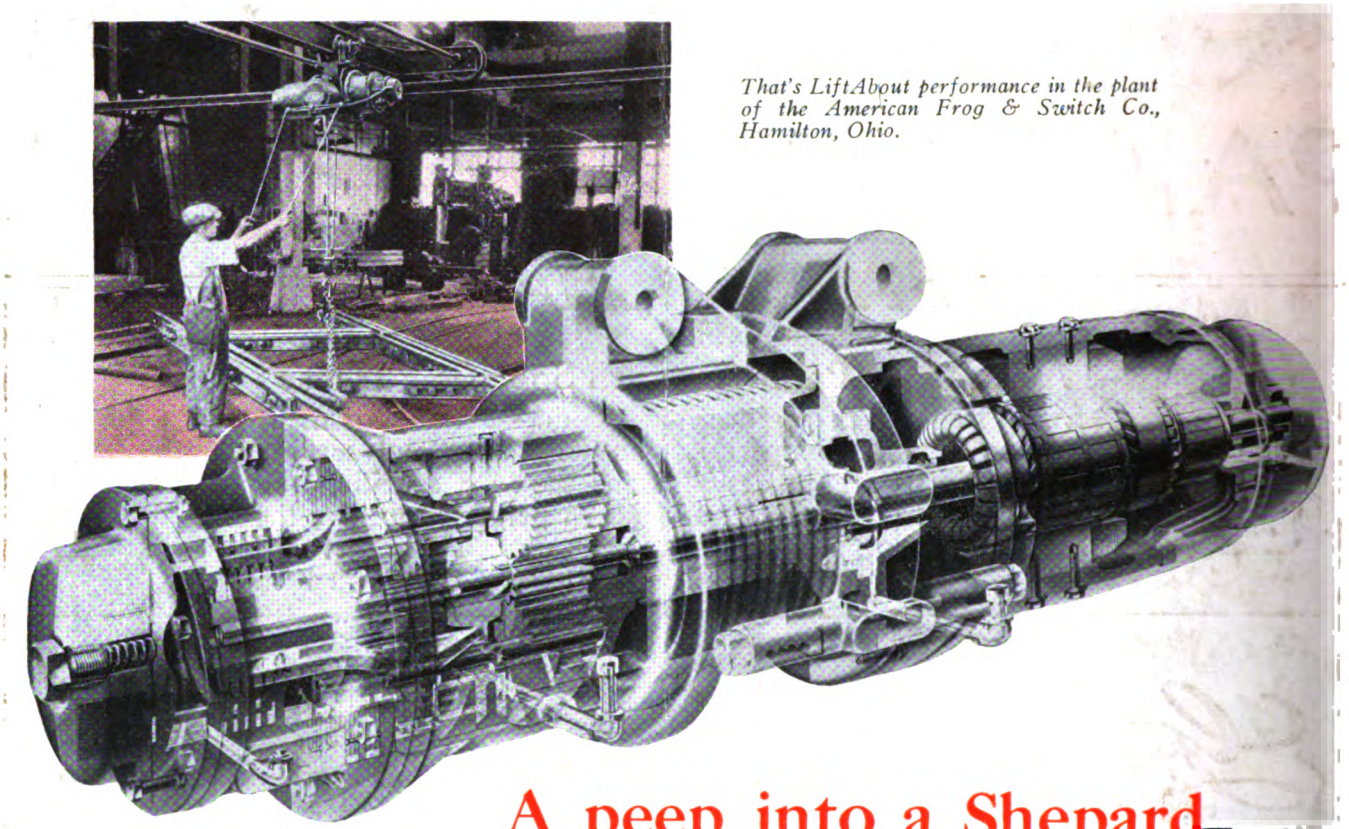
GOHEEN CORPORATION of N. J.

Paint Engineers Since 1888 — **Newark, N. J.**

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EILERT PRINTING COMPANY, INC.
516-526 W. 39TH ST., NEW YORK

Saved! 6 men and $7,000 yearly in wages



That's LiftAbout performance in the plant of the American Frog & Switch Co., Hamilton, Ohio.

A peep into a Shepard

Within those tightly sealed metal housings of a Shepard Electric Hoist is an orderly arranged, balanced mechanism completely protected from dirt, dust, dampness, fumes and varying atmospheric conditions.

The electric brake, mechanical brake, gearing, winding drum, motor are all in line and provide permanent alignment so essential to dependable operation. Thorough and automatic lubrication is assured by the oil bath method.

All parts are built on the unit system, and each is separately accessible without disturbing any other unit.

Shepard Electric Hoists predominate in industry—and the reason is easily understood—a design and construction with one thought in mind: consistent day in, day out performance.

Shepard Engineers are always ready to assist you.



Send for the LiftAbout "Book of Illustrated Economies," and copy of the 52 page Floor-operated Hoist Catalog.

SHEPARD ELECTRIC CRANE & HOIST CO.
420 Schuyler Ave., Montour Falls, N. Y.
Branches in Principal Cities

SHEPARD
ELECTRIC CRANES & HOISTS

Largest Manufacturer of Electric Hoists in America

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May, 1926 20 Cen

MAY 29 1926

Industry Illustrated

Plant Machinery and Equipment for Low-Cost Production Presented in Pictures



FOR many years, the meat-packing industry was practically alone in its use of conveyorized production. Then the automotive industry discovered what this principle can do; and only recently, plants in other industries found that "production on the move" was not only far-reaching in its applications, but revolutionary in its effects upon costs, production, and profits.

¶ This is only one of the many profit-stimulating ideas treated in the pictorial pages of this issue—but it is one which you would do well to study in its relation to your own plant.

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Publishing Offices
Industry Illustrated
W. 32nd Street, New York

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New Bonney No. 1 Sample Kit

$2.50

Three Bonney *CV Chrome Vanadium double end Engineer's Wrenches for the six most popular SAE bolts (3/16", 1/4", 5/16", 3/8", 1/2", 9/16") in a leatherette kit. The price, $2.50, is less than the regular price of the three wrenches if purchased individually, no charge being made for the leatherette kit.

This sample kit is offered at this price because we know that after a mechanic has used a few Bonney Chrome Vanadium Wrenches nothing else will satisfy him.



You can secure from your jobber. Write for detailed information.

Bonney Forge & Tool Works

Dept. B, Allentown, Pa.

Makers of Special Service Wrenches of Chrome Vanadium, Carbon Steel Drop Forged Wrenches, Stillson Wrenches, Vises and Drop Forgings and the Bonney Rim Tool.

BONNEY Chrome-"CV"-Vanadium WRENCHES

REG. U.S. PAT. OFF.

(Patents Pending)

NEW BONNEY CATALOGUE

containing complete Bonney line, with illustrations and prices, will be sent to readers of INDUSTRY ILLUSTRATED free on request.

*CV is a Bonney trademark registered in the U.S. Patent Office.

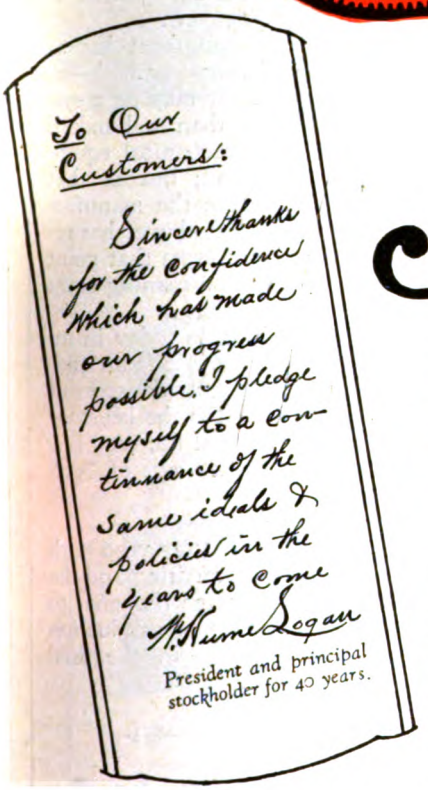
Chrome Vanadium registered August 11, 1925.

BONNEY "ONLY THE BEST"

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50th Anniversary 1876~1926



OUR golden anniversary! The year 1926, commencing our second half-century of progress, from present indications will also prove the largest year in our history.

The fifty years now behind us—the thousands of installations of Logan Conveyors in every branch of industry—tell their own story of service, of integrity, of strength, of conscientious effort to deliver to our customers permanent value rather than false savings in price. The word Logan on a conveyor is your guarantee of satisfaction—the insignia of quality upon which the business principles of our fifty-year-old company are based.

Logan Co.
INCORPORATED 1901

Formerly THE DOW CO., *Louisville, Ky.*

New York Office, 50 Church St.
Detroit Office, 8855 Woodward Ave.
Indianapolis Office, 606 State Life Bldg.
Kansas City Office, 3130 Washington St.
Chicago Office, 343 S. Dearborn St.
Rochester Office, 116 Saint Paul St.
Los Angeles Office, 1125 Central Bldg.
Philadelphia Office, 604 Fox Bldg.

Representatives in other principal cities

Logan Conveyors
LOUISVILLE

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Warns Against Rising Costs

Let the work slow down at any machine, and the fact goes down on a Veeder Counter. It's a warning to the operator to *get busy.*

A sag in the output of any workman can be remedied before raising your costs. Just so long as you get an *immediate* production-count.

Veeder Counters don't lose a minute in telling you the work-situation. No loss in production need last a day if your foremen watch the work with

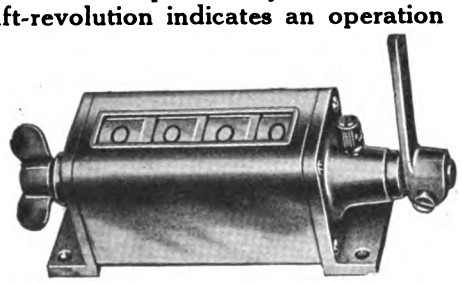
Veeder
COUNTERS

Here's the special Veeder Punch Press Counter; a heavy-cased ratchet mechanism, immensely durable.



Built especially for recording the product of heavy duty machinery where a reciprocating movement registers an operation. Strong stops limit the movement of the lever to 45 degrees, or ⅛ turn, which registers one on the dial. The large, legible figures are easily read ten feet away. Counter is regularly furnished with five figure-wheels, and may be *set back to zero* by one turn of knob. Requires no special fixtures for attaching. Price $18.00. (Cut less than 1/3 size.)

The *Revolution Set-Back Counter* below records the output of any machine where a shaft-revolution indicates an operation



Sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as required. Price, with four figures, as illustrated, $10.00—subject to discount. Large Set-Back ROTARY RATCHET COUNTER to count *reciprocating* movements where these count the product, $11.50 (list). *Cut ½ size.* Smaller counters from $2.00 up.

Write for the full-line Veeder booklet

The Veeder Mfg. Co.
31 Sargeant Street, Hartford, Conn.



The Publisher's Column

Getting Something for Nothing

AN industrial plant may run along comfortably for years; its production volume fairly stable, its profit margin perhaps small but sufficient. Then, one day, the management is "sold" the idea of some new equipment.

In a few months, the new equipment has so speeded production or lowered costs—or both—as to have actually paid for itself. It may be a system or method which cost less than a hundred dollars to install, or it may be mechanical equipment which cost several thousand; but at that stage it has cost *nothing.* Because the manufacturer was paid for making it, and the buyer has recovered what he paid. Moreover, from that point on, the new equipment goes right on earning extra dividends.

This is the process that is going on today in industrial plants all over the country. It is an endless process, and applicable to every department of every plant in any industry. It is the keystone of modern management, and is one of the very few legitimate, practical and permanent ways of "getting something for nothing."

Are you getting your share?

Study the pages of INDUSTRY ILLUSTRATED with this thought in mind. Both the advertising and the editorial pages are keyed to that same thought: to help you in getting better and cheaper production by methods and equipment which, in the final analysis, cost you nothing at all.

Industry Illustrated

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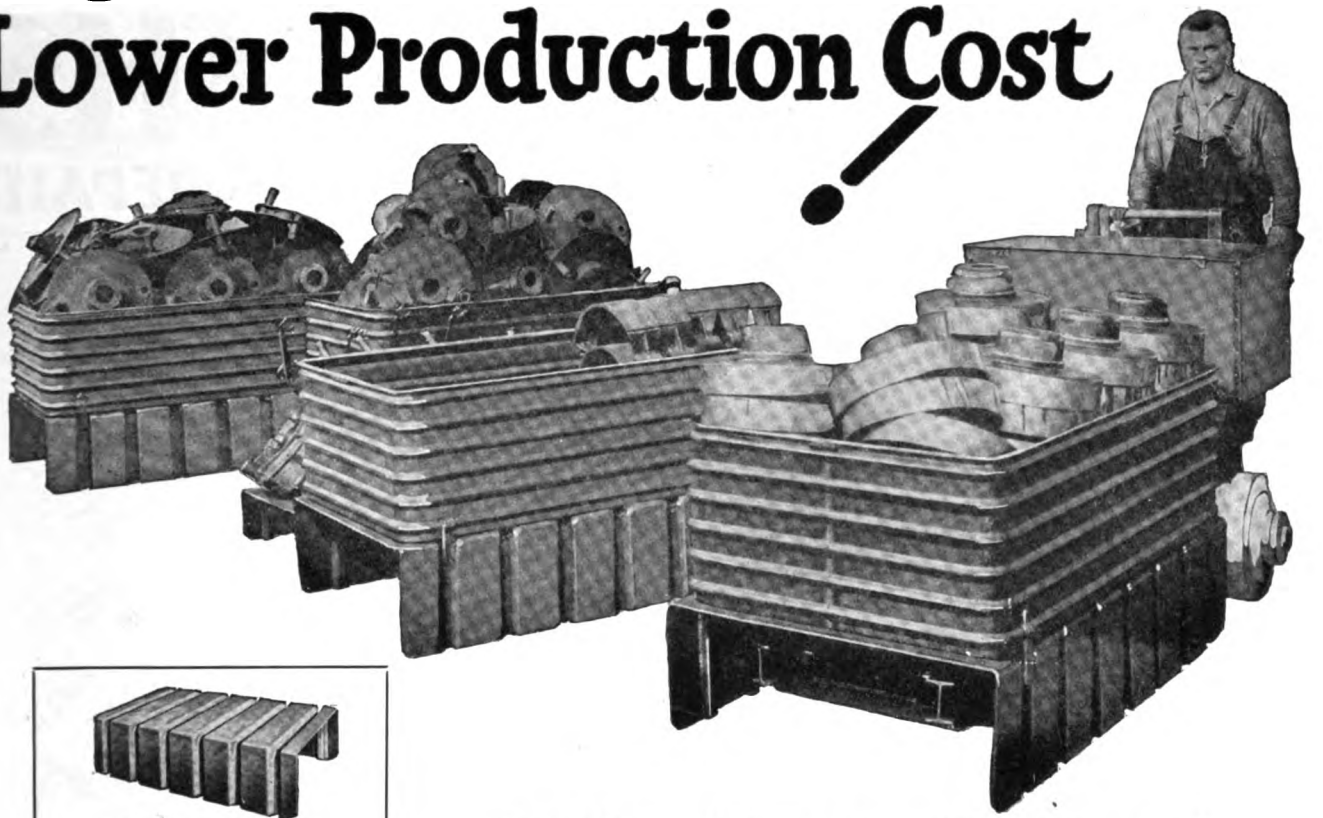
Pacific Coast: 155 Montgomery St., San Francisco, Cal.

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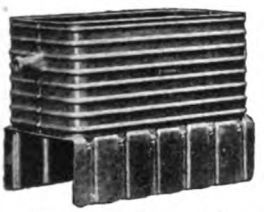


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TRUSCON Steel BOXES and PLATFORMS Lower Production Cost



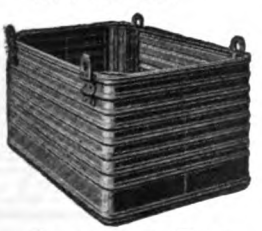
Truscon Platform — note the deep rib reinforcement.



Standard Box and Platform combination.



Truscon Boxes and Platforms in sizes to meet all needs.



Truscon Box equipped with lugs for crane handling.

YOU can eliminate waste labor and save valuable storage space by using Truscon Boxes and Platforms. They are constructed for efficient handling—allow you to keep raw materials at the production line without costly delays—and possess extraordinary strength that permits roof-high stacking with positive safety. Hundreds of manufacturers throughout the country verify their lasting qualities and economies.

Send for complete facts

TRUSCON STEEL COMPANY, YOUNGSTOWN, OHIO

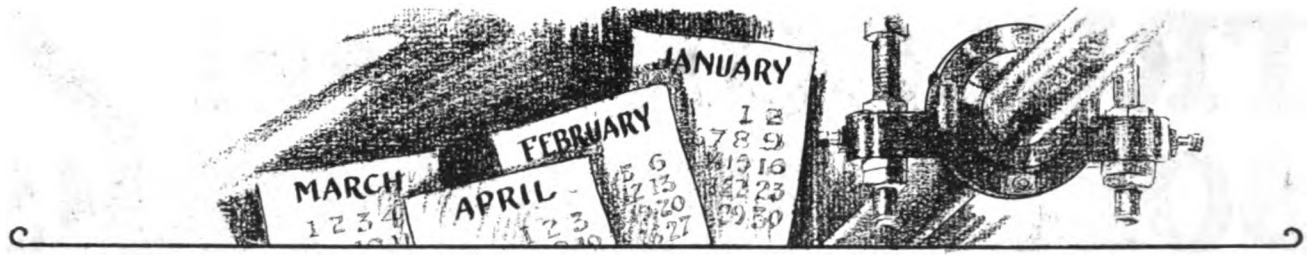
Special Box and Platform Representatives in New York, Philadelphia, Chicago, Pittsburgh, Cleveland, Buffalo, Detroit, Boston, St. Louis, and Cincinnati

TRUSCON ★ALLOY STEEL BOXES AND PLATFORMS

★COPPER ALLOY STEEL RESISTS RUST

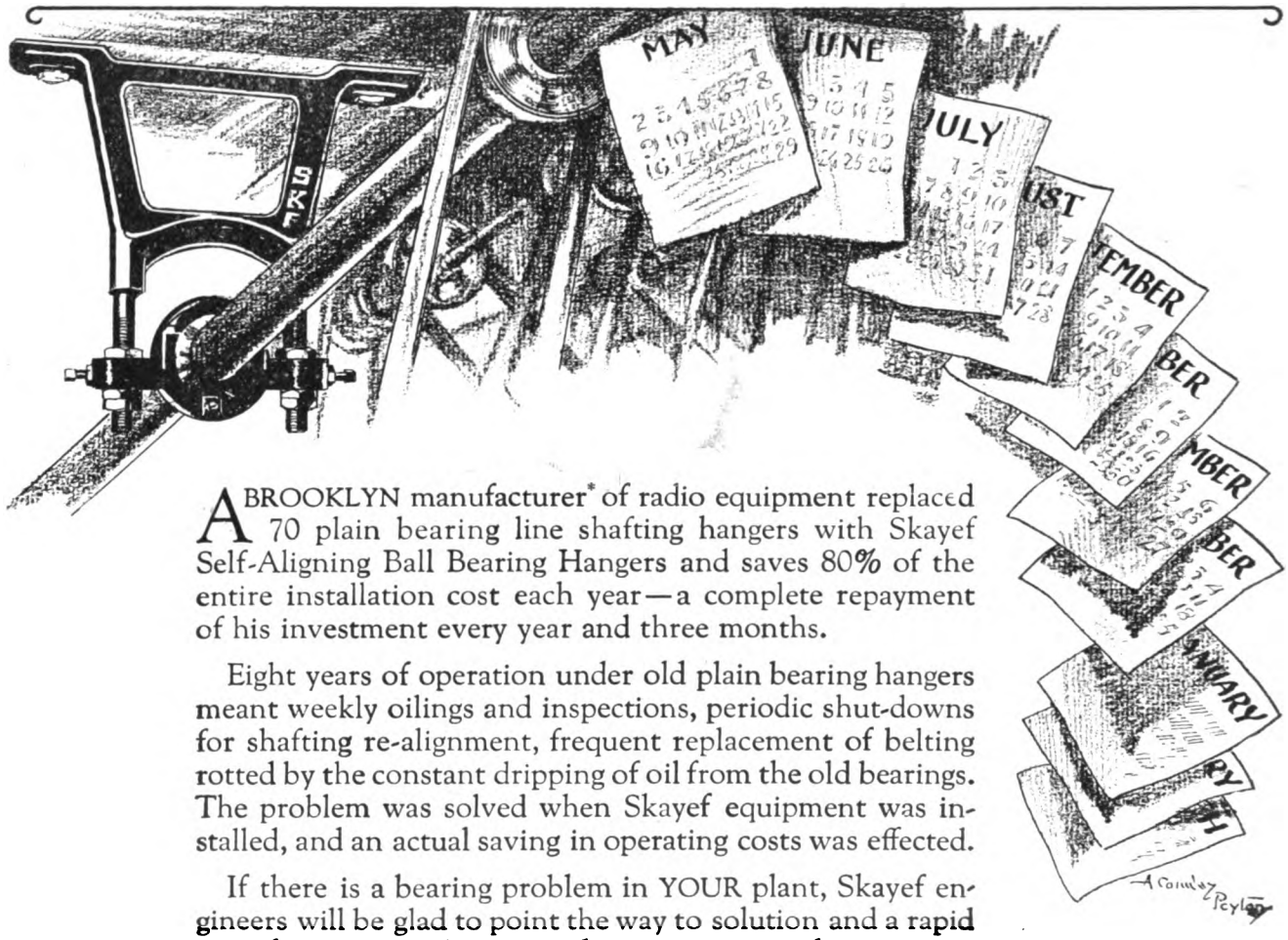
An enduring better steel for the manufacture of Boxes and Platforms. Copper Steel assures permanent value and performance at minimum cost.

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EVERY 15 MONTHS

THE ENTIRE INSTALLATION COST IS REPAID



A BROOKLYN manufacturer* of radio equipment replaced 70 plain bearing line shafting hangers with Skayef Self-Aligning Ball Bearing Hangers and saves 80% of the entire installation cost each year—a complete repayment of his investment every year and three months.

Eight years of operation under old plain bearing hangers meant weekly oilings and inspections, periodic shut-downs for shafting re-alignment, frequent replacement of belting rotted by the constant dripping of oil from the old bearings. The problem was solved when Skayef equipment was installed, and an actual saving in operating costs was effected.

If there is a bearing problem in YOUR plant, Skayef engineers will be glad to point the way to solution and a rapid capital turnover. A post-card request is enough.

*A certified survey of this installation sent on request.

1566

The SKAYEF BALL BEARING COMPANY, 165 Broadway, New York

BALL BEARING

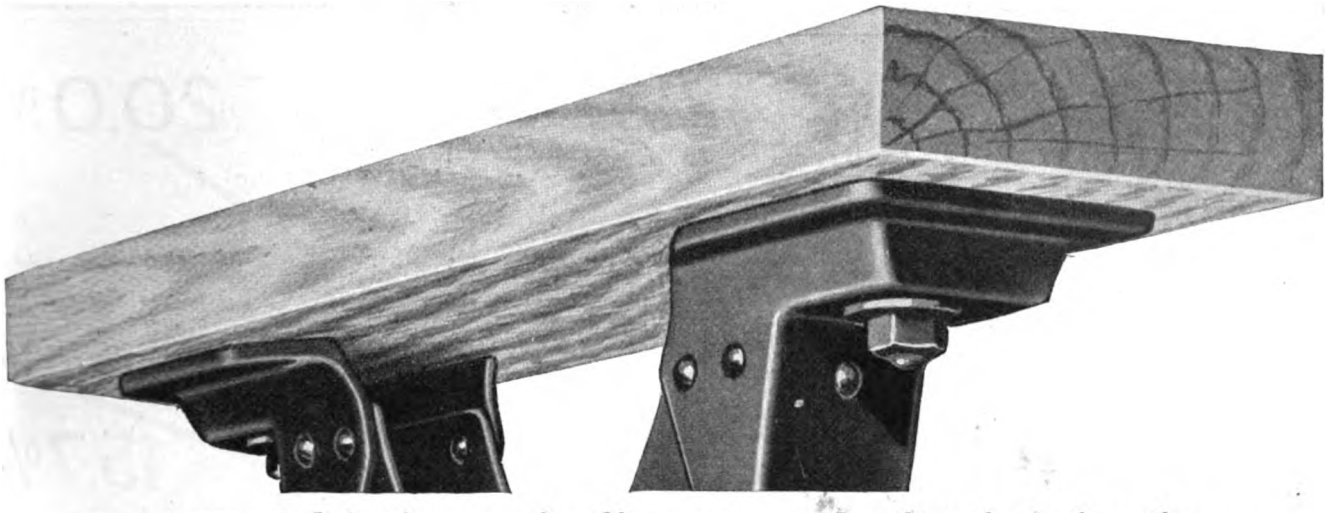
SKAYEF HANGERS

POST HANGERS, PILLOW BLOCKS AND TRANSMISSION APPLIANCES

SKF Puts the Right Bearing in the Right Place

For products not advertised in this issue write Industry Illustrated

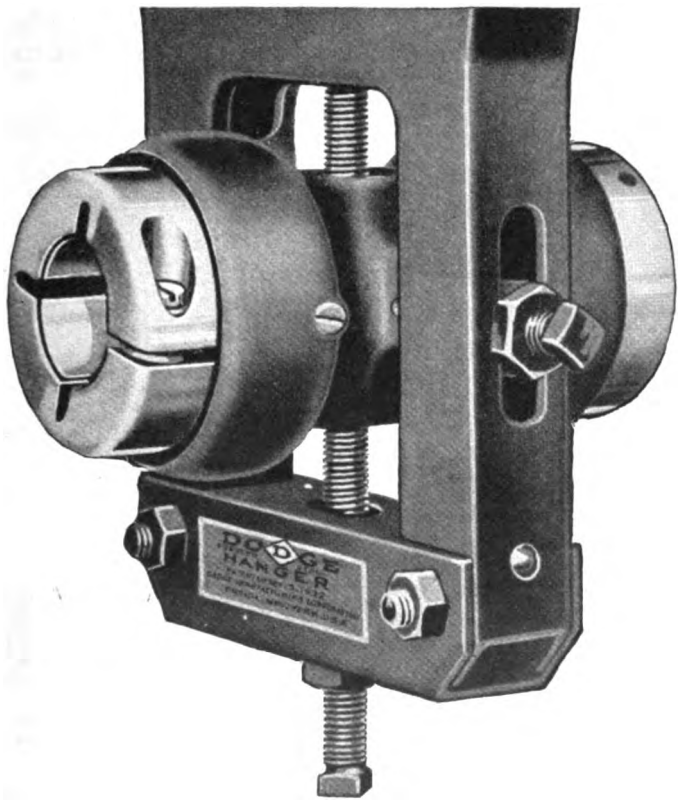
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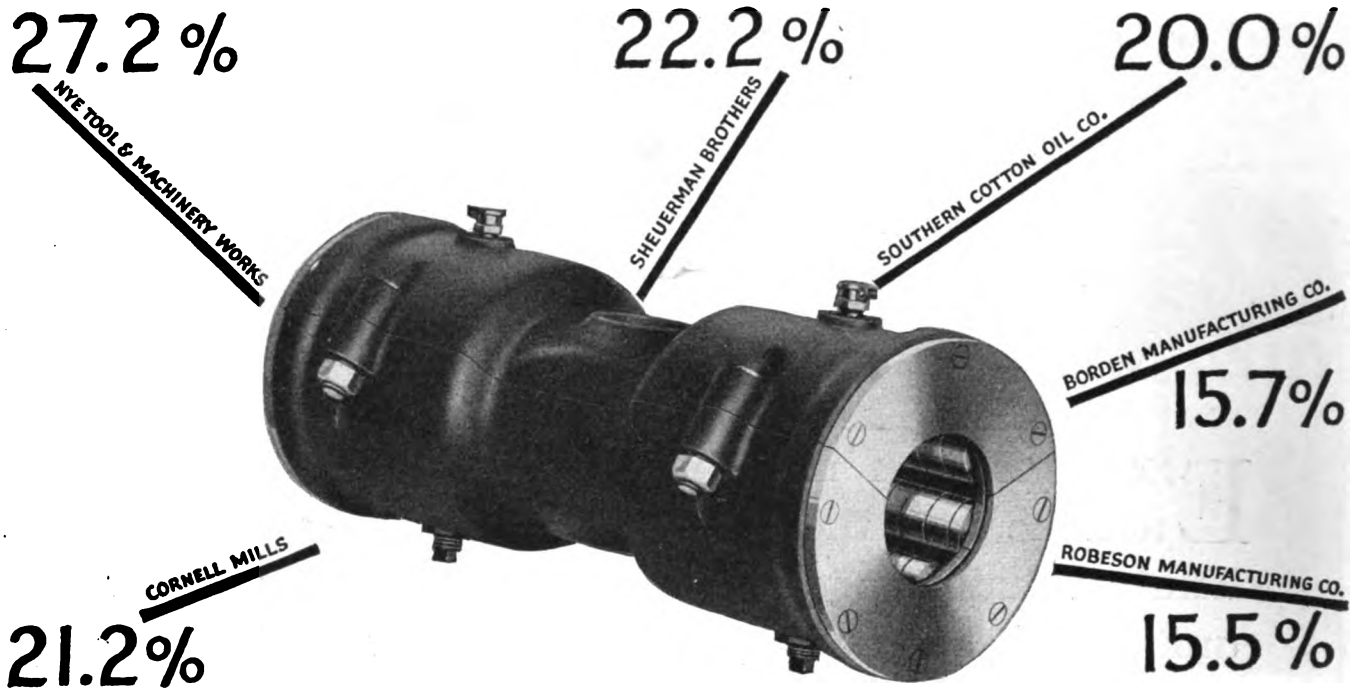
EXCESS friction, misalignment, faulty lubrication and the wear they cause are eliminated in Dodge-Timken shaft hangers. So power is saved; the power unit is spared from starting overload; far less lubrication is needed; shutdowns are guarded against; output tends to improve in rate and quality. No shop investment you can make can multiply any faster.

THE TIMKEN ROLLER BEARING CO., CANTON, OHIO

TIMKEN *Tapered Roller* BEARINGS



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Proof of Power Savings

Manufacturers of widely diversified products report that Hyatt Line Shaft Roller Bearings are cutting their power bills from 10 to 25% — *an average saving of 15%.*

They figure that their investment in Hyatt bearings is bringing an annual return of 50 to 125%. Thousands of Hyatts have brought this return, consistently, for 20 and even 30 years.

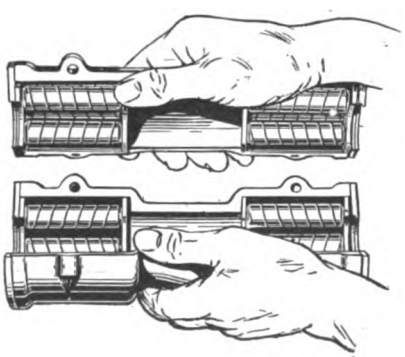
And most of these original Hyatt bearings are still rolling out dividends.

Hyatts also cut the cost and care of bearing-maintenance. Three or four oilings a year — no other attention — keep them steadily on the job.

Compare Hyatts with any other anti-friction or plain bearing. You will find Hyatts giving better, longer service.

For high-grade bearing efficiency, specify Hyatts.

Saves 15% of your total power bill. Completely split, for easy installation.



HYATT ROLLER BEARING COMPANY
Newark, New Jersey

HYATT
ROLLER BEARINGS

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A Place for Tools that is Accessible—with Security!

Workmen must have a place to keep their tools, especially if they own them or are responsible for those they use.

The places must be accessible but secured against pilfering.

Practical study both in our own manufacturing plant and in many others resulted in the production of The New Britain Frictionless Bench Drawer.

This drawer runs on anti-friction rolls on finished surfaces which gives a perfect smooth movement, while cramping or wedging is prevented by a simple mechanism consisting of cross shaft and pinions on racks.

Regardless of the load, this drawer can be operated with the pull of one finger.

A cylinder lock of good grade with two individual keys is provided. Master keyed if desired.

The drawer is made with wooden front, back and bottom and metal sides and is practically unbreakable. Inside dimensions are 21½" x 15" x 5", the standard drawer size.

This is equipment that satisfies both employer and employee, and the price is a pleasant surprise.

THE NEW BRITAIN MACHINE COMPANY

"Shop Furniture Originators" New Britain, Conn., U. S. A.

Gentlemen—

☐ **Quote price on** ..... **New Britain Frictionless Bench Drawers.**

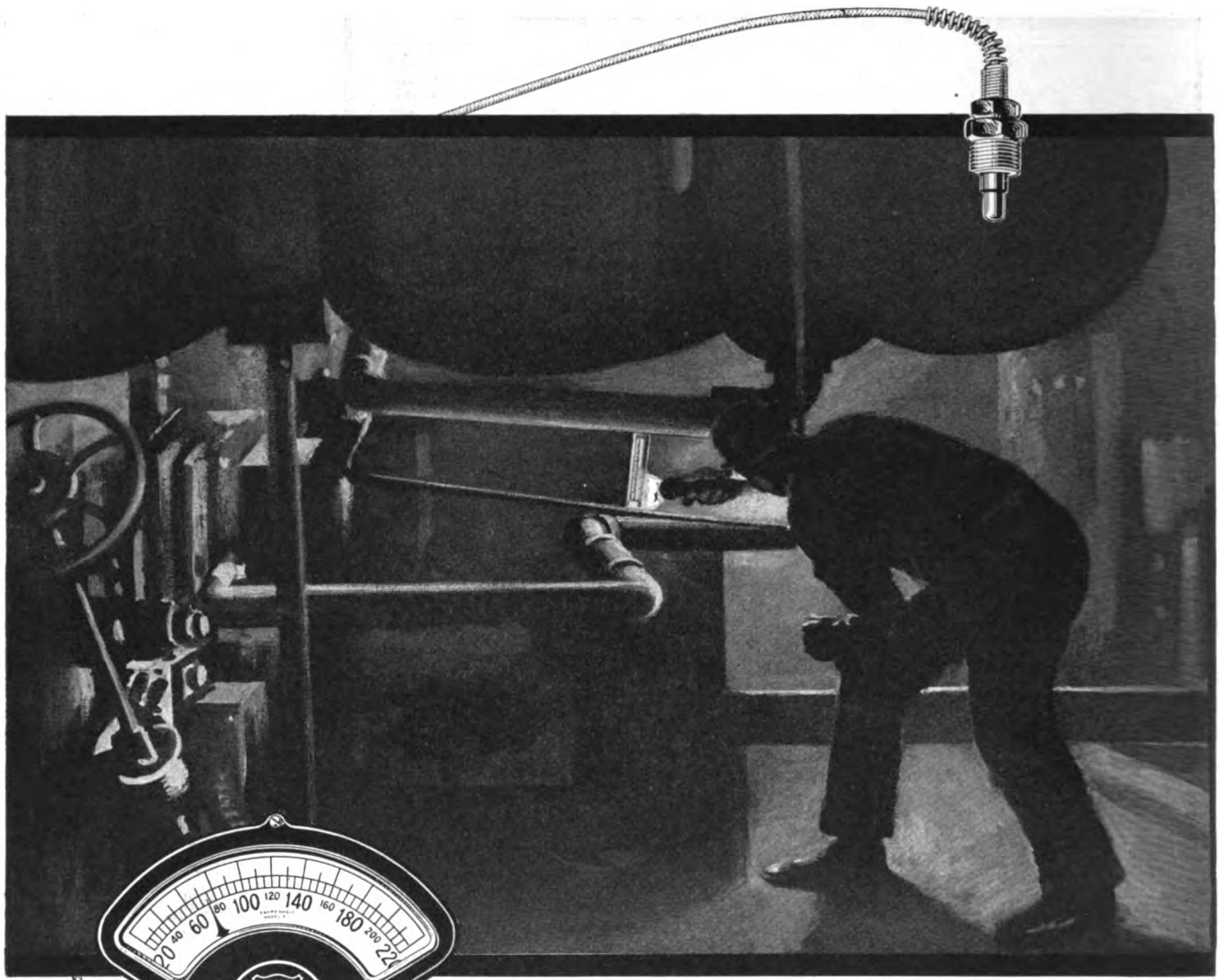
☐ **Send bulletin No. 1202.**

Signed .....

.....

.....

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Motoco Industrial Thermometer Distance Type

What MOTOCO will bridge

GLOOM

Power plants are generally hard to light. So are many other nooks and corners of industrial buildings where temperatures must be read frequently and accurately. The darkness, murk and gloom surrounding the thermometer make accurate reading impossible and put a premium on carelessness.

The Motoco Industrial Thermometer bridges the gloom. At the point where the temperature must be taken there is an unbreakable copper bulb; at a more convenient point several feet away (the other side of a partition wall, perhaps) where the light is good, there is a handsome indicator dial with bold, black figures and a bright red pointer; between the two there is a flexible metal tube that is not affected by the temperature of the room.

This makes easy reading. As a consequence the temperatures are checked constantly, performance reaches a higher level of efficiency, and working morale is improved. The Motoco way of bridging the gloom costs no more than a good glass tube thermometer. The Motoco Industrial Thermometer is made by the makers of the Boyce Moto Meter. Catalog No. 10 will be sent on request.

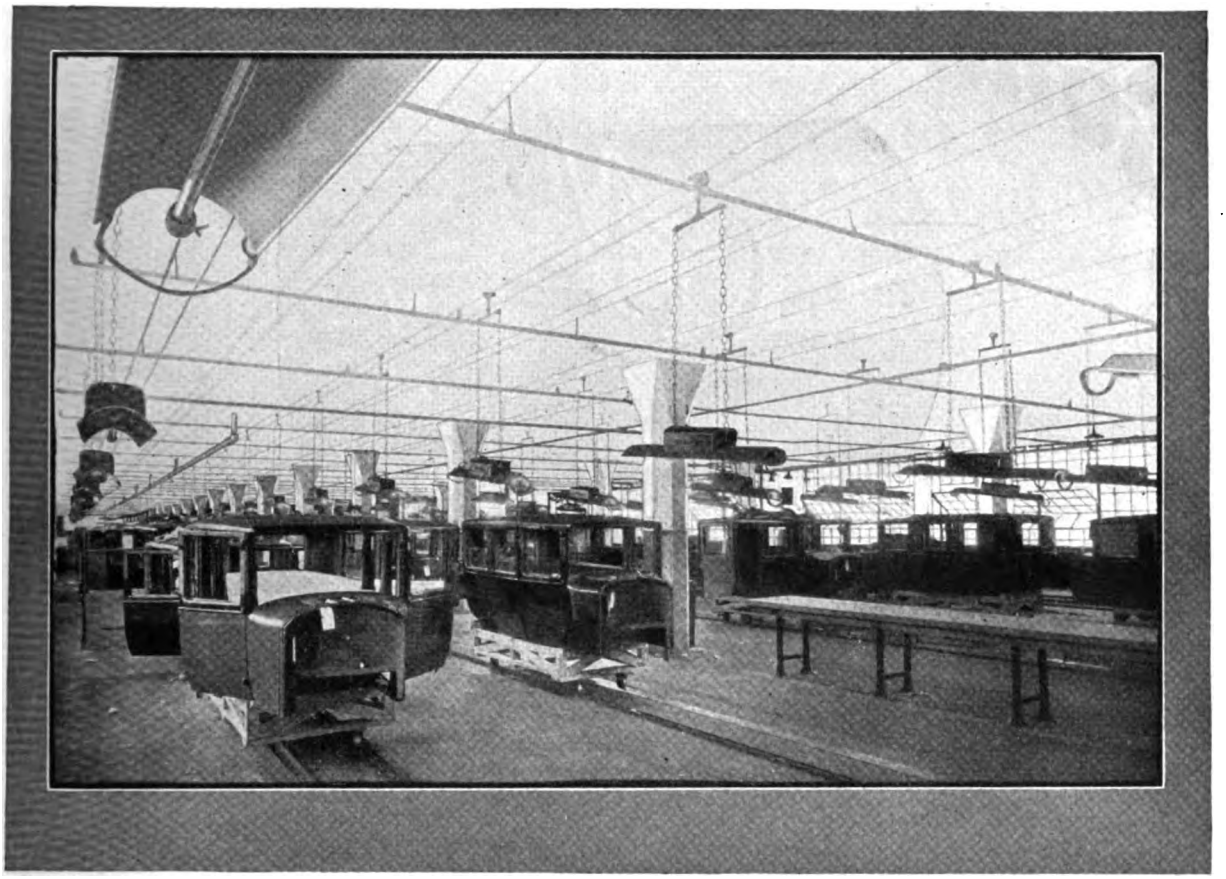


Boyce Moto Meter

The MOTO METER COMPANY, Inc.
Industrial Thermometer Division
10 Wilbur Avenue Long Island City, N. Y.

For products not advertised in this issue write Industry Illustrated

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The great Packard plant at Detroit uses Barreled Sunlight for interior painting "to maintain the best working conditions and to keep down repainting costs."

A letter from PACKARD— *on interior painting*

THE excellence of the Packard car speaks for the superb plant that produces it. A plant perfect in every detail of modern efficiency.

Read what the Manager of the Packard Company says about industrial interior painting:

"We find that well-kept buildings help to improve the manufacture of our product, and that good painting is a most important factor.

"We have used Barreled Sunlight on the interior of a great many of our buildings. Its lasting whiteness and washability have helped greatly to maintain the best working conditions and to keep down repainting costs."

This letter expresses the experience of *thousands* of plants that now use Barreled Sunlight on their ceilings and walls.

So satin-smooth is the finish of Barreled Sunlight that dirt cannot sink in. It washes like tile, even after years of service. Thus washing takes the place of repainting—and repeated washings will not wear away this durable finish.

Furthermore, made by the exclusive Rice Process, Barreled Sunlight is actually *guaranteed to remain white longer than any gloss paint or enamel, domestic or foreign, applied under the same conditions.* And it will not flake or scale if properly applied.

Labor costs are less when Barreled Sunlight is applied. Containing no varnish, it flows on freely with brush or spray, at the lowest cost per square foot of surface covered.

Sold in 55- and 30-gallon churn-equipped steel drums and in cans from ½ pint to 5 gallons. Where more than one coat is required, use Barreled Sunlight Undercoat.

U. S. GUTTA PERCHA PAINT CO.
Factory and Main Offices
5 Dudley Street, Providence, R. I.
New York—350 Madison Ave. Chicago—659 Washington Blvd.
San Francisco—156 Eddy Street
Distributors in all principal cities

Barreled Sunlight
Reg. U. S. Pat. Off.



THE RICE PROCESS WHITE

U. S. GUTTA PERCHA PAINT CO.
5 Dudley Street, Providence, R. I.
Please send us your booklet "More Light," and a painted sample of Barreled Sunlight.

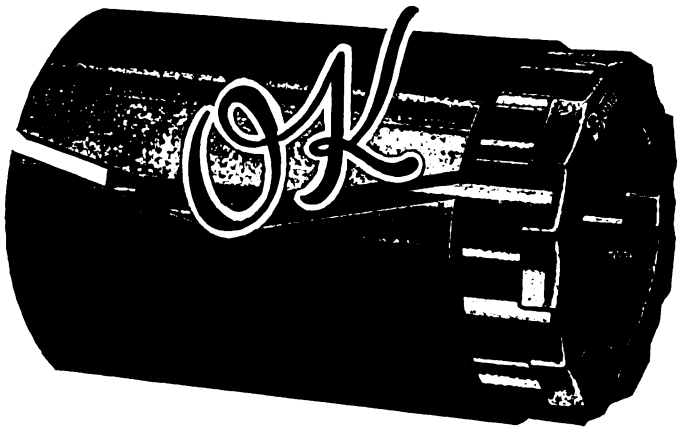
Name .....

Street .....

City ..... State .....

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Bond



This Bearing Has Made Good!

The Bond Commercial Roller Bearing, perfected and put on the market about two years ago, has won an enviable place in that short space of time. The list of prominent manufacturers who now use Bond Bearings is the best proof of the statement that *this bearing has made good.*

The Bond Commercial Roller Bearing embodies features found in no other bearing on the market. Perfect rigidity and unusual strength are built right into it.

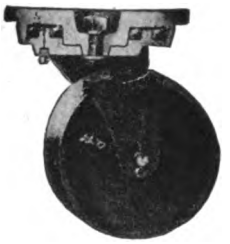
The Pressed Steel Retainers, or cage ends, are tied, spaced and held rigidly in place by Steel Stay Rods, alternating with hardened and ground solid Steel Rollers. These Stay Rods are shouldered and electrically welded into the Retainers. This scientific construction keeps the Rollers evenly spaced and always parallel to the shaft axis.

Greater efficiency and decreased power losses inevitably follow the installation of Bond Commercial Roller Bearings. No more wobbling and uneven wear on the rollers—just a smooth, frictionless flow of power.

The superior features of the Bond Commercial Roller are well worth your investigation. Ask us for a copy of our illustrated catalog showing dimensions, list prices and load tables. No obligation.

BOND TRUCK CASTERS

The Bond Line of Anti-Friction Truck Casters includes a type to meet every possible need of the industrial plant. Each type of caster was created by Bond Engineers to meet a particular requirement and give efficient, trouble-free service.



DOUBLE BALL RACE TYPE

A number of distinct, clean-cut improvements are incorporated in Bond Casters of the swivel type. Every ounce of strain and thrust is taken from the king pin and carried by the sturdy ball races. No chance of a bent or broken king pin! No sticking, dragging or refusing to swivel! Balky casters are a thing of the past if your trucks are fitted with Bond Casters.

Let us show you how trucks equipped with Bond Casters can speed up production in your plant and perform efficiently, even where cranes are commonly used. Write for illustrated caster catalog.

BOND FOUNDRY and MACHINE COMPANY

Manufacturers of a Complete Line of Power Transmitting Machinery, Truck Casters, Emery Wheel Stands, Garage Equipment, Etc.

Manheim, Lancaster Co., Pa.

New York Office: 1834 Broadway at 60th St.
For nearest distributor consult McRae's Blue Book

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A Shovel or Crane Is No Stronger Than Its Cables!

When you buy a Shovel or Crane, it usually comes to you equipped with Wire Rope.

Make this test:—Please! Ask the manufacturer what grade (tensile strength) of wire rope he has put on. When he tells you, ask him to **prove it.** You're entitled to this—its the life of **your workmen** you're risking.

The good reputation and the "say so" of any manufacturer **doesn't mean a thing** when you are asked to risk your life.

You're entitled to **KNOW** what you are using—A **live** man is worth more than all the dead ones.

WILLIAMSPORT

TELFAX TAPE MARKED—FACTORY CERTIFIED

WIRE ROPE

proves its grade in plain English—anyone can see it plainly—it is indestructible and this protection is worth more to a user than the wire rope costs. The best insurance you can buy.

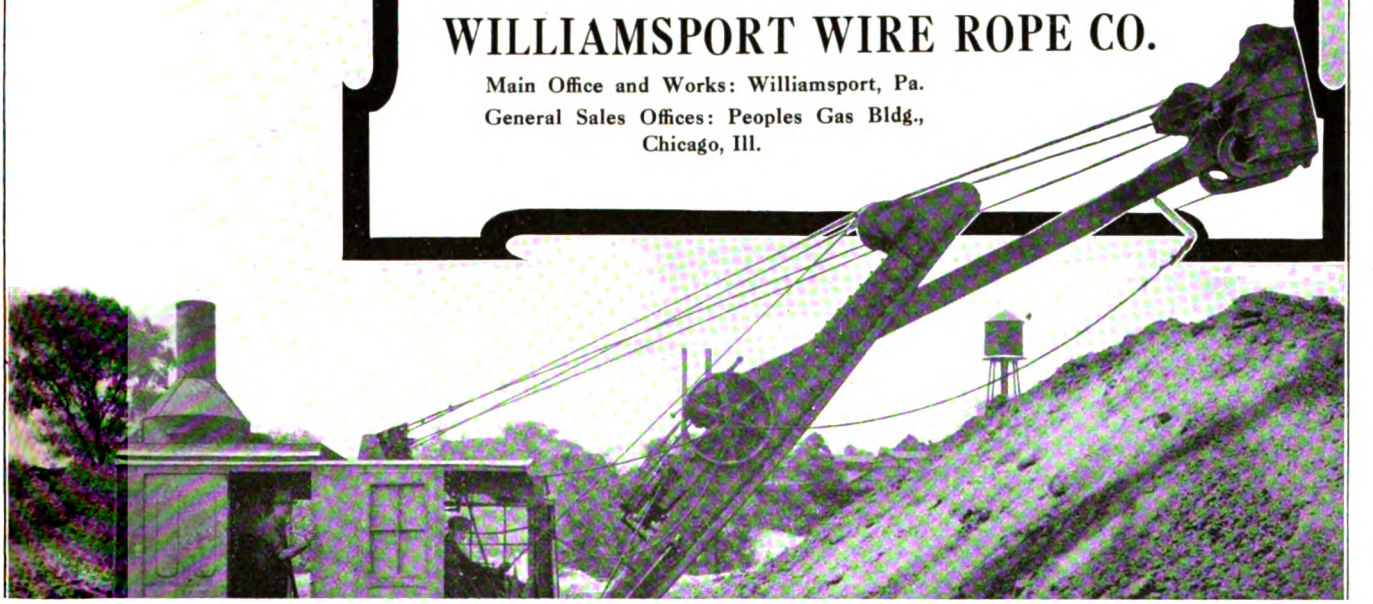
Manufacturers who equip with Williamsport Wire Rope deserve your confidence. They want **you** to know what you are getting.

The McMyler Interstate Co. is one of these manufacturers. There are others. Write us for their names.

WILLIAMSPORT WIRE ROPE CO.

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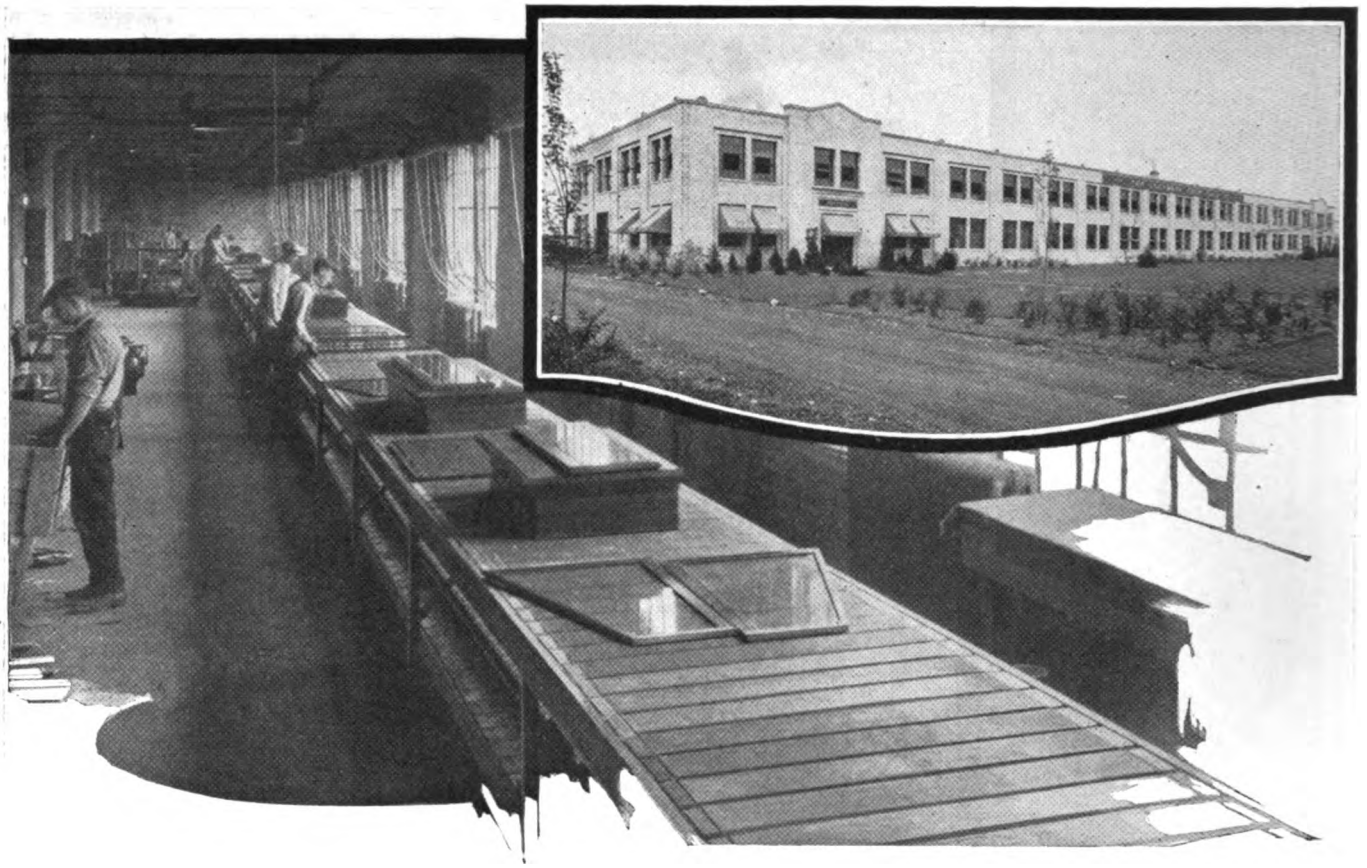
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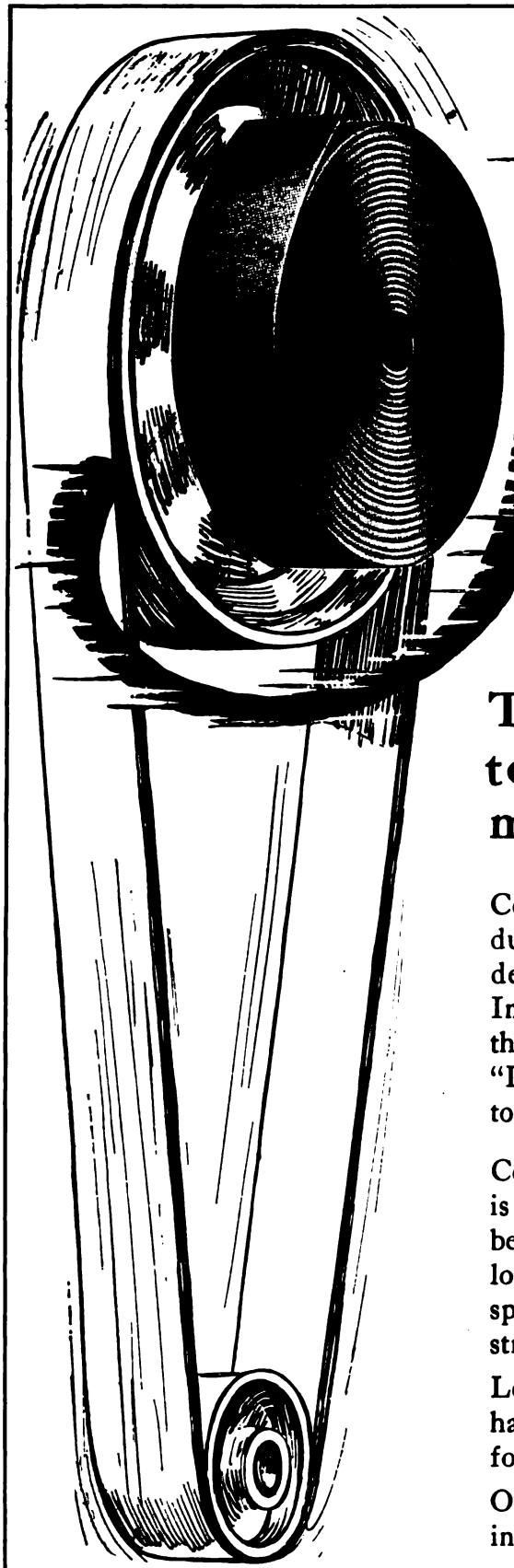
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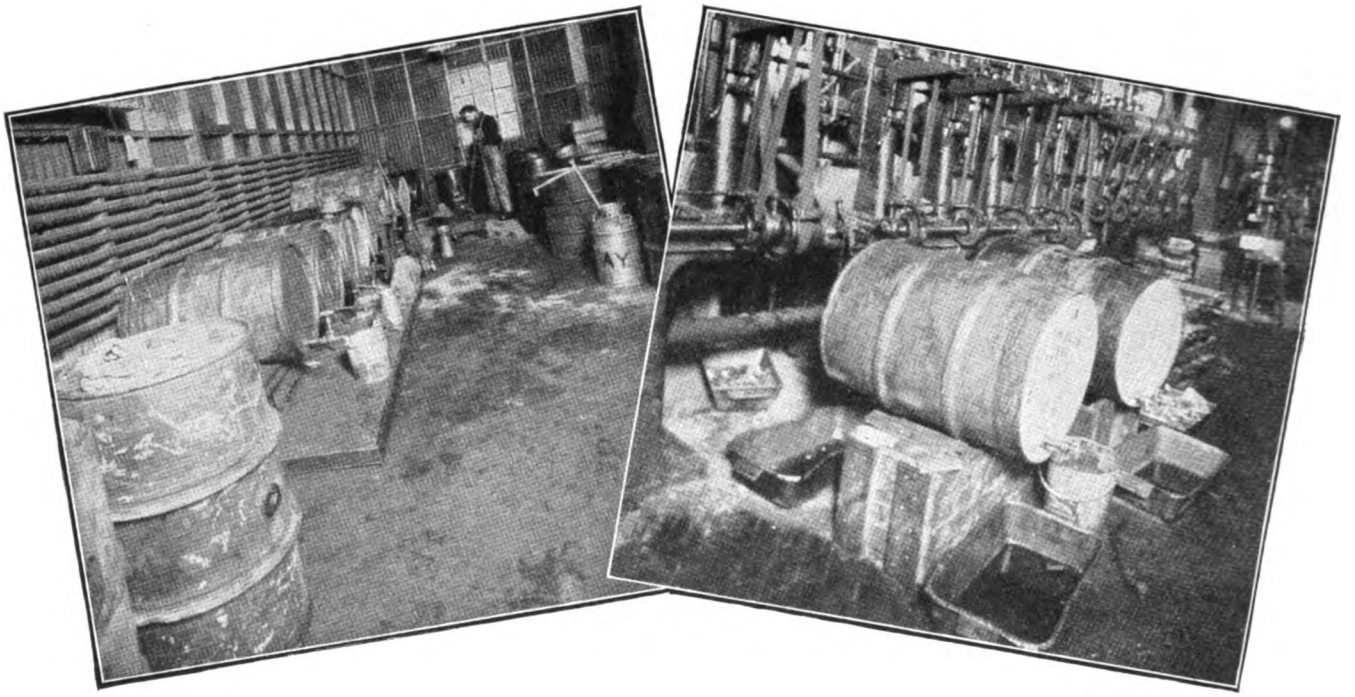
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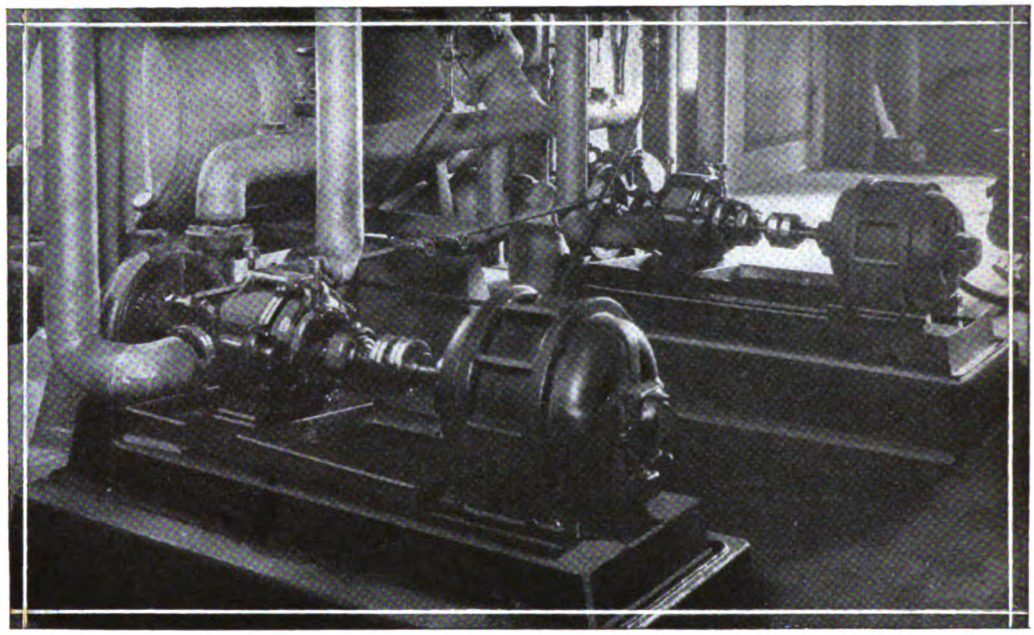
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Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures

JOHN H. VAN DEVENTER, *EDITOR*

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Art Director

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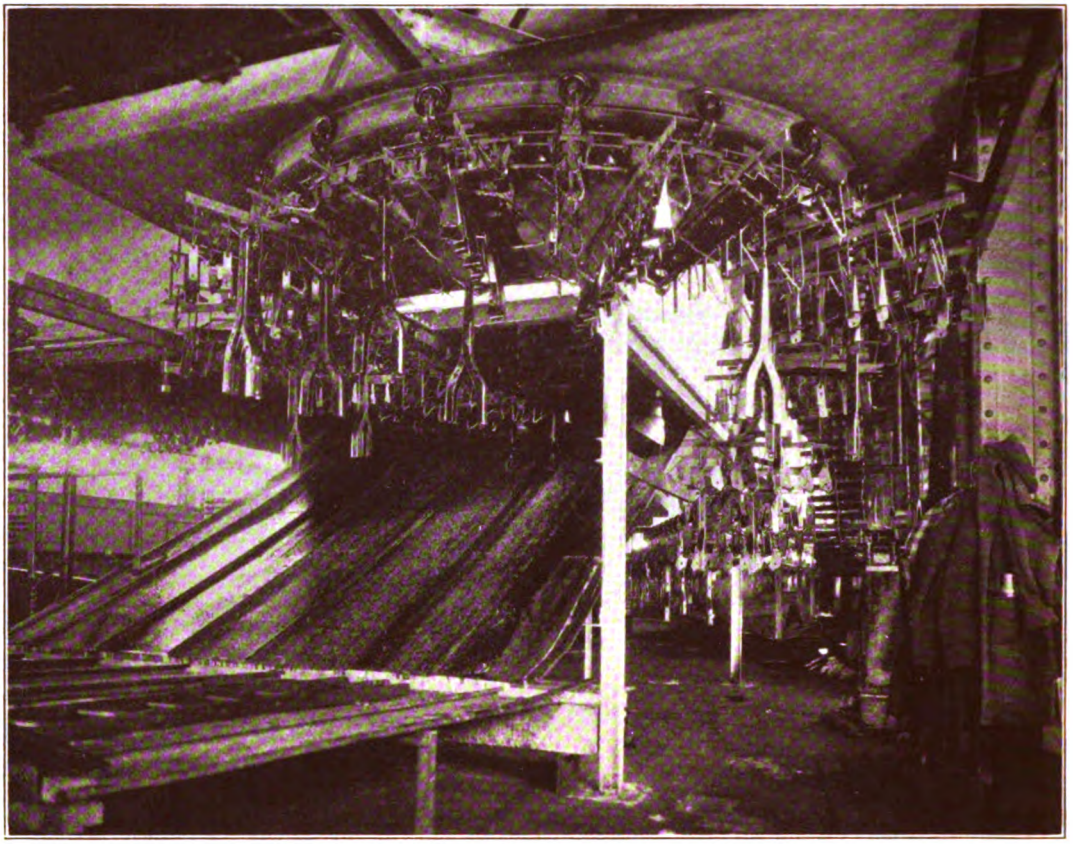


Fig. 1. A conveyor designed for carrying a large quantity of small parts through processes. As the parts come from machines, they are hung on hooks on conveyors, and carried through dipping and other operations.

Putting Production on Conveyors

A Proved Principle, Adaptable to Almost Any Plant

By Jervis B. Webb

WHEN the weather is good in the spring of the year, Sunday afternoon finds a great proportion of the population out in their automobiles for a ride. No two drivers of automobiles have the same ideas as to the speed of travel which will produce the greatest amount of pleasure or benefit to them from the ride; and when traffic is heavy and there is, as there always is, a driver who hasn't any particular place to go and is not pressed to get there, we have the pace-maker for the whole procession. Here, with the resultant traffic congestion, we have a very concrete example of the way work travels through many manufacturing plants.

For example, a pile of material is placed beside a production machine and the man works from that pile and makes another pile of finished operation on the other side of him. When a sufficient pile has accumulated, this is gathered up and moved on to the next operation.

Putting production on conveyors is solving these problems in a very satisfactory manner by bringing about a steady flow of product from operation to operation on a mechanical schedule, and bringing it to the proper operation at steady and regular intervals, avoiding accumulation of parts waiting to be worked upon and accumulation of parts which are finished; and the speed of this production is in the hands of the management, who control the speed of this conveyor system, and not in the hands of the individual operator.

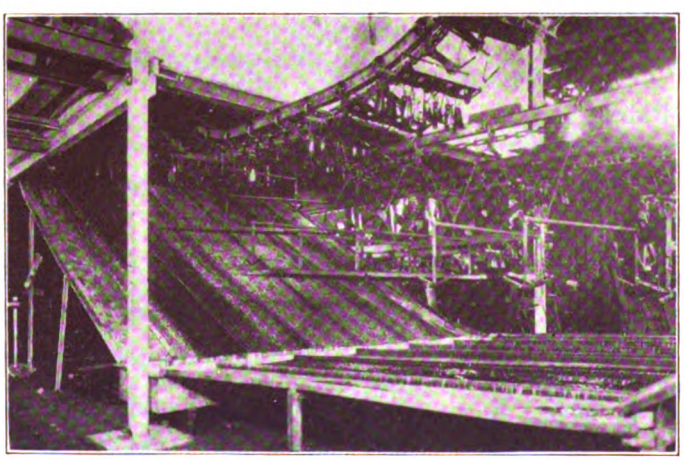


Fig. 2. These automobile chassis rails are on their way mechanically through painting and over-drying operations.

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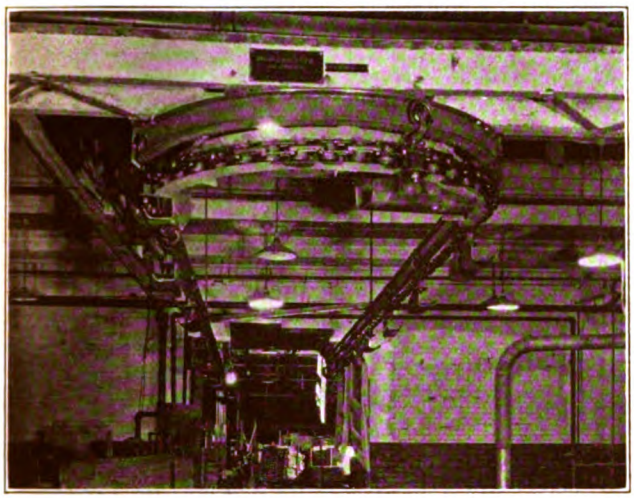


Fig. 3. The loading end of a conveyor for handling body doors. Note the succeeding illustrations—and keep in mind the fact that the same ideas are applicable to almost any production problem.

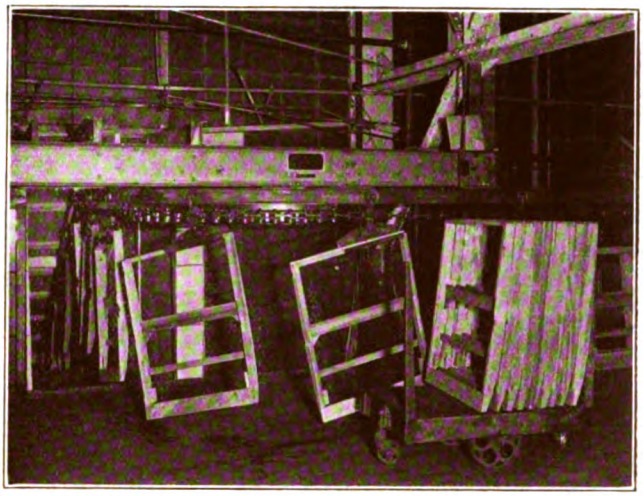


Fig. 4. Door frames are here entering the third floor, to have the sheet metal applied. This, of course, is done off the conveyor line.

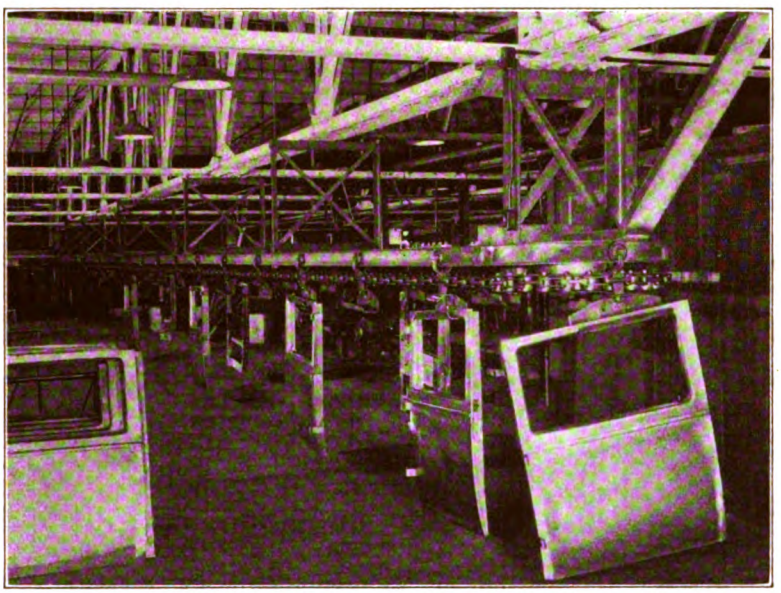


Fig. 5. After the sheet metal work is completed, the doors are re-hung on the conveyor line; production being so synchronized as to avoid extensive gaps between incoming and outgoing doors.

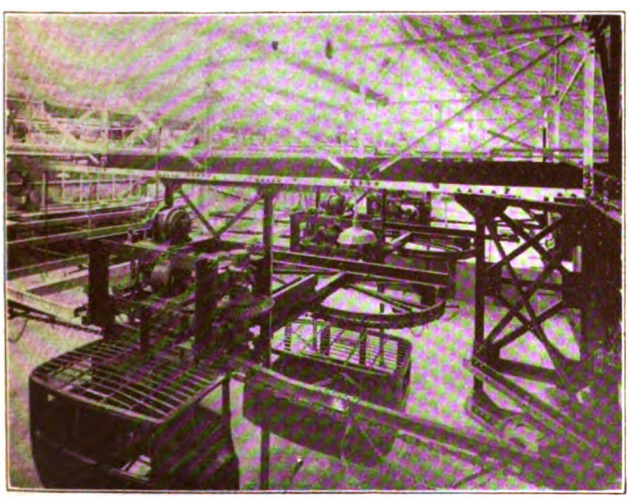


Fig. 6. Compare this conveyor, handling heavy and bulky bodies, with that of Fig. 1. Surely a wide diversity.

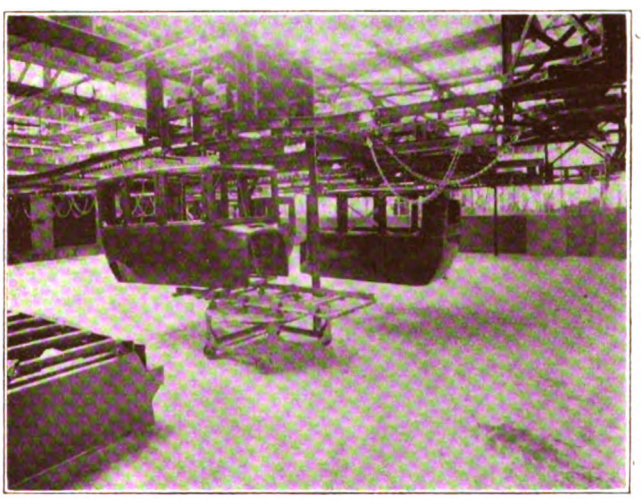


Fig. 7. This shows a transfer point, from a painting conveyor to the trim line conveyor in an automobile body plant.

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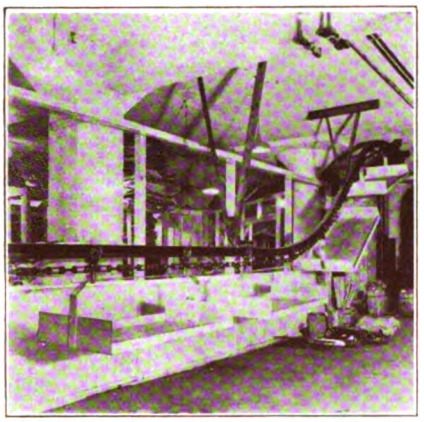


Fig. 8. An I-beam track, with conveyor chain supported by 2-wheel trolleys, used in the conveyorized production of automobile seat cushions.



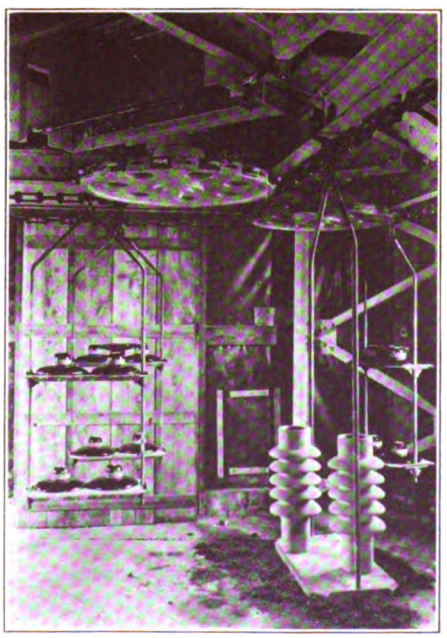
Fig. 9. Note how this system (Figs. 8, 9, 10) leads wherever desired, through successive operations, with minimum space requirements and maximum simplicity.



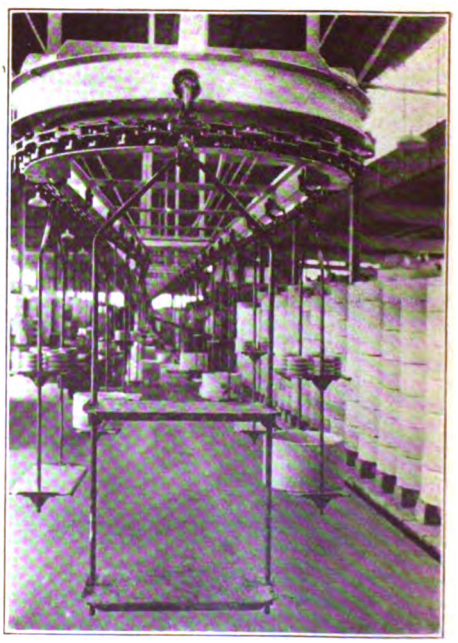
Fig. 10. The system shown in these three illustrations, incidentally, permits passing through intervening departments without disturbance, by going up out of the way.



Fig. 11. At the left —This is the same basic conveyor principle as shown above, but here it applies to the manufacture of clay insulators.



Figs. 12 and 13. At the left is shown a turn in the conveyor line, with unglazed ware on the one side and glazed ware on the return side; while the right-hand illustration shows how the "saggers"—in which articles are placed for glazing in the kiln—are carried on the lower shelf, while the unglazed insulators are on the upper shelf of the conveyor.



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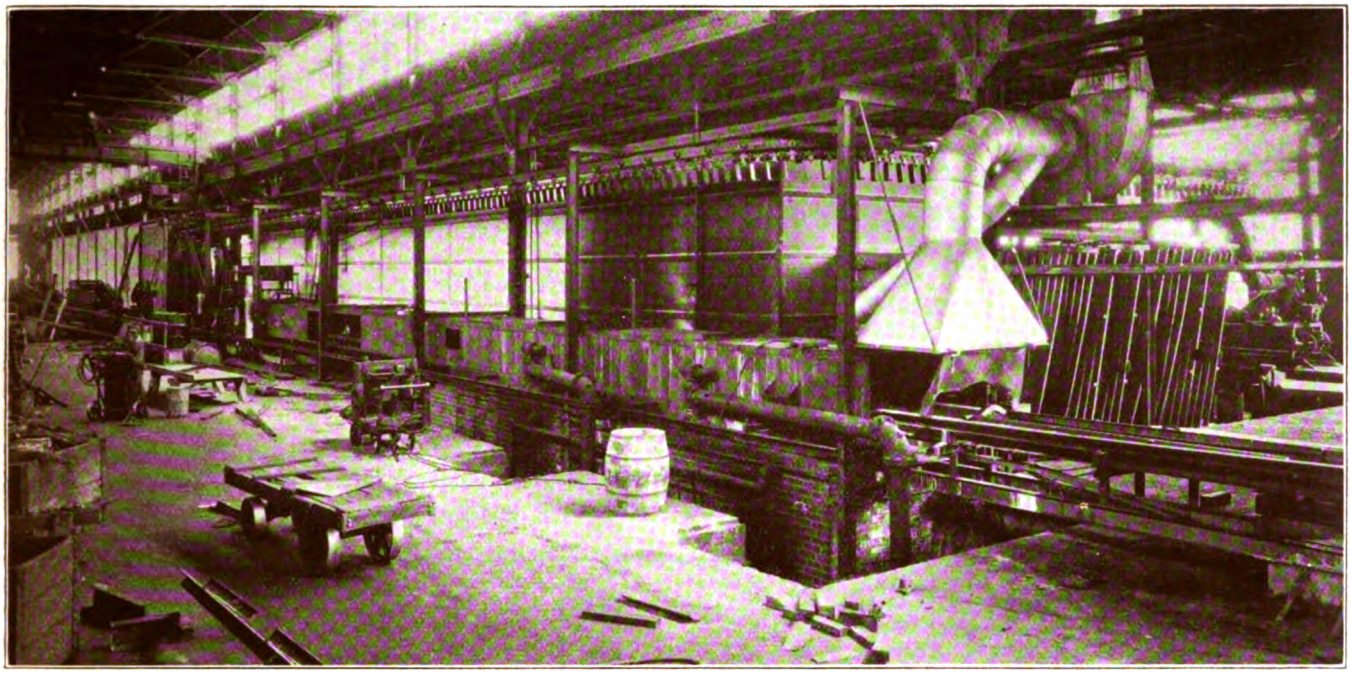


Fig. 14. Above—Note how automobile frames are laid flat on a conveyor, and thus carried through washing operations, after rivetting, and preparatory to painting.

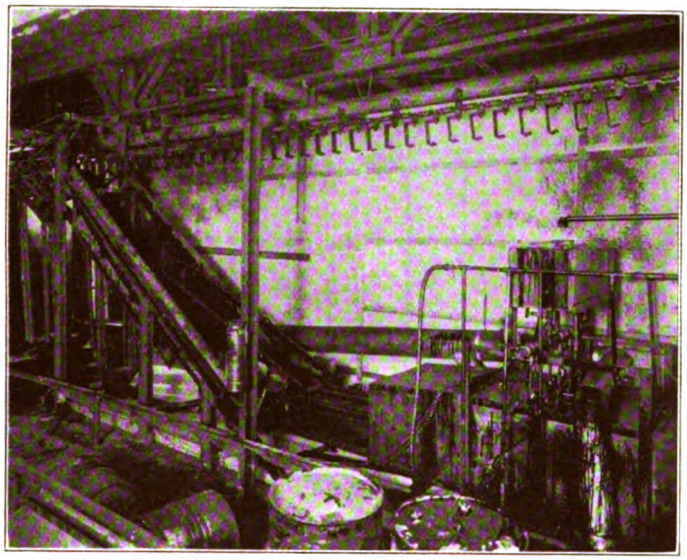


Fig. 15. At the left—This paint flowing machine is installed on the automobile frame conveyor line, and paints the frames as they come from rinsing and drying.

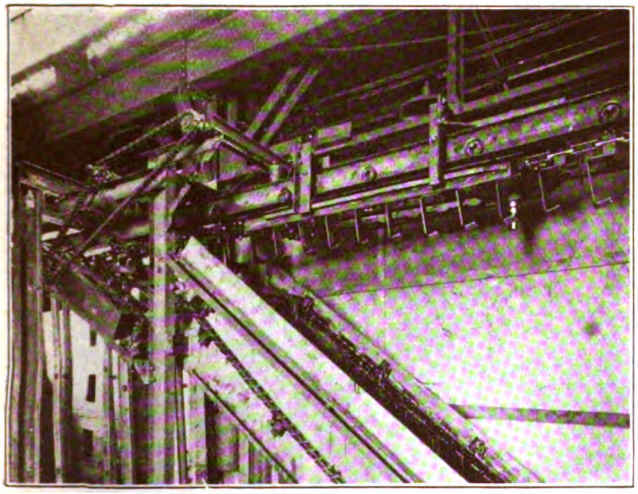


Fig. 16. On the way to drying ovens, the painted automobile frames are here loaded mechanically from the horizontal to an incline conveyor.

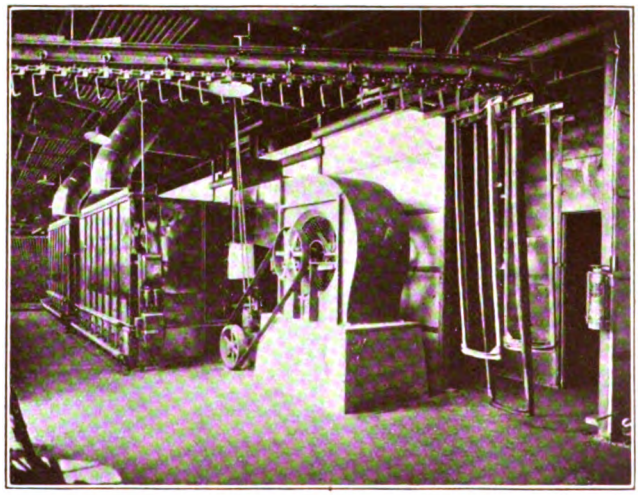


Fig. 17. Note the close spacing, in contrast to the washing and painting operations, as these frames pass out toward the loading platform. Synchronization enters into the problem here.

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What Power Means to the Worker

Gerard Swope, President of the General Electric Company, Gives Some Interesting Figures

Graphic Visualization by Frederick H. Peard

HOW the introduction of more automatic machinery and improved methods of manufacture have resulted in a reduction of prices of products of the General Electric Company as well as higher wages for employes, was pointed out in a statement made public recently by Gerard Swope, President, in announcing figures of the company's business for the first three months of the present year.

"A study of our largest factory, at Schenectady, where today 21,000 men and women are employed, indicates that supplementing the worker's skill by electrical power has enabled him to increase his earnings.

"This analysis referred to covers the 12 years from 1914 to 1925 inclusive, that results before and after the war and postwar readjustments may be compared. During this period the cost of living increased about 68 per cent. while the average earnings of the workers (not the hourly rate, but the actual dollars they received each week) increased 107 per cent. —in other words, more than doubled. "Let us assume,"

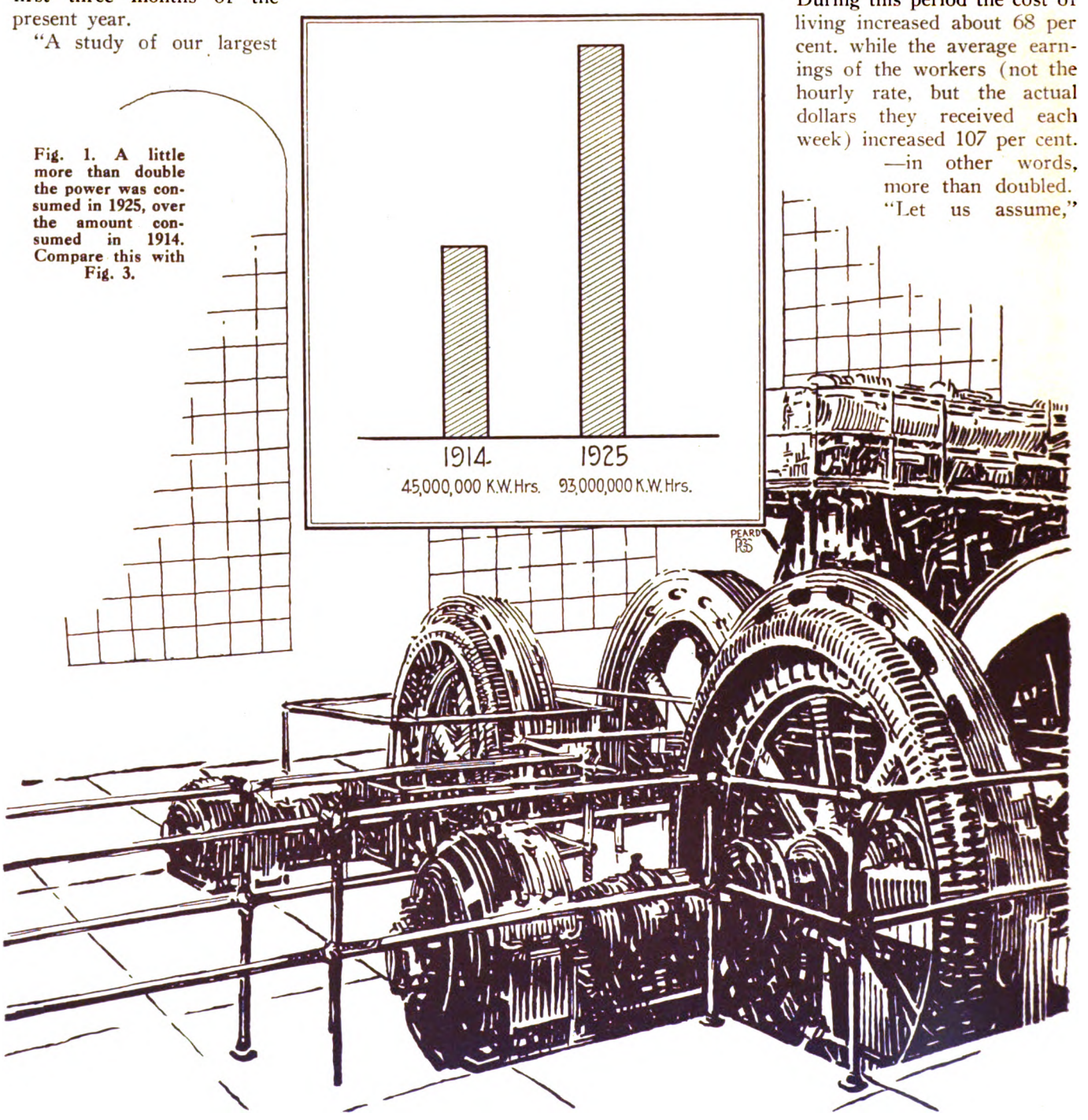


Fig. 1. A little more than double the power was consumed in 1925, over the amount consumed in 1914. Compare this with Fig. 3.

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Mr. Swope continues, "that the average earnings in 1914 were $20 per week and the average cost of living was $18 per week, leaving a margin over and above the cost of living of $2 per week or 11 per cent. In 1925 the average income would be increased 107 per cent. to $41.40 per week, while the cost of living would have increased 68 per cent. to $30.24, leaving a margin of $11.16 per week or 37 per cent. over and above the cost of living.

"In this same period the electric power consumed in this plant, much of which is purchased from a public utility company operating hydroelectric plants, has also more than doubled—from 45,000,000 kilowatt hours in 1914 to 93,000,000 kilowatt hours in 1925, while the average number of workers increased 34 per cent.

"This is in line with the declared policy of this country in the restriction of immigration. The problem, therefore, is to make workers more efficient and do the work that is necessary without a great increase in numbers, and to gain these advantages it is necessary to supplement their ability and strength by more power, and that power electrical.

In concluding his statement, Mr. Swope declares that these figures show progress in the right direction. "With more power supplied to the worker, he produces more with less effort and is thereby enabled to earn more money and improve his standard of living."

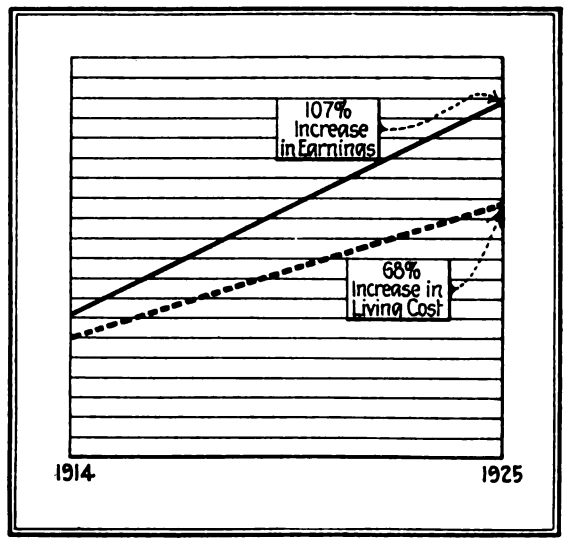


Fig. 2. Based upon actual conditions at the Schenectady plant, this chart shows the increasing margin between earnings and living costs.

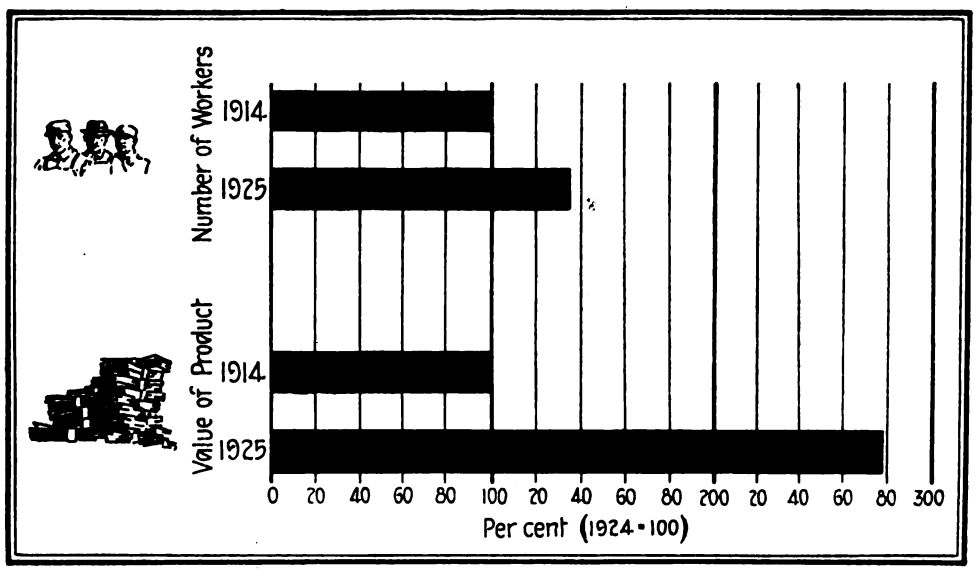


Fig. 3. With more than 100 per cent. increase in power, and only 34 per cent. more workers, not only did the workers' earnings increase (Fig. 2), but the value of the plant's product increased 179 per cent. Literally a "mutual benefit" affair all around.

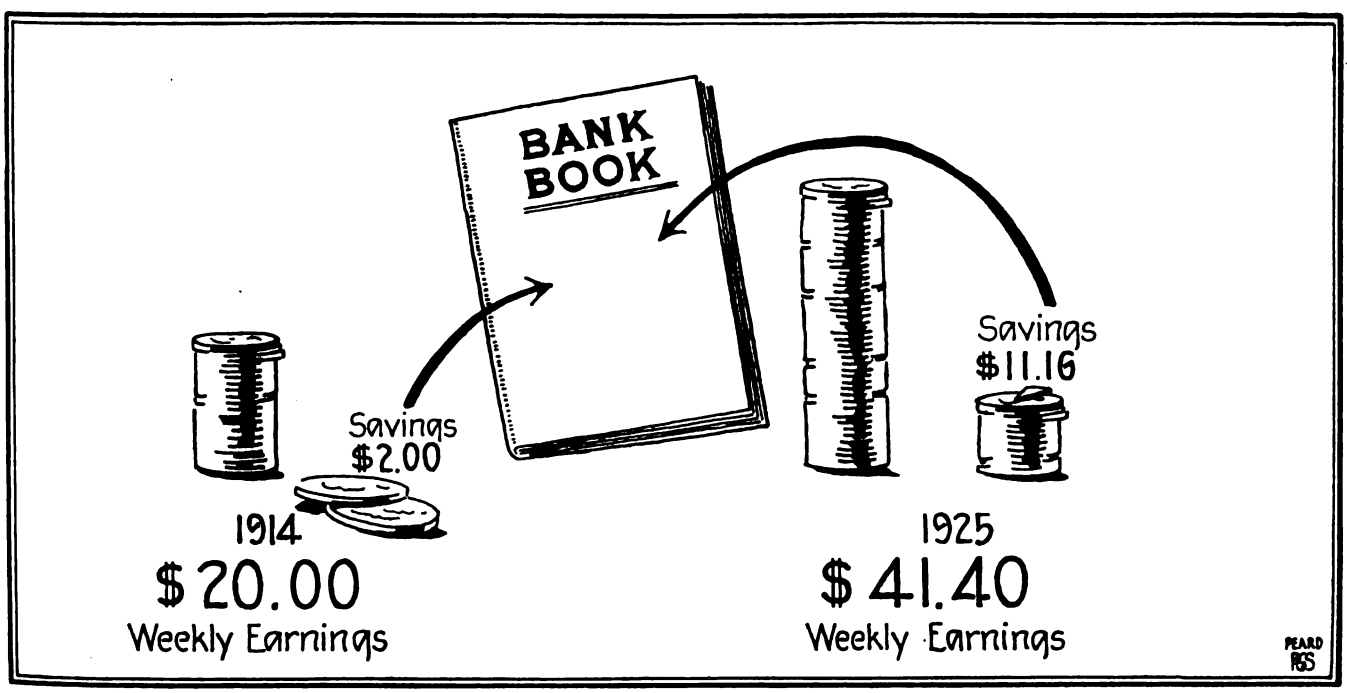


Fig. 4. Taking a concrete case of a worker who in 1914 earned $20 a week and had to spend $18 of it for living—note how his condition in 1925 (for the same work) compares.

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Saving Men, Material and Money by Mechanical Cupola Charging

By William G. Hammerstrom

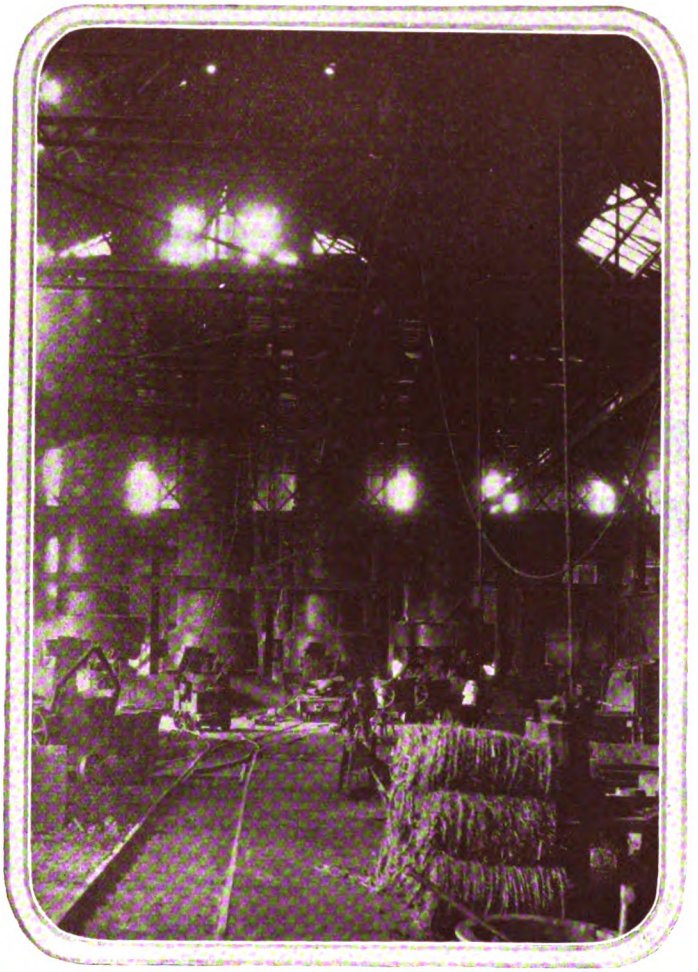


Fig. 1. Interior view of the pipe foundry, showing the four cupolas.

MANY efforts have been made in the past, and many devices designed to overcome the extremely heavy man duties that are called for on the cupola charging floor, and where some efforts have resulted in success, not a few have proven otherwise. Simplicity in design and operation is always desirable, and usually gives the best result. Many a good scheme, however, has been defeated through too complicated and elaborate mechanical devices designed to carry out the original idea.

The items that interest the foundryman mostly in connection with his cupolas are, of course, a good quality and hot iron, a low melting cost through a proper ratio of coke to iron, a minimum wear and tear of the equipment and lining, and last, but not least, the elimination of waste of materials and manpower.

At the Radford, Va., works of the Lynchburg Foundry Co., manufacturers of cast iron pipe, there has recently been installed a mechanical cupola charging device, which has entirely removed all manual labor on the charging floor, with the exception of the crane operation.

Two of the four cupolas are used alternately each day. While one set is in operation, the other is made ready for the next day's run. A 30″ diameter steel pipe header is located parallel with the cupolas into which the blast is discharged from the blowers through 24″ diameter pipes. From this header runs four 24″ diameter pipe connections, one to each cupola, and each line carrying a valve located at the inlet of the wind box. In the center of the header is placed a 30″ valve, and by this system of valves, any of the cupolas can be operated from any of the two blowers.

The charging device consists of an overhead crane of 30′ span, traveling lengthwise of the building on runways fastened to the columns of the steel structure. Attached to the underside of the crane is an 18″ I-beam serving as a monorail, on which the charger travels on double monorail trolleys. (The electrical equipment is made for a direct current of

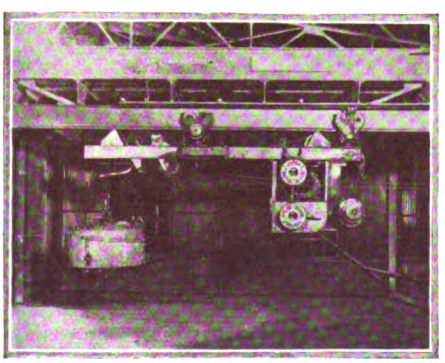


Fig. 2. The charger, with bucket, ready to charge a cupola.

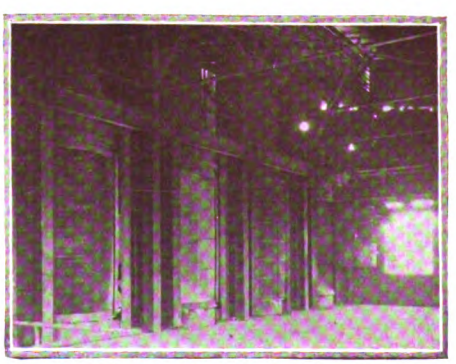


Fig. 3. Charging floor, showing charger (at extreme right) ready to enter a cupola.



Fig. 4. The charges are made up in the yard, in batteries of three buckets.

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220 volts.) The crane and the charger are controlled by operator in the cage.

The charging buckets are 4′ 10″ in inside diameter, and 2′ 8″ high. The bottom doors of these buckets are pivoted at the center line, and made to open by the tripping of a latch operated from the operator's cage. Each half of the door has two small rollers, which aid in the closing and latching of the doors when the buckets are lowered on the floor. Each charge in the bucket is 4,000 lbs. in weight consisting of pig iron, scrap iron, and foundry returns. On the bottom of the bucket is placed 400 lbs. of coke, which in addition to the weight of the empty bucket and the iron, make up the total hook load, which is somewhat less than the normal capacity of the 3-ton charger.

With a melting capacity of the two cupolas of 40 tons per hour, and each charge weighing two tons, it requires 20 trips per hour of the crane, or one trip every third minute to keep the charges at the proper level in the cupolas. The speeds of the charging equipment and the size of motors were designed to meet this condition, and which have in actual operation proven to be very ample.

The result of good charging is usually expressed in the good old term "distribution" and no doubt many a foundryman has hesitated in installing a mechanical charging in the belief that no piece of mechanism for this particular duty can improve or even equal the old fashioned hand charging. Many innovations have perhaps failed in the past just for this reason. On the other hand, the charging by hand involves the many uncertainties of the human equation and since the job itself is not of the kind to draw the most desirable and dependable labor, hand charging cannot be relied upon to be done to perfection.

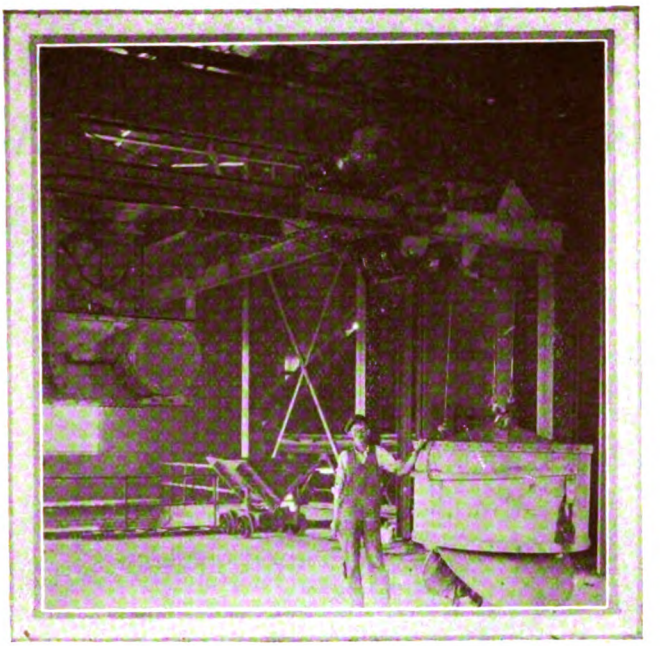


Fig. 5. Above is a view showing the crane and the automatically closing bucket. After charges are made up, as in Fig. 4, a gasoline tractor delivers them to the crane. (See Fig. 7).



Fig. 6. A general view of the tracks, yard, coke bin and trestle, with charging buckets shown at the right. Pig iron is unloaded from cars to yard by locomotive crane and magnet.

The results obtained at the Radford Works in regard to the "even distribution" have exceeded expectations, results which can no doubt be duplicated anywhere if the problem is given the time and attention it merits.

The installation has also proven its full worth from a monetary point of view in addition to obliterating one of the hardest tasks in the foundry. In the old hand charging method, eight men were employed on the charging floor throwing in iron and coke. These have now been entirely replaced and the crane runner is the only man engaged in connection with the actual charging of the cupolas.



Fig. 7. Buckets are shown in this illustration on trucks, drawn by the tractor which delivers them to crane.



Fig. 8. This shows how the crane picks up each bucket, in turn, from its truck; returning it when empty of its charge.

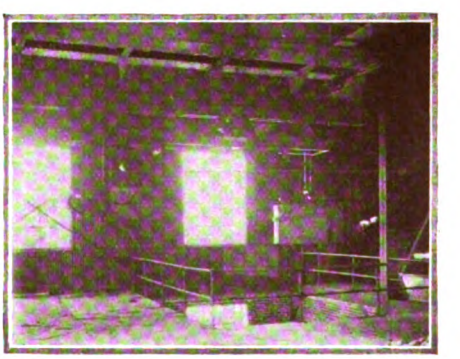


Fig. 9. Having raised the bucket (Fig. 8) to the charging floor, the crane takes it from here direct to cupola.

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Quantity and Quality, Plus Variety

One of a Series of Pictorial Visits to Noted Plants

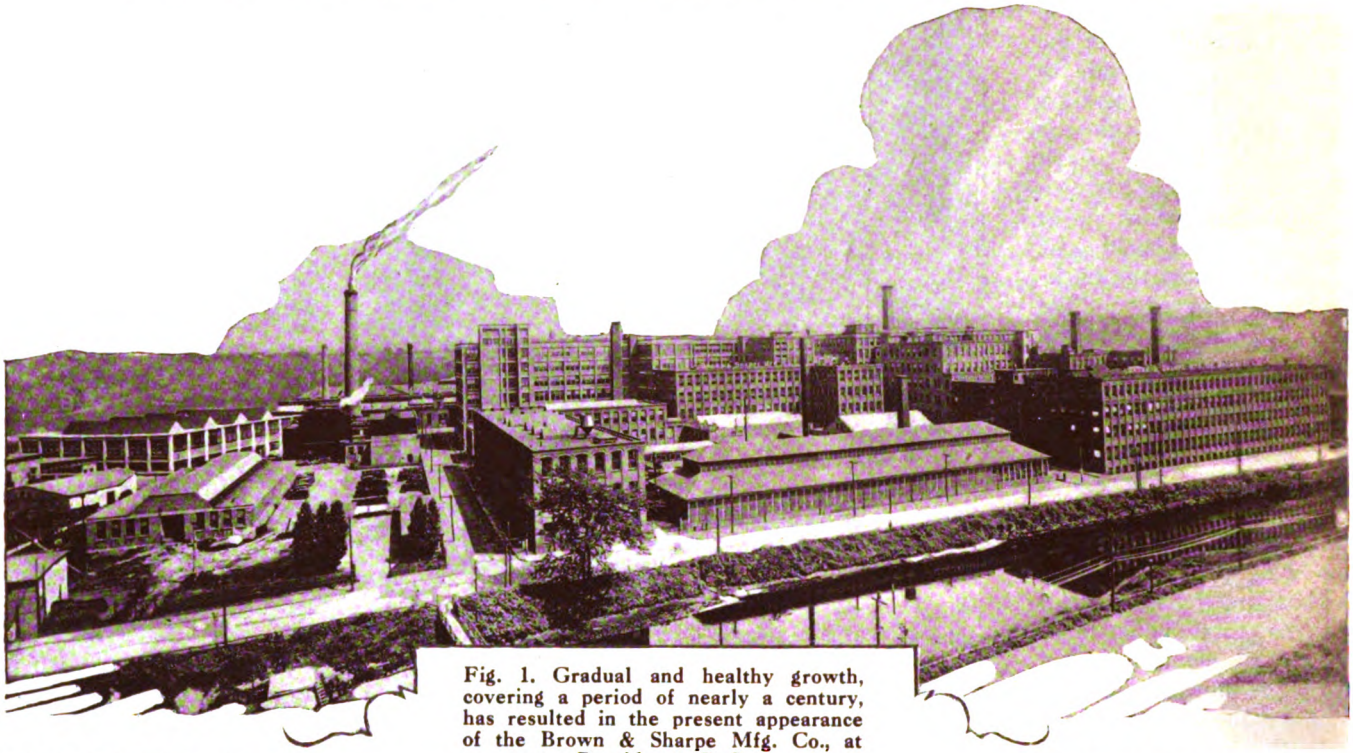


Fig. 1. Gradual and healthy growth, covering a period of nearly a century, has resulted in the present appearance of the Brown & Sharpe Mfg. Co., at Providence, R. I.

NEARLY all of those who are interested in big industrial undertakings, and particularly those who are active in machine shop operation, look forward to the time when they may have an opportunity to visit the plant of Brown and Sharpe Manufacturing Company, at Providence, R. I. For this concern has a historical background that is unique, as well as a present day importance as one of our foremost American tool plants. Moreover, it is regarded as the parent of precision manufacture in America.

The pictures which follow, and which serve to take the reader on an abbreviated journey through this plant, will prove the point that a business which has many years back of it can still be strictly up-to-date in methods and equipment.



Fig. 2. This concern operates its own foundries, for gray iron as well as brass and bronze. A molding floor of the iron foundry is shown above.

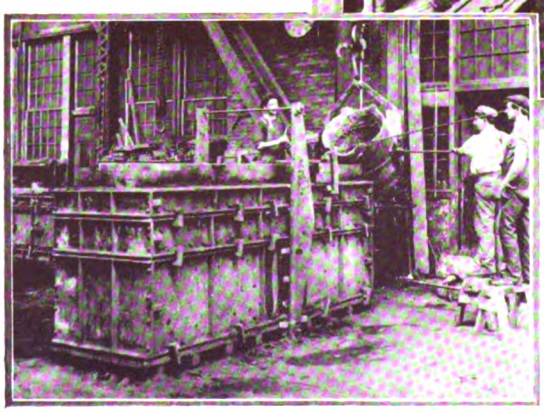


Fig. 3. Metal flasks are in vogue. Here is a three-part mold for a machine bed, ready to receive the hot metal.

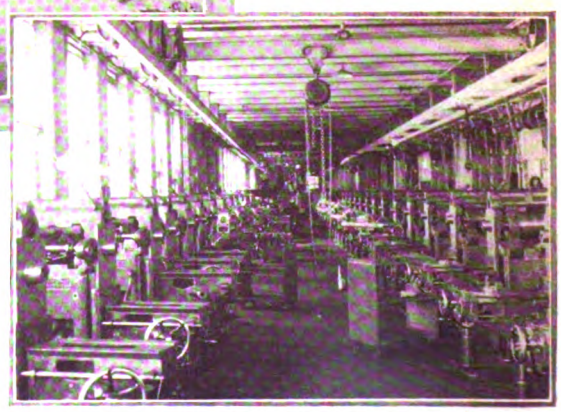


Fig. 4. The quantity production keynote is struck by this view of an erecting floor in the milling machine department.

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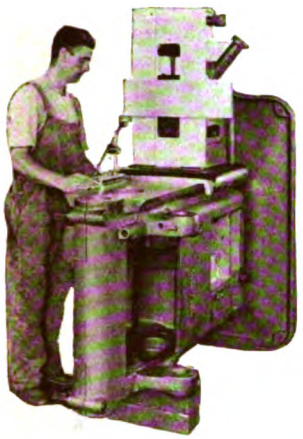


Fig. 5. Quantity production and precision must go hand in hand in the successful machine tool plant. This inspector is checking the relation between saddle and column of a milling machine.

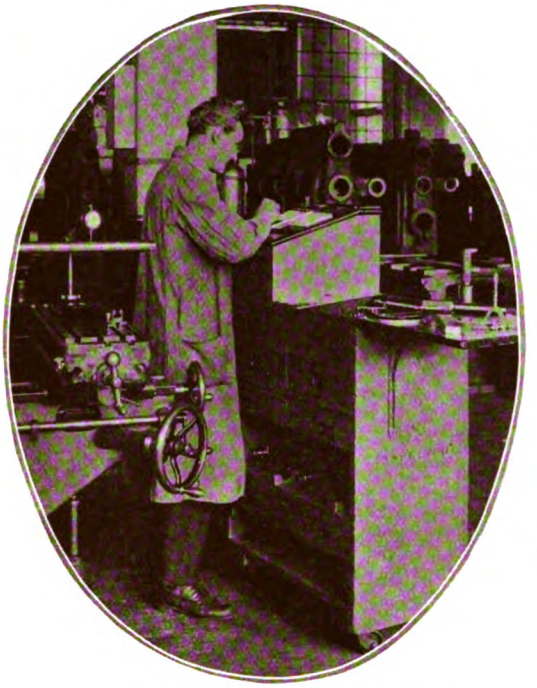
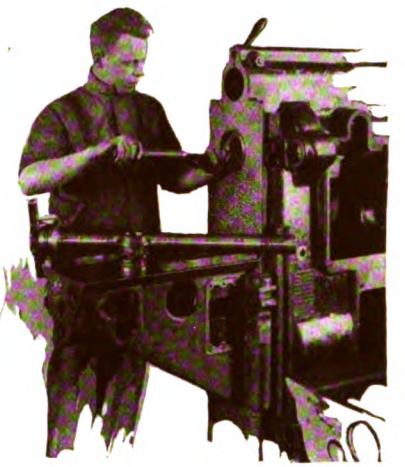


Fig. 6. The machine inspector is provided with a mobile bench and desk, on wheels, containing inspection tools and blanks.

Fig. 7. Nothing will take the place of scraping in providing an accurate and lasting running fit for precision bearings.



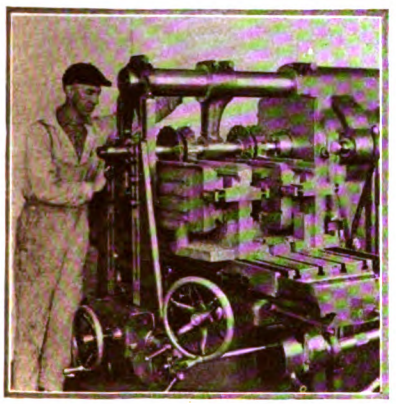
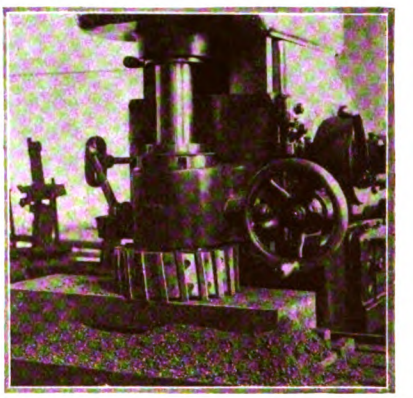


Fig. 8. By clever jigging, four milling machine tables have their ways finished simultaneously, as shown at the left.

Fig. 9. At the right is shown a large inserted tooth face mill in operation, removing metal at a quick feed.



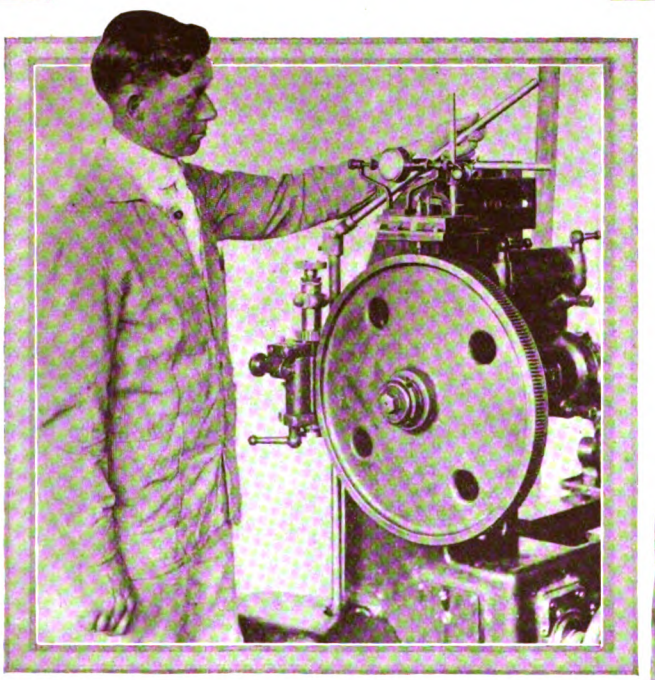
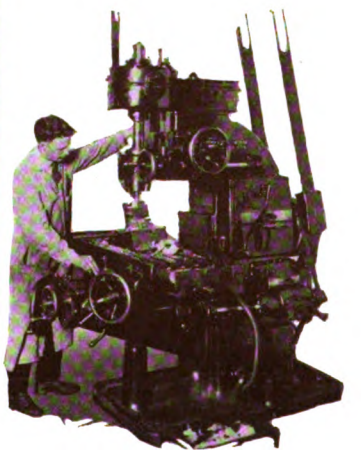


Fig. 10. Index wheels for gear cutting machines require rigid inspection for upon their accuracy depends that of the gears produced by them.

Fig. 11. Spiral mills, of heavy pitch are also used, and made by this company, for high duty milling.



Fig. 12. The vertical spindle milling machine comes into play for reversing and other work beyond the range of the horizontal spindle type.



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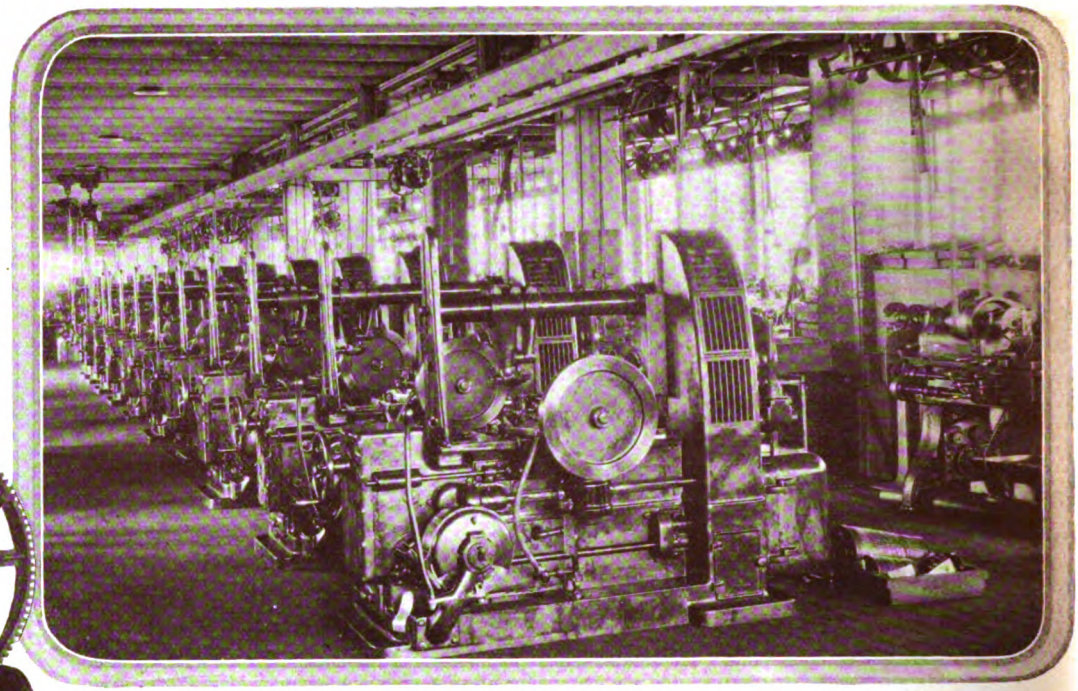


Fig. 13. At the right is a line of gear hobbers in process of erection.

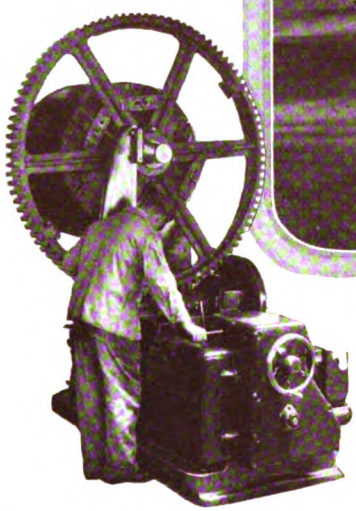


Fig. 14. Above. Here is a rather big job of gear cutting. It is being done, at the factory, on a B. & S. Automatic gear cutting machine.



Fig. 15. Accurate gears require close inspection. These spiral bevels are being tried for mesh on master centers.

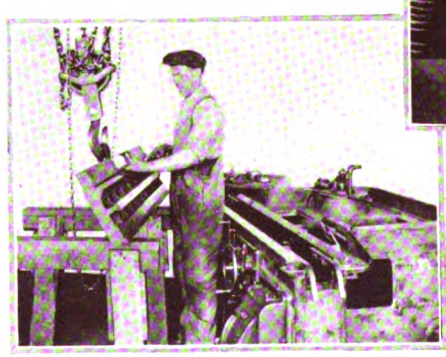


Fig. 16. Here again is an example of the art of scraping—a hand skill job that no machine can yet supplant.



Fig. 17. This is the "measuring room." The first linear dividing machine was produced by Joseph R. Brown in 1850.

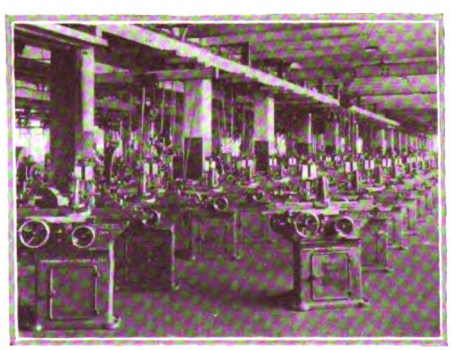


Fig. 18. A corner of the erecting floor for tool grinding machines. Note the overhead hoist structures in the side bay.

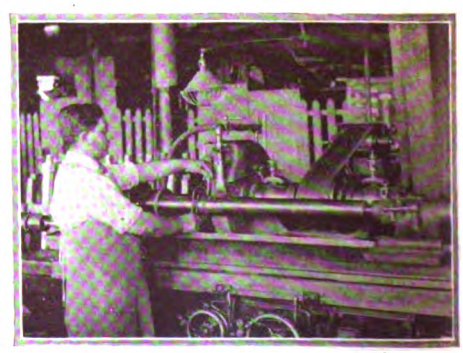


Fig. 19. "Grind the spindle and scrap the bearing" is the slogan where accurate running fits are required.

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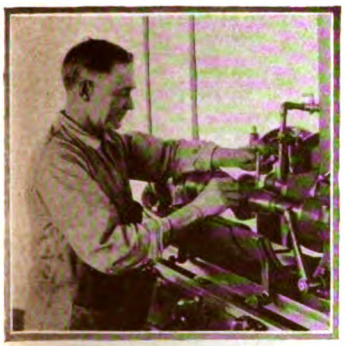


Fig. 20. Calipering a taper bearing with the "mikes." Some job for a skilled man. This company makes the "mikes," the bearing, and the grinding machine.

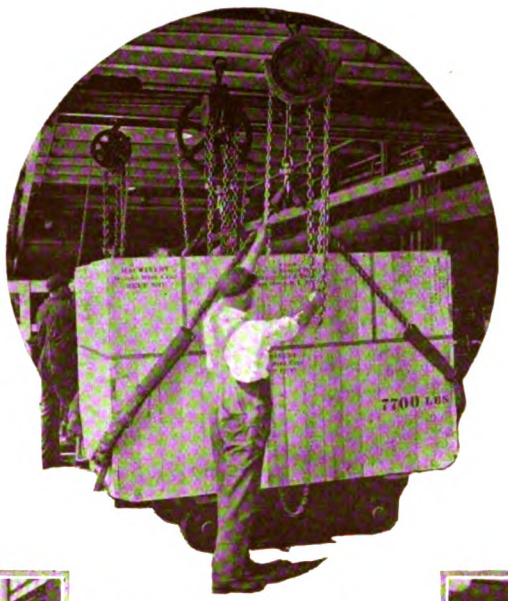


Fig. 21. Getting ready to cross an ocean or two. This shows a corner of the export shipping department.



Fig. 22. Jigs for precision tool parts must be more than precise. Jig inspection is a necessity that is not neglected.



Fig. 23. Above. B. & S. apprentices are introduced to the fine points of the art of scraping through actual practice.

Fig. 25. As an indication of variety, just look at the article below, one of this plant's products.





Fig. 24. Above. About 110 young men are now serving an apprenticeship which includes plenty of class instruction.

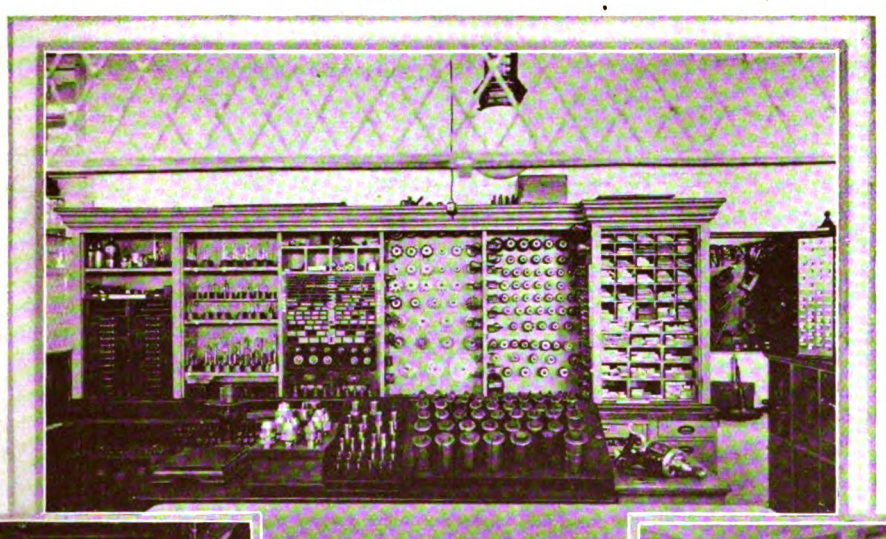


Fig. 27. Some straight edge is this one below! It is about to be carefully packed for shipment, as one of the B. & S. products.

Fig. 28. Injuries incidental to the daily life in a big plant are given treatment in the well equipped dispensary shown below.

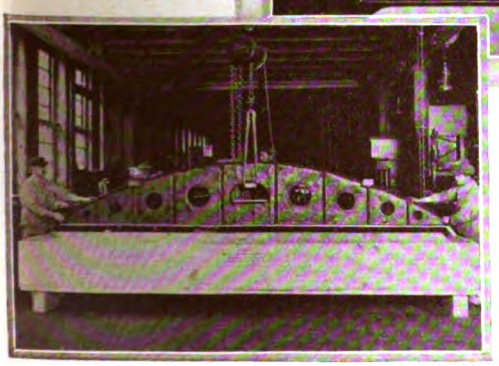


Fig. 26. A corner of one of the many tool rooms. Note the orderly arrangement of cutters, bushings, etc.



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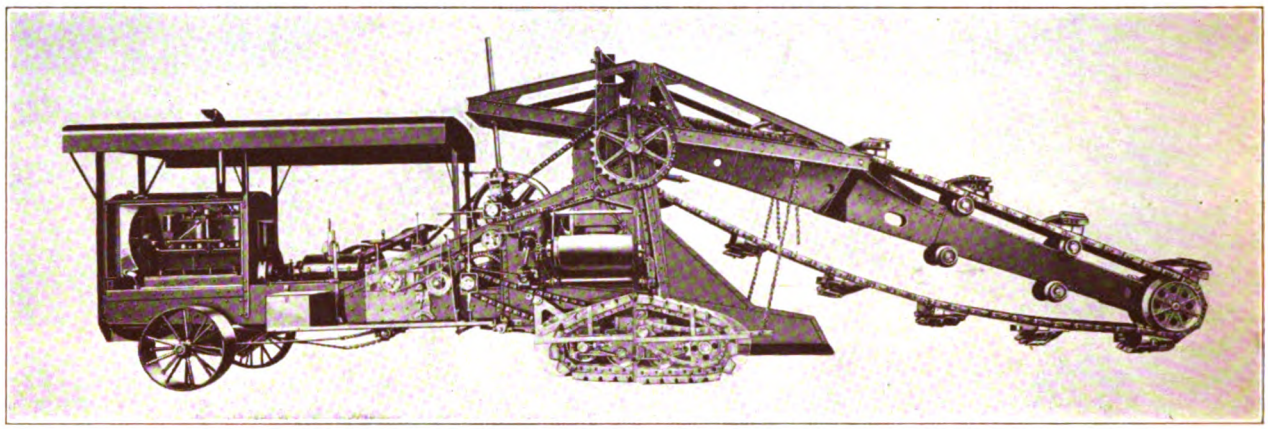


Fig. 1. Operating side of a modern trenching machine. Its intricacy of construction, and the multitude of gears, chains and bearing elements require the most careful attention to lubrication, especially where these parts are exposed.

The Lubrication of Excavating Machinery

A Guarantee of Low Maintenance Costs

By Allen F. Brewer

MAINTENANCE of practically any type of productive machinery is to a large degree dependent upon the extent to which wear is reduced or prevented. The cost of maintenance, therefore, is dependent upon lubrication, for lubrication is a most effective method of reducing wear between moving elements.

The average excavating machine is the "houn dawg" on the construction job. If it is not mired down to the hubs in mud, it is expected to climb rockpiles and move young quarries quite as readily as it would a bucketful of sand. Just watch the next shovel you see attack a pile of stone or broken masonry and you'll realize its duty.

Gears, chains and wire rope, are the most frequently exposed parts and the parts where even partial protection is generally an impossibility. Such parts in general will function more continuously in the absence of lubrication than practically any other wearing elements. On the other hand, they will also involve greater power consumption under such operation and considerable labor, time and material costs when replacement is necessary.



Fig. 2. The drag scraper and the Fordson tractor. Both tractor and scraper cables, etc., must be properly lubricated, otherwise production will fall off and maintenance costs probably rise.

Wire rope, especially, requires frequent and careful lubrication, due to the possibility of rusting and corrosion of the internal strands. On the drag-line scraper, for example, a considerable length of such rope is involved. Penetration of abrasive particles within the strands is sure to cause wear as they subsequently rub against each other.

A good soaking in wire rope lubricant prevents this to a great extent, even though the exterior surface may be more sticky.

For such a lubricant to give the best results it should be:

Of high viscosity, so as not to drip off or be squeezed out when exposed to high temperatures and pressures; plastic at all temperatures, with no tendency to harden or cake; insoluble in water; so tenacious as to prevent entry of solid or fluid foreign matter; readily applicable in the requisite amount without the necessity of too much heating; as free from evaporative tendency as possible; and with no appreciable acid or alkali content.

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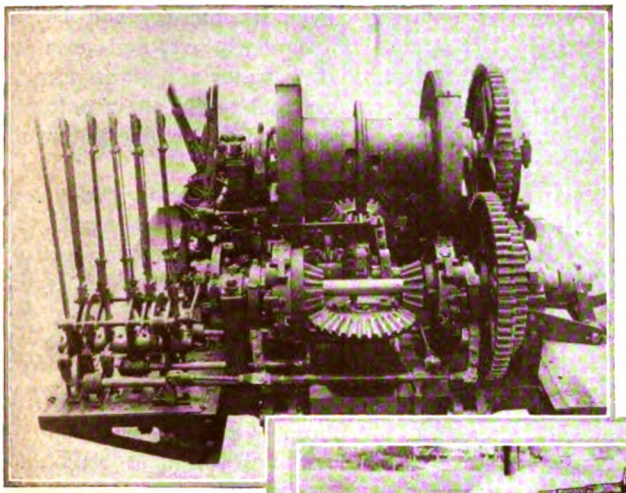


Fig. 3. Front view of crane machinery. Note the independent automatic double drums. On certain of these machines self-closing oilers serve the drum bearing, reducing the possibility of entry of foreign matter.

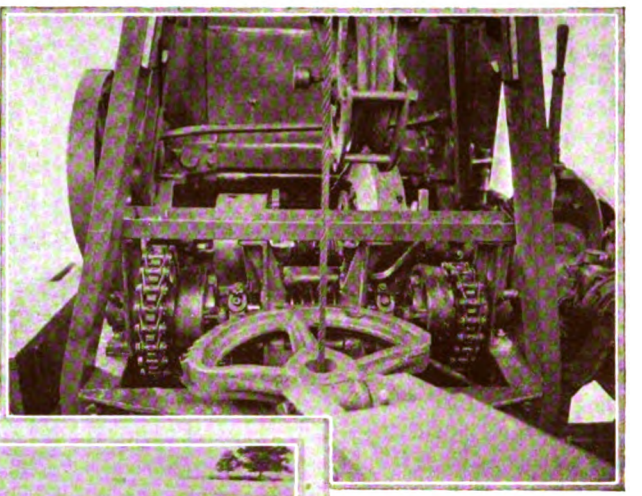


Fig. 4. The swing mechanism of a backfiller crane. The fact that gears, wire rope and chains operate exposed renders lubrication an important matter.

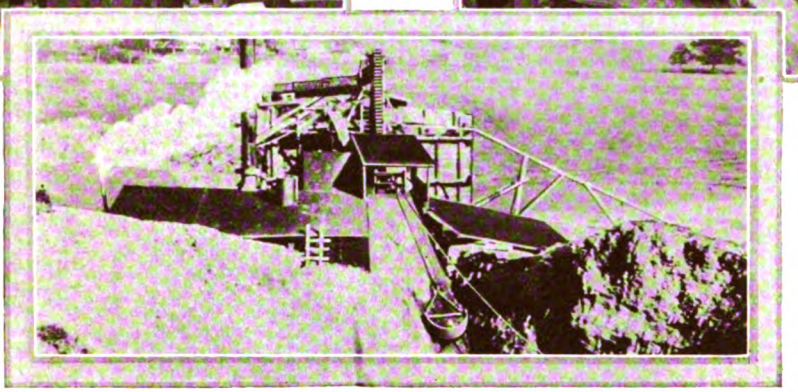


Fig. 5. A typical view of a sand and gravel handling job by means of a drag-line scraper. The proximity of the wire rope to the material handled can be noted, hence the need for its protection and preservation.

Steam cylinder lubrication on steam operated excavating equipment is important in many cases due to the nature of the steam used. As a rule, pressures will be comparatively low, ranging in the neighborhood of 150 pounds per square inch. Furthermore, the exposed nature of many of the steam lines and engines gives rise to considerable condensation.

Care should be taken, in selecting cylinder oils, to choose those which are compounded with sufficient fixed oil or animal fat to give the requisite tenacity to the lubricating film. Such oils should have as their base a steam refined cylinder stock of 125 to 150 seconds Saybolt at 210 degrees F. An oil of this nature, with from 6 to 10 per cent. of compound, will in general effectively resist the washing action of any water that may be present in the steam or engine cylinders after a shutdown.

Cylinder oils should be delivered to the steam line of each engine involved at a point from 4 to 6 feet back from the throttle valve, although, in the case of a thrusting engine, it may be necessary to deliver the oil at a point further back.

Both hydrostatic and mechani-

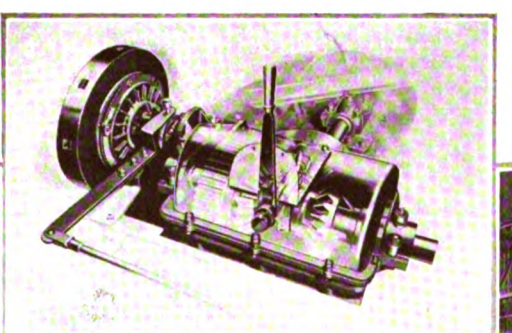


Fig. 6. Gear reduction and machinery reverse unit in a modern trenching machine. Note that the gears are enclosed in an oil-tight housing and thereby capable of bath lubrication by means of oil. In this way friction and wear on the teeth are materially reduced.

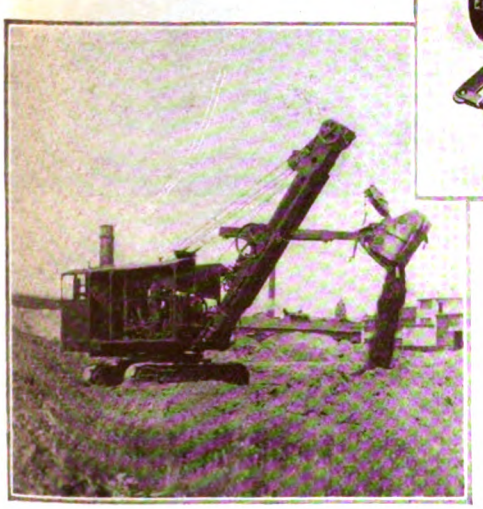


Fig. 7. The fact that the average shovel operator does not handle his machine with "kid gloves" requires that we protect the multitude of exposed wearing parts as far as possible with proper oils and greases.

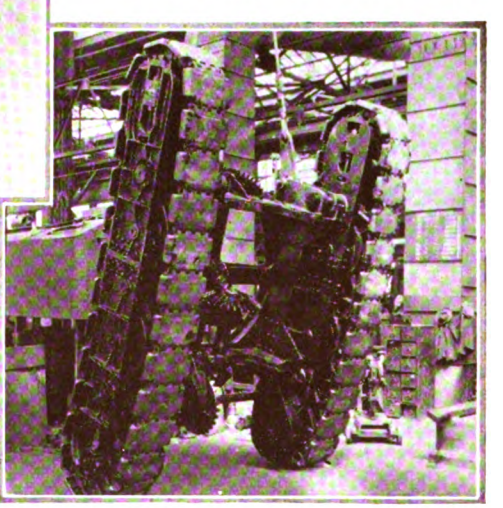


Fig. 8. Bottom view of an excavating machine showing propelling gears and tractive or crawling elements. To see such a machine wend its way "knee deep" in mud excites admiration for the builders who have designed the wearing parts to stand such service.

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cal force feed lubricators can be used for this purpose. The former are the less positive and will tend to be more wasteful of lubricating oil. This will be especially true if operators are careless in turning off such apparatus when engines are idle. Mechanical force feed lubricators, by virtue of the fact that their operation is contingent upon the operation of the engines are more economical and positive in their furtherance of effective lubrication. Whatever type is used, however, it is important that the oil be fed into the steam line via a suitable atomizer to bring about as complete breaking up of the oil as possible, and thereby literal lubrication of the steam.

Bearing lubrication on the average excavating machine is generally a matter of grease cup or oil can service. As a rule, the miscellaneous external bearings involved on such equipment, whatever its nature, will be so frequently exposed to dust, dirt, water and abrasive matter that really effective lubrication will become a difficult proposition.

This fact will cause certain operators to regard the lubrication of such parts as a more or less hopeless task, dosing them with waste engine oil, black oil or inferior greases, according to the means provided for lubrication. Of course, such products will lubricate, but not to the extent required by the bearings of high grade machinery. Furthermore, enough dirt or other foreign matter will gain entry, anyway, without the addition of more in the form of contaminated lubricants.

All told, therefore, it is a paying proposition to lubricate the average excavating machine as carefully as possible, as a study of maintenance, repair and lubrication costs for a few months will prove.

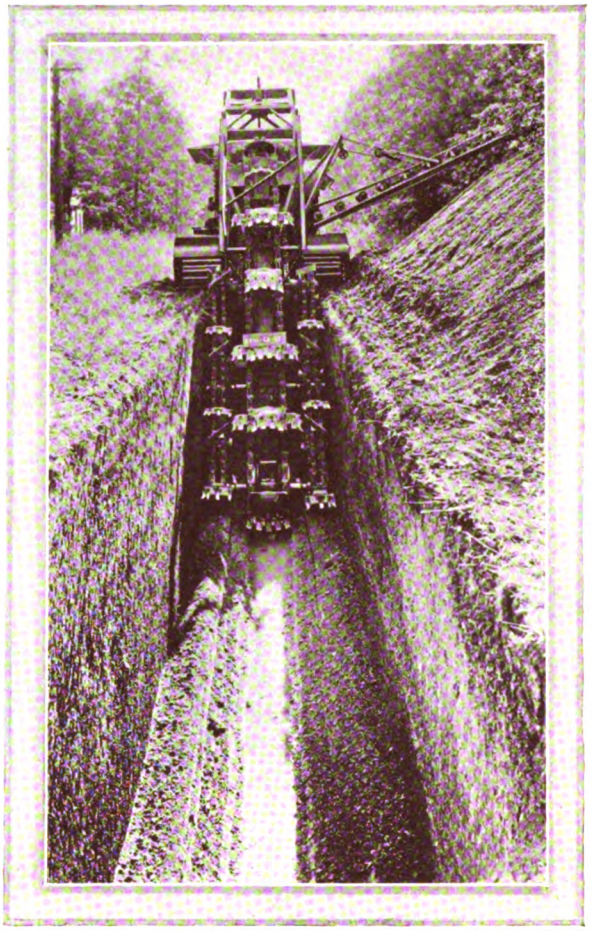


Fig. 9. We have viewed the trenching machine from its side, in Fig. 1. Here we see it in action, equipped with a trench widening device, digging 76 inches wide, 11 feet 6 inches deep at the rate of 37 feet per hour.

Fig. 10. Lubrication of excavating equipment by the pressure grease gun is conducive to increased production, lower maintenance costs, and economy of lubricants.

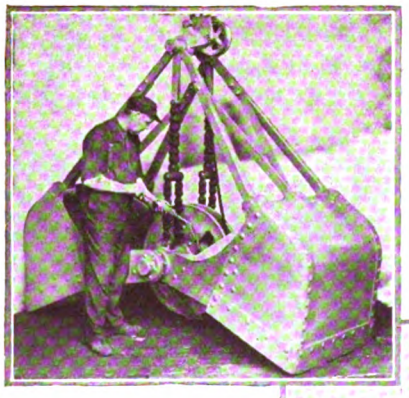


Fig. 11. But not only will the mechanism of the excavating machine serve in the handling of earthy or mineral products. Here, in the form of a steam crane it is handling scrap material in quite as effective a manner.





Fig. 12. In water as well as on dry land does the drag scraper function, provided its wire ropes and cables are properly lubricated and protected against rust.

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Why the Salesman?

The Job of Teaching People to Want What They Need

By R. Howard Claudius

HAVE you ever tried to get puppies to take their first saucer of milk? They like milk; they have been living on it but they have not been getting it out of a saucer and they don't want to get it out of a saucer. They can not believe it is possible to get good milk out of a saucer; the idea is too strange; it revolts them. You may show them the milk and make them smell it but they do not believe their senses; they will have none of it. At last you lose your patience and, saying, "You little fool!", you seize one of the recalcitrants and rub his nose in the life-giving liquid which, to him, must be ambrosia and nectar combined. He struggles in vain; there is milk all over his muzzle; he backs away, licking his chops Then, he tastes and, at last, he believes; he returns to the saucer of his own accord and, thereafter, is a firm supporter of the new method of serving milk. He soon forgets that he ever got it in any other way.

It is only too true we are all but as little puppies when it comes to taking a new thing when it is offered us. We may be hungry for milk but, if we have always gotten our milk in glass bottles, we do not want it in anything else. We may talk about our progressiveness but we progress only as we are driven. We have come a long way and it is fine to look back and congratulate ourselves on our achievement but how about looking ahead? How about making still more improvements? Ah, that doesn't sound so good. What more improvements do we need? We are doing very well; we are satisfied. No, when it comes to looking ahead, we leave that to our leaders and little help they have from us! The man with a new thing can keep it, for all of us. You know the story of the Bell telephone. You know the story of the Westinghouse air brake. You know the story of the Ford car. But do you know the story of the tungsten lamp? That's the time you got your noses rubbed in it.

If there is anything civilized man needs it is cheap artificial light. Everything else he needs and makes is made largely by its help. Half of his entertainment and education is conducted under it. Well, you don't have to be told how we need it and want it. You remember, also, how long it was we had to wait before we had anything much better than the torches we used to use in the caves back in the Stone Age, something like—well, anyway, it was thousands of years ago. And then suddenly gas came and, right on top of it, electricity. You never knew the work that was put on the lamp to make electric light possible; you knew only that, after you had made up your minds to take the plunge (the first of you had to be pushed off the edge) from gas to electricity, the lamp was continually improved so that you had more and more light for your money. You took these better and better lamps as they came because they were handed out to you and looked the same as you had been getting and cost no more. There was nothing startling about them. The milk was coming as it always had.

And then, one sad day, those leaders away out ahead on the path to more light, discovered something new, a lamp that was not merely a little better than the best in use but was twice as good. But, alas, it looked different and cost a little more. Now, these men had not been acting all their lives as pioneers without learning a good deal about the inertia of human nature. They knew they had a new thing that the world wanted but they knew also that the world didn't know it wanted it and didn't want to be told. So they knew, from the outset, that getting those new, better lamps into use would not be easy. Think of it! That's the reputation we have earned and we can't disavow it.

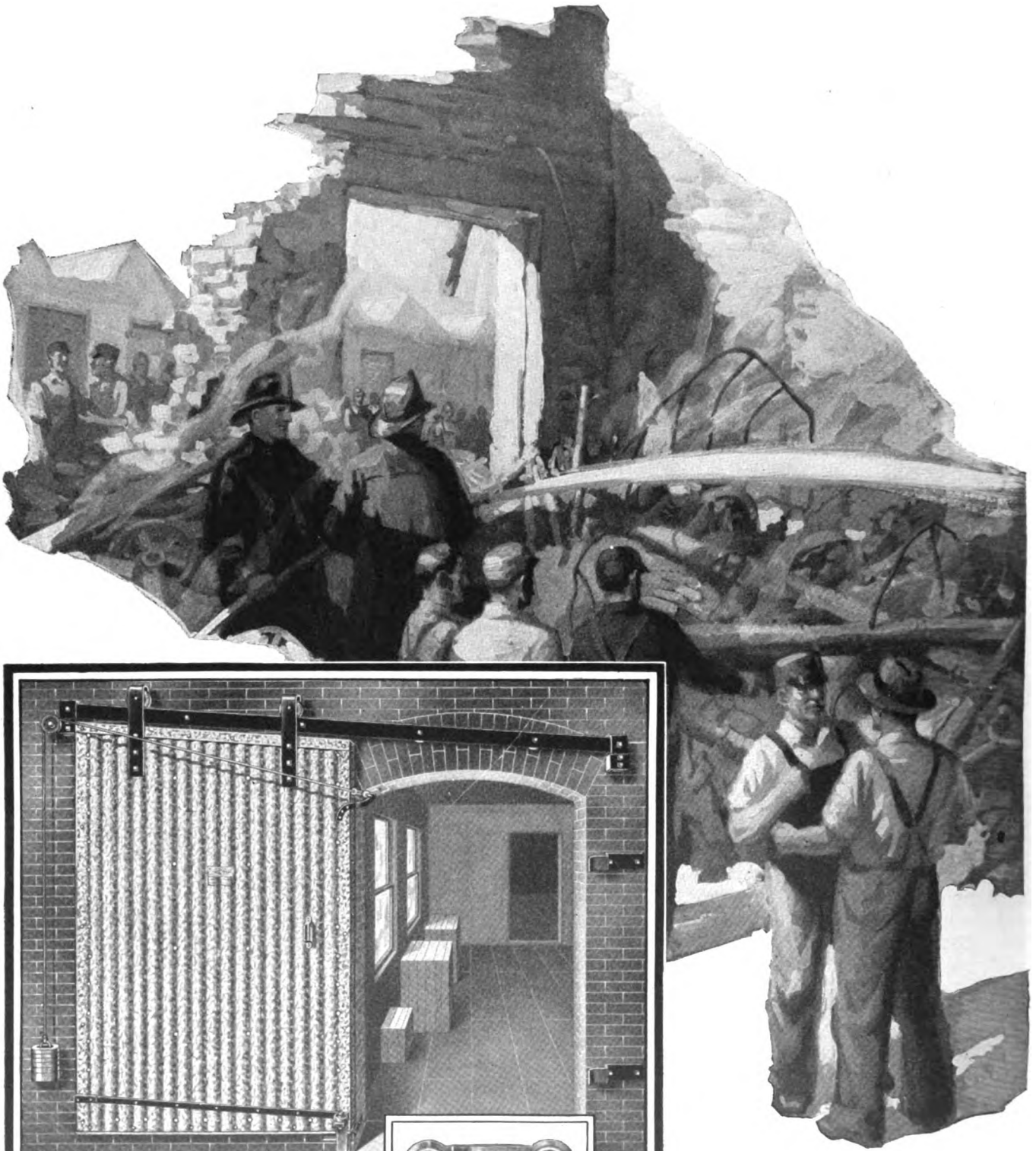
Now, the gradually improved lamps had always been put out to the users through the companies supplying the current, so that this was the logical channel for the new lamp as well. But, (will you believe it?) a number of these companies, headed by men posing as leaders in their localities, companies in many cases having, as part of their corporate name, the name of Edison, himself the original inventor of the lamp in its first form, and acknowledged as the dean of their industry, some of such companies refused to accept the new lamp for their customers. You might have thought we were back in the eighteenth century when the spinners of Lancashire smashed Arkwright's spinning-jenny!

Advertising was, of course, resorted to, but advertising is slow in getting up to speed; it has inertia, the quality that gives it momentum which keeps it going after it is started, but makes it hard to start. It is too much like just showing the milk to the puppies and letting them smell it. Something more was needed; they must be forced to taste it. Salesmen were sent for. These were real salesmen, ready to place their time and ability at the service of their employers just as does any other professional man. No contingent fees, in the way of commissions, were offered them. They were laborers not capitalists. The men behind the new lamp had plenty of capital and were not asking these salesmen to invest money or time, which is the equivalent of money, in the enterprise on the prospect of sharing in the receipts, which is what commission means. No, they hired these experts and put them on the pay-roll and sent them to the factory to learn how the lamps were made and why so. And then followed a beautiful exhibition of the powers of salesmanship.

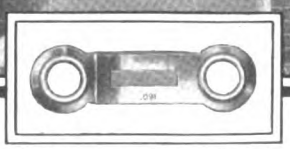
This corps of experts went out into the metropolitan cities of the country and parceled them among them and then singly descended upon the butcher, the baker, and the candlestick-maker, upon the office building, the department store, and the theatre. And they told these storekeepers, these manufacturers, these tradesmen, and the managers of all establishments using light that they had to sell a new lamp capable of delivering twice as much light for the same money as the old ones. And the butchers and the bakers and the candlestick-mak-

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What would happen if



Richards-Wilcox Fire Doors and Fire Door Hardware—to meet any requirement—are covered in a complete catalogue. Send for your copy.



R-W Fusible Links are furnished for different degrees of temperature to meet any requirement.

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your plant were destroyed tomorrow?

Insurance is *not* full protection

YOU carry insurance, of course. Every sane business man does. But if fire destroyed your plant, what would become of your organization, of your dissatisfied customers, of your trained employees, of the orders on your books?

No fire can pass automatic FyeR-Wall Doors. They are a sure and positive protection to any building. FyeR-Wall Doors are made of corrugated galvanized sheets with heavy asbestos between. The hardware and operating equipment is automatic and positive.

They do the work and are guaranteed for twenty-five years.

FyeR-Wall Automatic Doors cost no more than tin clad doors. They cost nothing for maintenance. They last as long as the building. And they *save money*. You get a 15 to 25% lower insurance rate on your buildings when they are equipped with FyeR-Wall Automatic Fire Doors. Both the doors and the hardware, after passing the highest laboratory tests, carry the label of the Underwriters Laboratories.

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A Hanger for any Door that Slides

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(718)

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Mercury

[This is No. 5 of a series]



Superintendents of Plant Transportation

There is in nearly every manufacturing establishment one man whose duty it is to attend to the movement of materials and supplies.

It is his responsibility to see that raw materials are unloaded from cars and moved to storage—from storage to the point of first operation—trucked from operation to operation — and finally delivered in the form of finished goods to the shipping platform.

His, is a big job and an increasingly important one.

Sometimes he is known as *"Supt. of Transportation"*—sometimes he has another title.

To all men, so placed, the Mercury story is an intensely interesting one. Mercury equipment and the Mercury System have helped many to make big savings.

"Superintendent of Transportation"—the Mercury literature—all about tractors and trailers and their application—is yours for the asking.

Mercury Manufacturing Company
4112 So. Halsted St. Chicago, U. S. A.

ers and the managers of the larger places using light said:

"You don't say!" or

"I may try some the next time. Have you a card?" or

"We don't need any today," or

"How do I know you're telling the truth?"

And the salesman would have an instrument that showed the current taken by a lamp and he would apply it first to one of the old lamps and then to one of the new and the "prospect" could see that, while the light was much more, the current was the same. And the salesman told *why* the tungsten filament gave more light than the old carbon one and *why* it had not been used before and *how* it had been made possible to use it now. And, all the time, the "prospect" was sizing him up, sizing him up as a man, then as a man worth listening to and finally as a man you could believe. Along with his goods, the salesman had to sell himself, but, of course, you know that. So, at last, the salesman took an order. The lamps in service spoke for themselves and seconded the salesman. More calls and the harder nuts began to crack. More lamps in service and the salesman's advice was sought here and there on how many lamps to put in and where they would do the most good. The day came and seemed, after all, to come quickly when more than half the places along the principal streets had the new lamp; the campaign had succeeded and the advance could now be trusted to proceed from its own momentum. The reactionary electric light companies began to think of explanations why they had hesitated to offer the lamp to their customers. (They were never blamed much. To all but a small fraction of their customers it seemed only natural that they should hesitate to recommend an improvement that made two lamps shine where only one shone before; people might turn one of the lamps out. Only their more far-sighted colleagues knew how wrong they had been.) People now bought the lamps; they did not have to be sold.

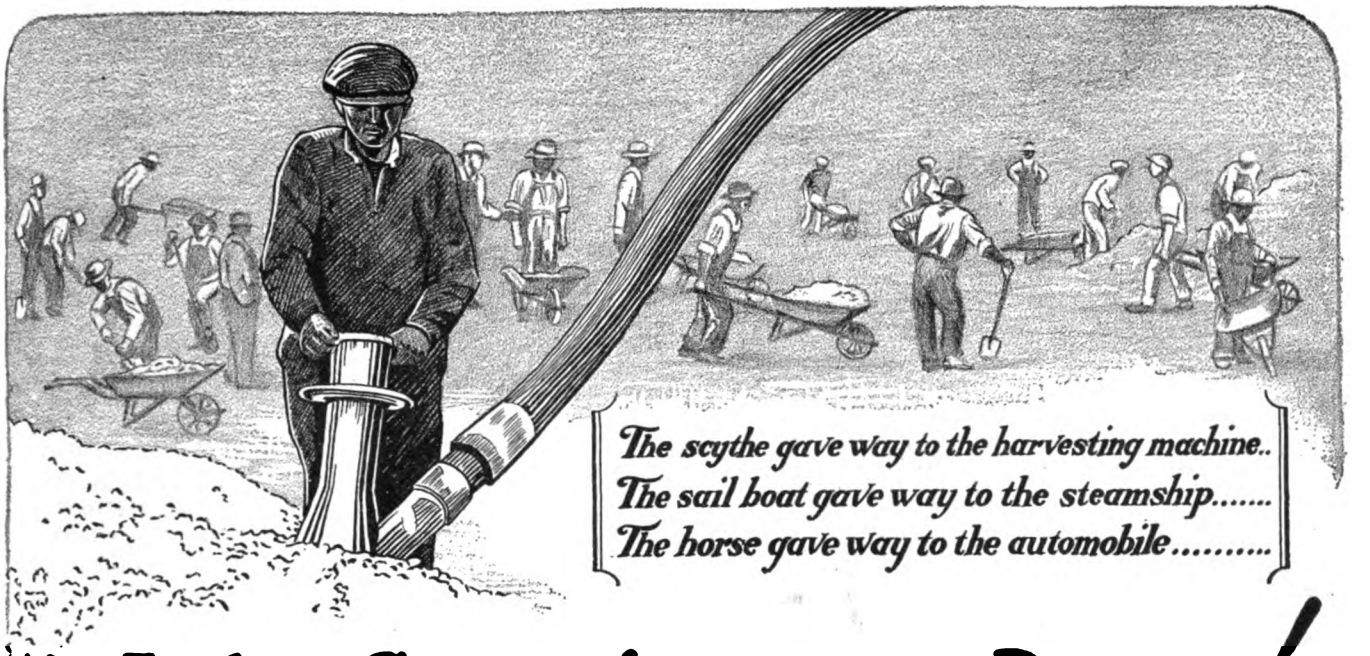
It is hard to find a prettier example of the correct use of salesmanship. Everybody profited. Everybody would have lost if the lamp had been left to make its own way. Years would have passed with trifling sales and the old wasteful lamps working away. If you want their noses rubbed in it, hire a salesman.

Tractors and Trailers

MANUFACTURING enterprises in general have so greatly expanded their outputs during the last quarter of a century that now they have separate specialists taking care of nearly every activity. It is through application of the principle of specialization that manufacturing in this country has been able to expand since 1899.

The great increase is due, partly, to abundant supplies of raw material, of fuels, and of water and electric power. But intensive scientific study by trained specialists has made known the extent to which advantage could be taken of our natural resources.—*La Salle Extension University.*

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Labor Costs give way to Dracco!

The item of labor costs is the one big factor in every manufacturing plant. And this item becomes much more involved with the problem of conveying and handling fine, dusty, valuable, poisonous, or unpleasant materials.

The Dracco System enables you to cut your labor costs from that of a "gang" to one or two workers. Not only that but it eliminates unnecesary dust, and waste—and cuts down the depreciation of your machinery.

The Dracco System improves the working conditions in your plant—your workers are able to do more and there results the corresponding lower operating costs.

The simplest way is always the most economical way. By efficient applications of the pneumatic principle Dracco Engineers have been able to show many industries the way to reduce labor costs in material handling.

They have some interesting figures to show you. The Dracco System may be adapted toward handling your particular material—Send for data.

Dust Recovering & Conveying Co.
Cleveland, Ohio

DRACCO DOES IT

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The Versatility of the High-Lift Electric Truck

By F. C. Eibell

ONE of the important developments in the field of the electric industrial truck, in the last year or two, has been the improvement and refinement of the high-lift type of truck to meet a wide variety of requirements. The electric tractor, gasoline tractor, platform truck, hand-lift truck—all these and various others, have their definite places in the scheme of things. In the present article, the writer will for the moment confine himself to the high-lift type, in order to show its versatile features.

When used in combination with skids and trailers, this type of electric truck makes available a combination of the widest intra-plant application. The elevating platform truck can be used to load its own skids on to 8 or 10 trailers and then draw these trailers with as much speed as the average tractor to their unloading station. Here it unloads the trailers, depositing the loaded skids in railroad cars, at the benches of mechanics, or in convenient places for laborers to load the materials into storage bins.

The elevating platform truck of the high-lift type is used to lift loaded skids from the floor, transport them to a given place, and raise them to such a height that the cost of stacking or tiering in storeroom, freight car, steamship hold, etc., is reduced to a minimum. The time it takes to load and unload this type of truck as compared with the other types of trucks is practically nothing. Its field of application is all industry.

Its general usefulness has been greatly increased by the application of auxiliary equipment. In addition to the universal use of skids with this type of truck, rams, forks, clamps, cranes, and various forms of brackets have been designed to facilitate the handling of a wide variety of products.

By applying quickly removable forks or prongs directly to the elevating platform it has been

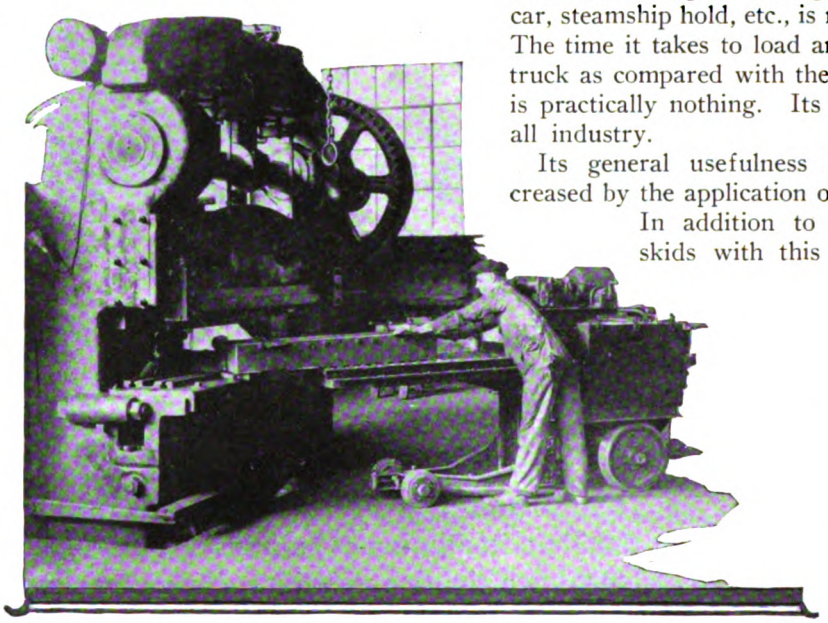


Fig. 1. Note the auxiliary roller equipment on the platform of this truck, which is used in placing and removing blocks on a punch press. This ingenious arrangement of rollers can be quickly removed from the platform when desired.

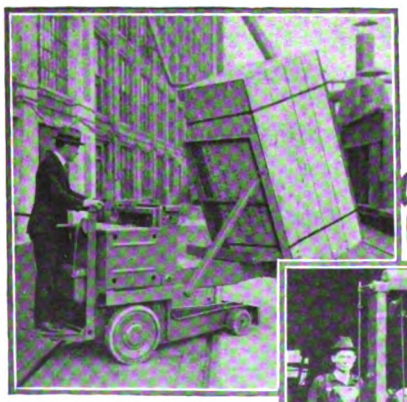


Fig. 2. A tilting cradle attachment permits heavy packing cases of merchandise to be picked up, securely held, and moved where desired.



Fig. 3. In a foundry, these heavy castings are moved to every operation from rough casting to finishing operations by the truck shown above.

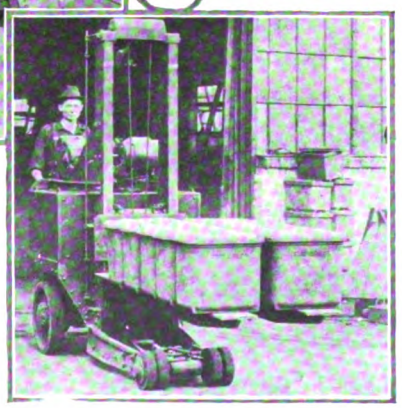


Fig. 4. The platform has been replaced, here, by two wide, flat forks which enable the truck to pick up ten carburizing pots at a time.



Fig. 5. Both gondola and box cars are more easily loaded when the material can be brought to proper height for easy handling.

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Fig. 6. Here, above, is a dump body fastened to a skid. Left in the foundry for loading with refuse, it is picked up by the truck as part of the latter's many jobs.

Fig. 7. Below—making a one-man job of loading, transporting and placing a three-ton die in this big press.

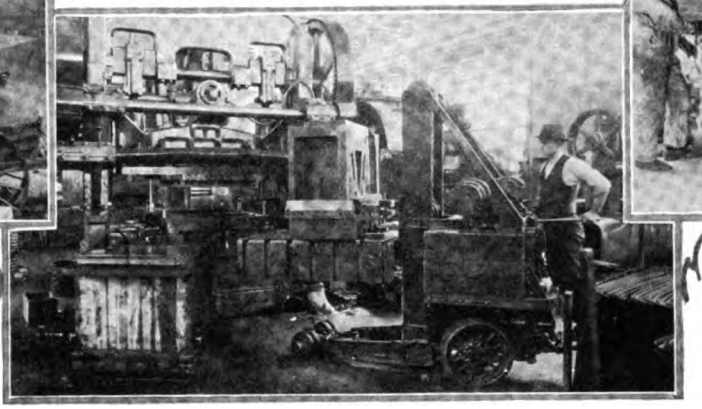




Fig. 8. The crane attachment, especially useful in foundry work, is here being used, with chain slings, to handle pig lead.

found possible to handle tin plate in a way more economical than heretofore known.

Large foundries making a considerable quantity of uniform shaped heavy castings, such as heater sections, have adapted high-lift elevating platform trucks by applying two prongs to the platform, spaced in such a way as to fit in these huge castings and permit their being handled without manual labor, to the storage rooms or to the various machine operations.

On production jobs where large quantities of materials are placed in carburizing or heat treating furnaces another adaptation of the high-lift truck has been developed. The standard

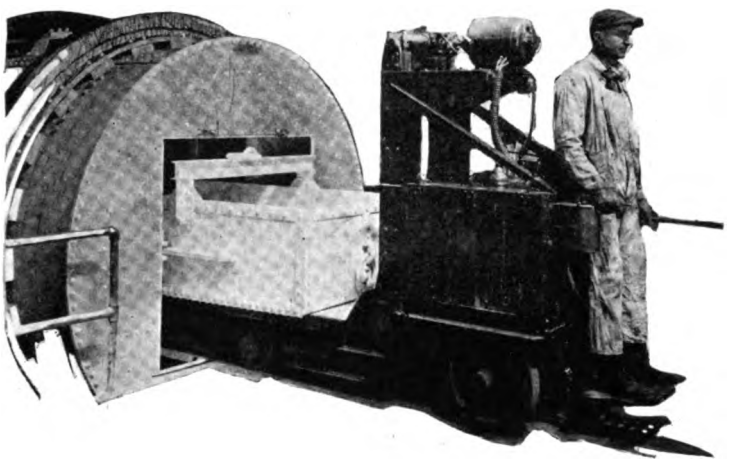
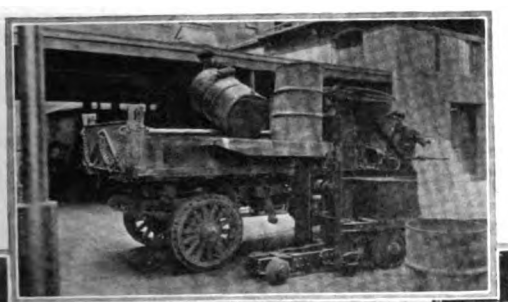
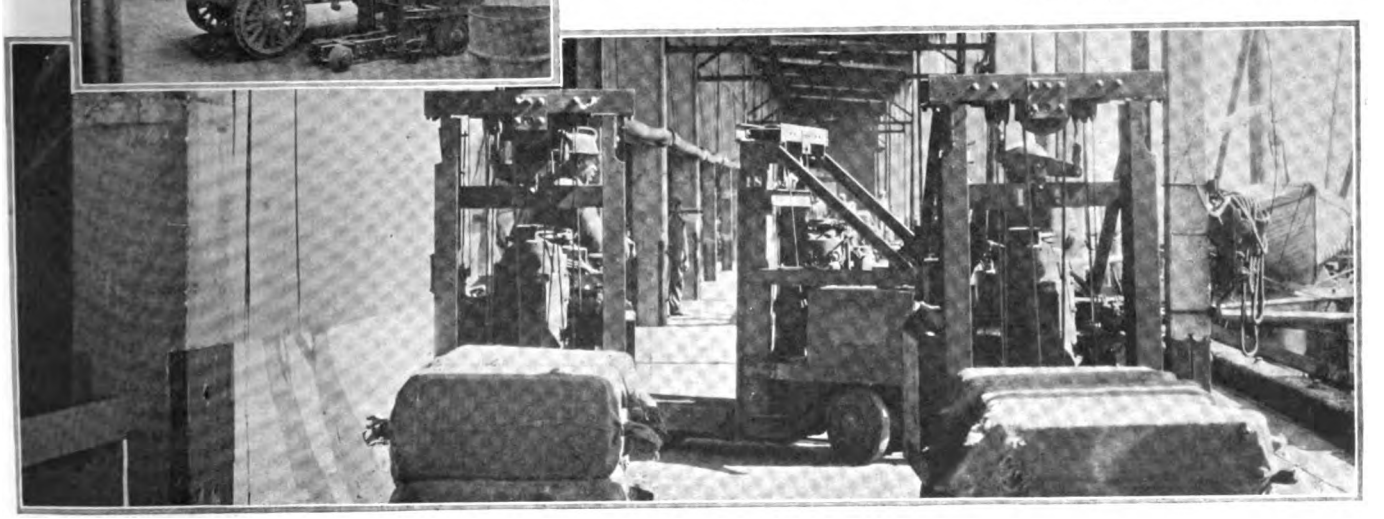


Fig. 9. A revolving drum at a White Lead plant, being charged by means of a (detachable) dump body attached to the lift truck platform

Fig. 10. At the left—At this plant, refuse collection is made a part of the lift truck's odd jobs in spare time from routine use.

Fig. 11. Below—The high-lift truck is proving its worth on steamship docks, where but a few years ago it received scant consideration.





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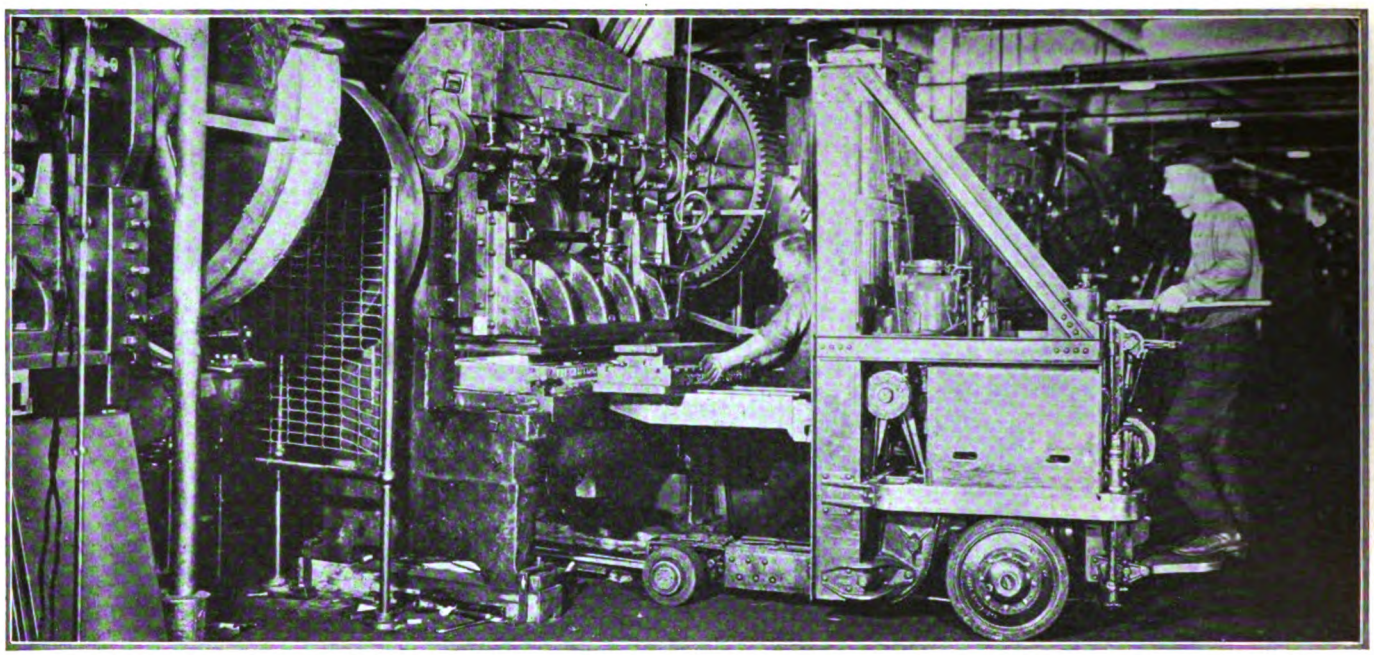


Fig. 12. One of the chief factors in the high-lift truck's use in machine shops, is its ability to keep expensive machines "on their toes" in producing.

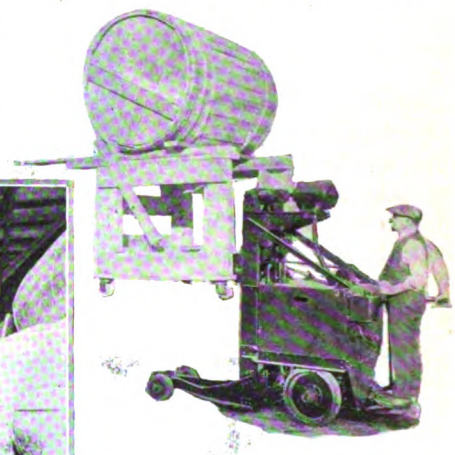
elevating platform is cut to leave only enough space for the support of two long steel bars that project somewhat beyond the small wheels. These bars are 8 feet long and made of 3x3" solid stock. The furnaces are so constructed that the bars can pass through spaces in the bed and allow a quick removal of the pots from the furnace.

Coils of wire are handled efficiently by applying a long bar to the elevating platform. The coils are kept on end in the various manufacturing and storing operations so that the truck at any time can run its bar extension through the coils, pick them up, and carry them wherever necessary.

The handling of pig lead has always been a problem until the elevat-

Fig. 13. Below—This expedient was resorted to, to pile tobacco barrels three-high with a medium-lift truck (See Fig. 14)

Fig. 14. This 84-inch lift truck was ordered as a result of the expedient shown in Fig. 13. Possibly by now, these barrels are being piled four-high!





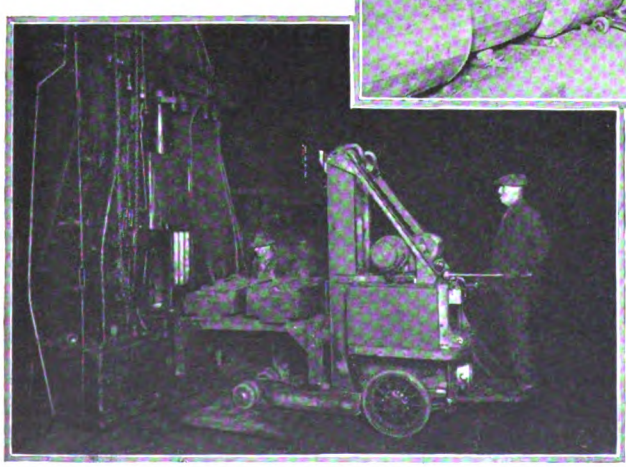


Fig. 15. It speaks well for the tractive power of this truck, that it is able to give a good account of itself on the dirt floors of a forge shop.

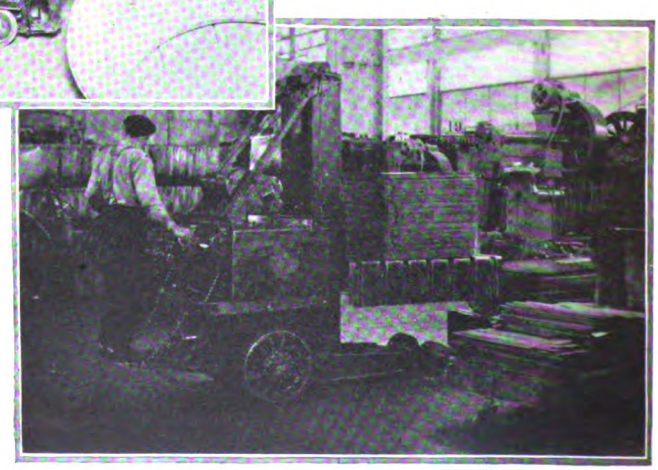
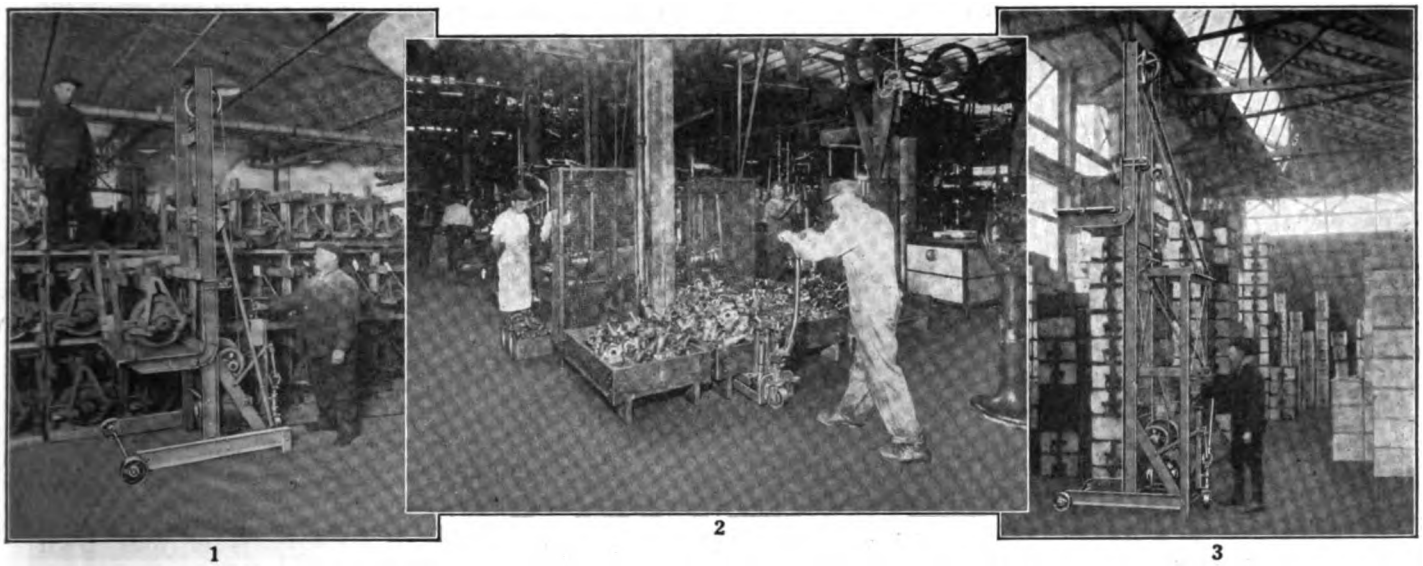


Fig. 16. Taking stampings from machines to the storage rooms in an automotive plant. The ability to stack one load on top of another conserves floor space.

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1 2 3

3 of 150 Different Installations

Described in Our 1926 Catalog

"The Most Complete Catalog in its Field"



Photograph No. 1 shows two men handling and storing motors three high in one of the Chevrolet plants with a Lewis-Shepard Worm Drive Electric Power Stacker. This effects a tremendous saving of time and storage space. Photograph No. 2 pictures the way castings on platforms can be quickly and easily moved from the foundry to the store room with JACKLIFTS. Photograph No. 3 shows how another firm makes air space pay them rent by piling crates with one of our special Worm Drive Electric Power Stackers.

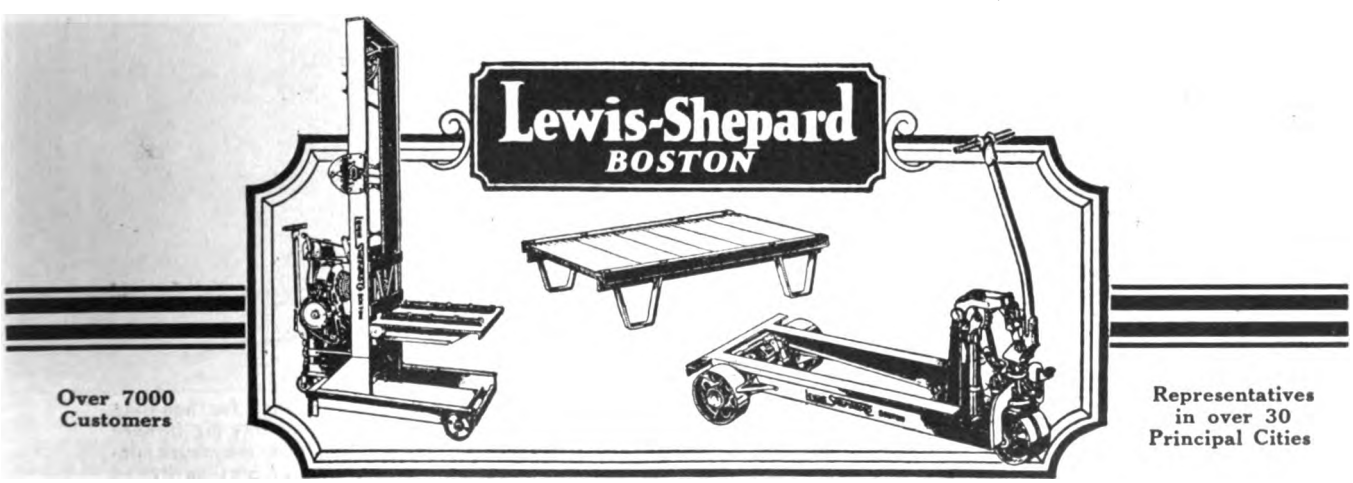
Our NEW 1926 CATALOG describes the work Lewis-Shepard Lift Trucks, Portable Elevators, and other Labor Saving products are doing on 150 different installations. This New Catalog is the most complete and instructive ever published in its Field.

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ing platform truck and a couple of competent engineers came on the job. Two prongs extending beyond the rear wheels of the truck were fitted to the elevating platform. These prongs are run under the lip or ear of the pig. The pigs are stacked alternately so that by raising the lower tier the entire stack can be raised. The prongs are easily adjusted by merely turning a screw provided for that purpose and in this way can be set to handle pigs of various lengths.

A tilting cradle has been applied to the elevating platform that virtually converts it into a large and powerful stevedore's truck. The tilting cradle has a lip at the bottom which can be forced under heavy boxed goods. The operation of the elevating platform raises the load and tilts it at the same time and the angle is such that the load can be safely carried.

This, of course, is but a sketchy outline of the many different things which today are being done by this versatile "mechanical roustabout." There are two things worth keeping in mind, in studying the accompanying illustrations. First, in each case, picture how many men would be required for the particular job if the truck were eliminated; and, second, how closely does this particular job resemble one that is being done, daily, by less efficient methods in your own plant?

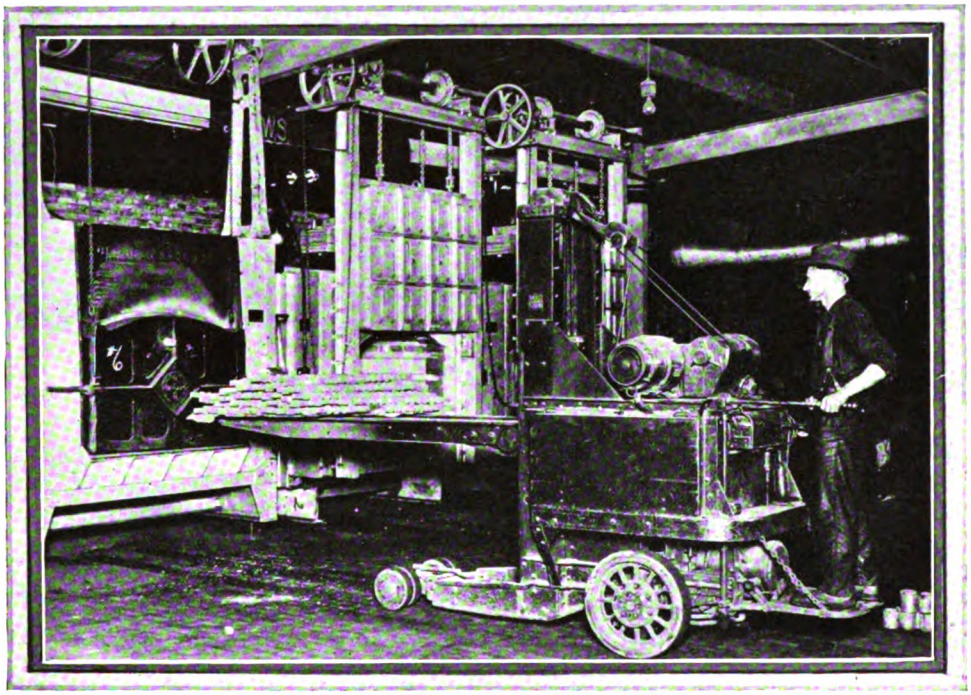
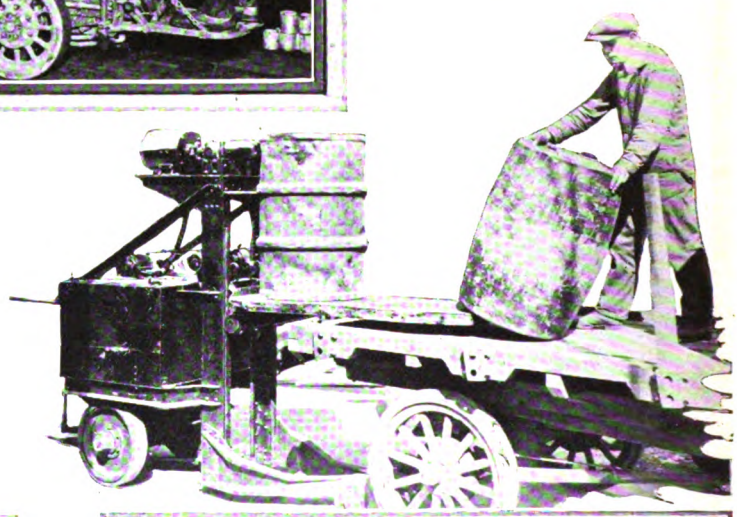


Fig. 17. This is the fork-equipped truck shown in Fig. 4; engaged here in carrying work to be heat-treated. The work is picked up, elevated, and then delivered to the furnace and deposited inside the latter.

Fig. 18. One of the dividend producing features of this type of electric lift truck is its ability to do chores and odd jobs. Being utilized in major operations, there need never be any idle time charged against it, because in between these big jobs the truck can handle such a wide variety of time-saving and labor- and money-saving operations. Below is one example of its versatility in "off hours."



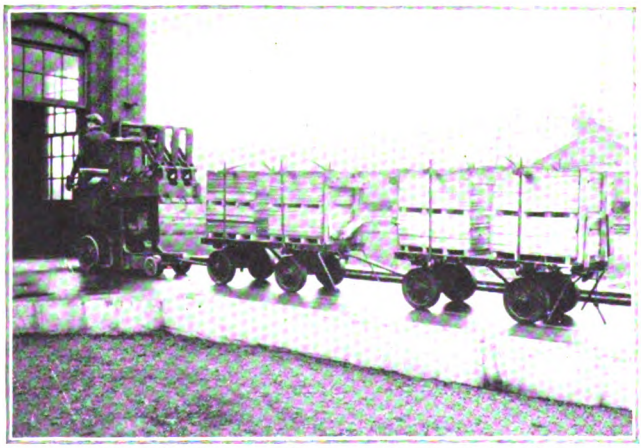


Fig. 19. These trailers are first loaded with **the heavy tin plate sheets, by means of the lift truck—which then plays the part of a tractor, and pulls the load to the machine shop.**

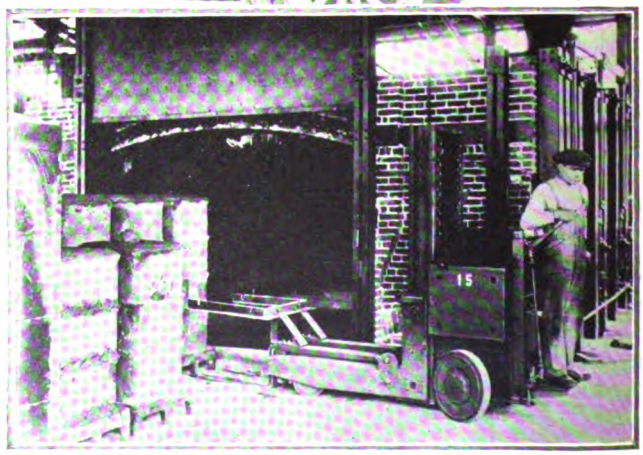


Fig. 20. A simple contrivance for handling **annealing pots. The floor of this big furnace moves out over a pit, and the truck deposits successive tiers of pots on it.**

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New Departure Ball Bearings

ANTI-FRICTION BEARINGS are increasingly used in machine tools and mechanical appliances of every description. The ball type of bearing, and particularly the New Departure Ball Bearing, has unique advantages over other types in that it maintains true positions in alignment for the longest time without wear, permits the highest speed and has the lowest friction loss.

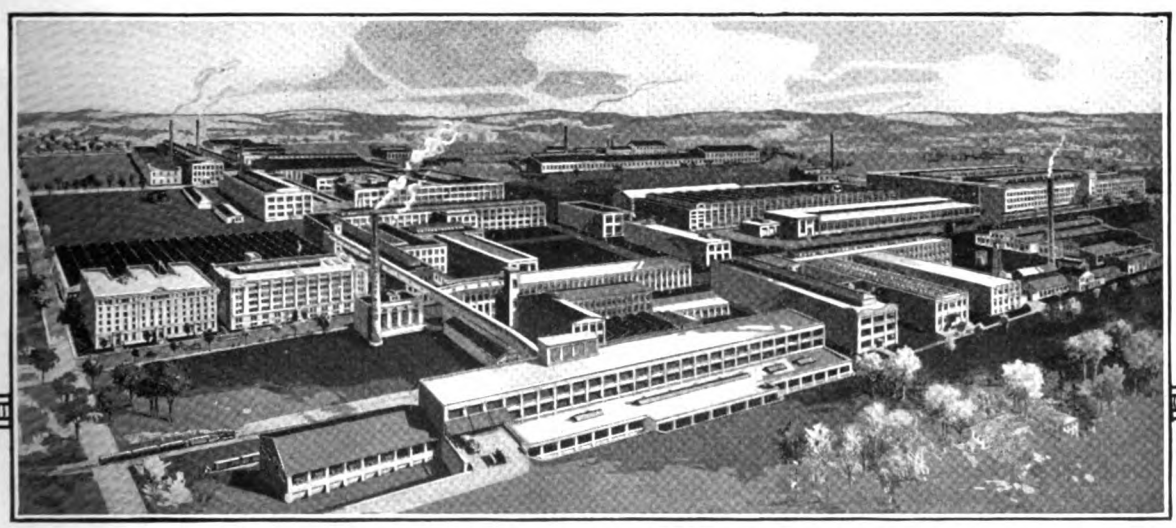
For machinery that requires accurate centering of spindles, where even the play due to the presence of a film of oil between the plain bearing and the spindle is not permissible, the ball bearing is absolutely unexcelled. It runs with metal to metal contact and makes accuracy permanent.

More often than not it is possible to obtain all of these advantages at no greater cost than the plain bearing.

This Company has become the largest manufacturer of anti-friction bearings in the world, because it has consistently maintained for many years highest quality and precision in its product.

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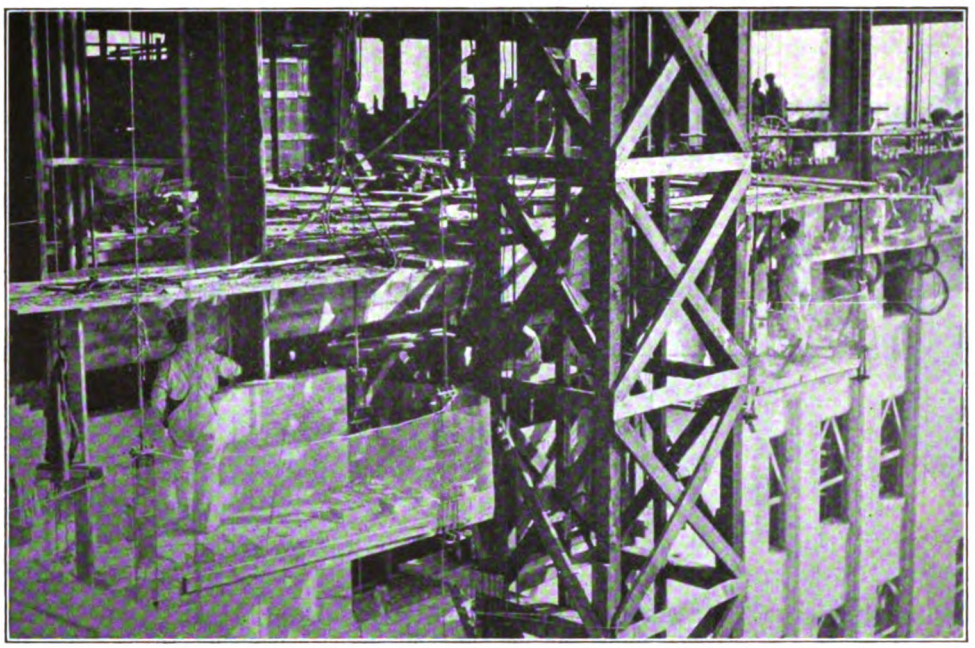


Fig. 1. The bricklayers' hoisting scaffold, which has heavy wire screening, instead of the old-fashioned canvas, as an outside guard. Stronger, this also gives better light.

Making Building Construction Safe for the Workers

By Charles W. Geiger

IF the elaborate and complete system of safety features shown in the accompanying photos were used by builders throughout the country, the tremendous loss of life and limb would be greatly lessened. In the construction of a 26-story building in San Francisco in which these safety features were used there was not a single fatality and no serious injury to any of the workmen.

Any and all of the safety features illustrated in the accompanying photos can easily be used by any contractor.

Two special elevators with safety devices were installed for elevating brick, mortar and terracotta, and workmen were not permitted to ride on these elevators. They were required to use two passenger elevators which were in charge of experienced elevator operators. No one was ever injured in passing from floor to floor because of this system.

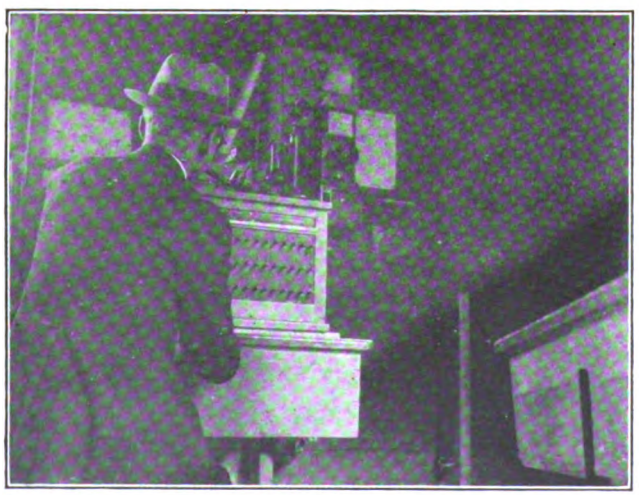


Fig. 2. The telephone switchboard, connecting all telephones in the building under construction, with the field office. In case of emergency, this is of incalculable value.

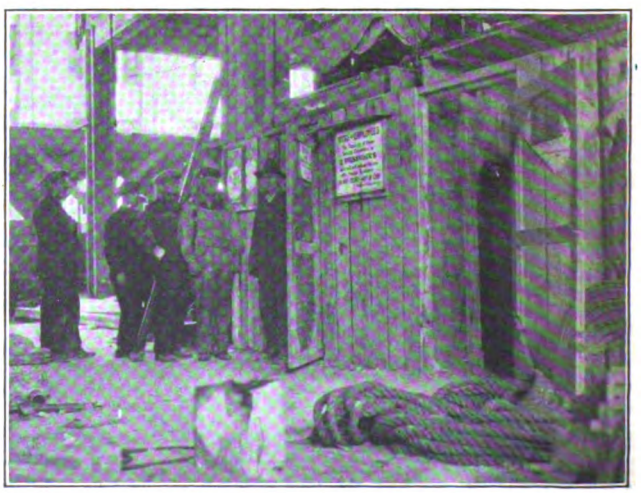
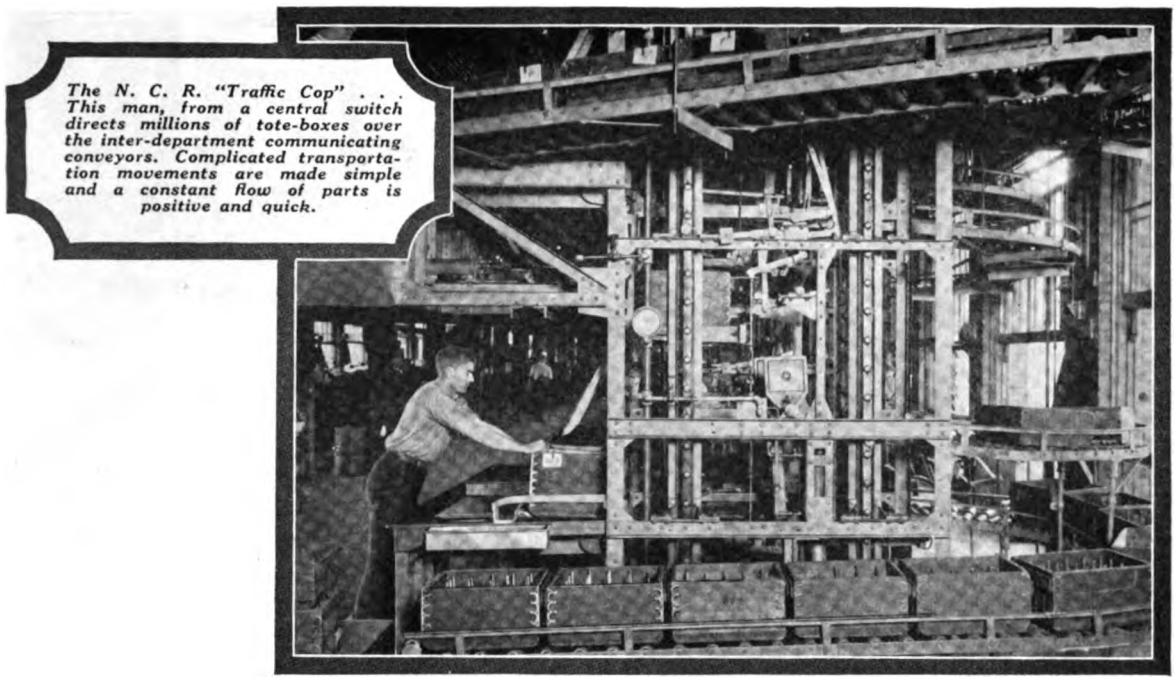


Fig. 3. Passenger elevators, in charge of experienced operators, carry the men to and from the various floors. No workman is permitted on the material-carrying elevators.

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The N. C. R. "Traffic Cop" . . . This man, from a central switch directs millions of tote-boxes over the inter-department communicating conveyors. Complicated transportation movements are made simple and a constant flow of parts is positive and quick.

Always—Their Conveyor Problems were Solved . . . Profitably

THOUSANDS of small parts . . . . dozens of different models and a factory and assembling site of 42 acres, with 22 buildings, all of which must work as one unit—present a conveying and material distribution problem of great magnitude.

As the business of the National Cash Register has grown, new buildings have been added—with new buildings many gaps in the distribution of parts and the manufacture of machines became evident. So it is no little tribute to Lamson Engineering ability that on 40 different occasions at different stages of N. C. R. growth . . . . Lamson engineering skill and conveying advice was sought to assist in solving some handling problem.

Only by conveyors were the National Cash Register Company able to control the movement of partially completed material in its flow toward completion.

This vast plant of many different buildings now operates as one unit, as under one roof, steadily and methodically. Lamson engineering knowledge and material-handling skill have made gigantic money and manufacturing savings possible in an extremely practical manner.

Stock is delivered uniformly and quickly . . . . congestion in passageways is relieved. No department is swamped with parts while in another, workmen stand idle, awaiting supplies. The advantages that are a part of straight line production have been attained.

Lamson Engineers can be depended upon to solve conveyor problems, practically, surely, and with constant thought of future manufacturing growth and business enlargement. Thousands of industrial executives depend upon Lamson to assist them in eliminating factory waste . . . . to speed up production and to release materials in process of completion.

For nearly five decades Lamson Engineers have been successfully analyzing handling problems. After an intimate study of your plant and your individual industrial situation they will frankly give you their conveying recommendations.

THE LAMSON COMPANY
SYRACUSE, NEW YORK

LAMSON·CONVEYORS

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Fig. 4. Above—Note how floor openings are guarded to prevent men from accidentally falling through.



Fig. 5. Instead of loose planks, carelessly laid, the outriggers shown at the right provided safety for the men stripping the concrete forms.

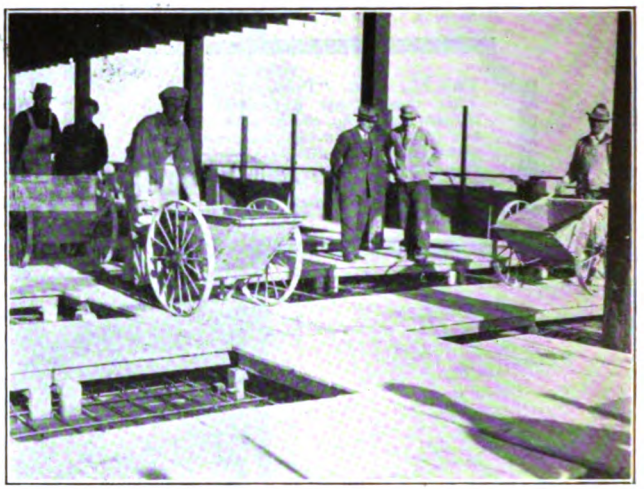


Fig. 6. Note, above, the portable wooden platforms for the men to wheel the concrete-buggies on, in floor construction.

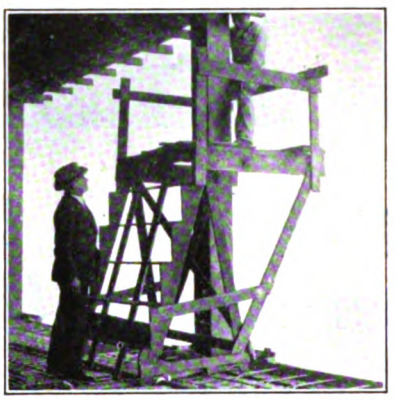


Fig. 7. A portable scaffold, used by carpenters in tightening the form work. Note the removable back rail.

A prolific source of accident in building construction is the unguarded floor opening. It takes but a little time, and some waste lumber, to make these openings safe—as shown in the upper left-hand corner of the page. Immediately below this illustration is one showing how the outriggers for stripping the concrete forms were braced and guarded by a rope railing.

Such protective measures may take a little extra time and cost a little bit more; but the money and time lost through even a single serious accident would be many times greater. Not only is the safety movement humane; it is also worth while in the more narrow sense of a profit-and-loss investment.

Telephones were installed on various floors of this building which were connected with the switchboard located in the field office, which greatly facilitated communication and which could be used in calling for an ambulance in case of accident.



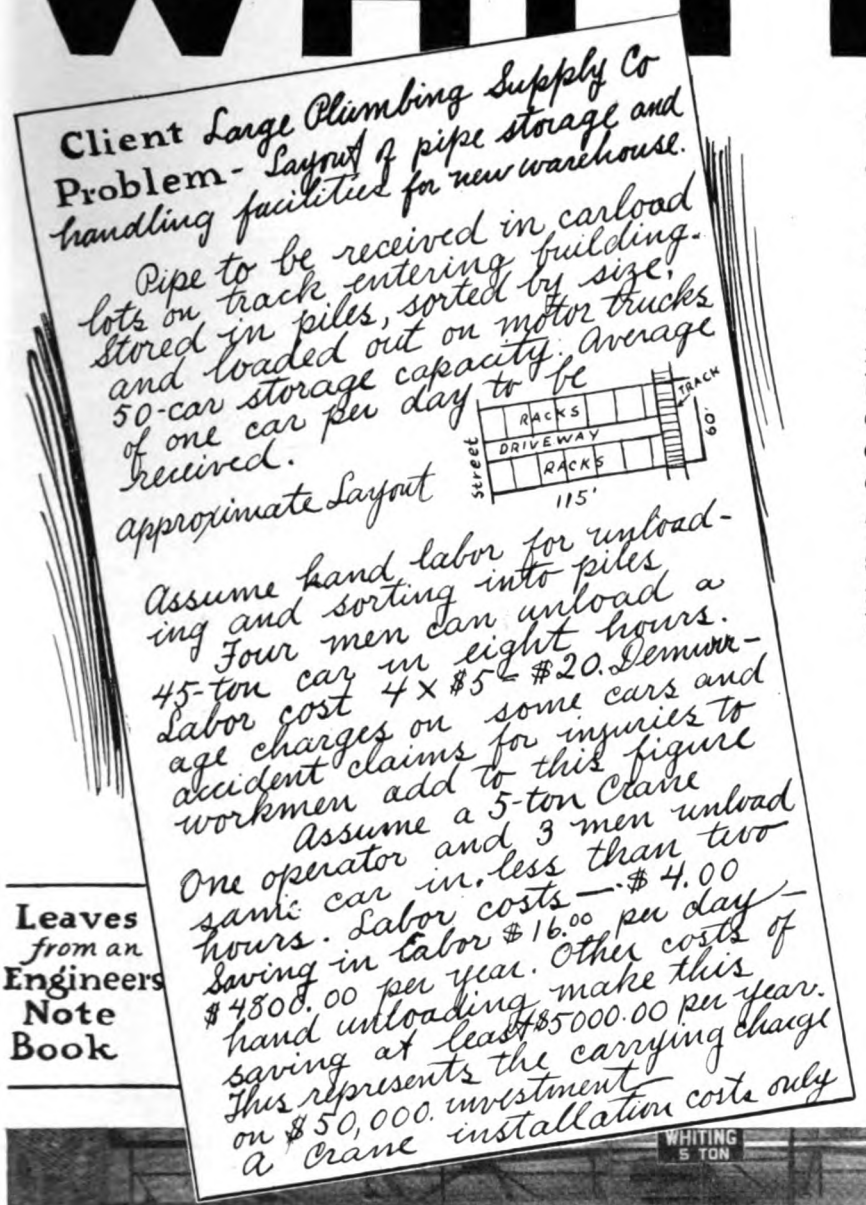
Fig. 8. This wooden chute extends through the floors, and provides a safe means of conveying debris away for removal.



Fig. 9. Temporary stairways, with hand rails, minimize accident when they are properly constructed.

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WHITING



Leaves from an Engineers Note Book

Electric Cranes *for Warehouses*

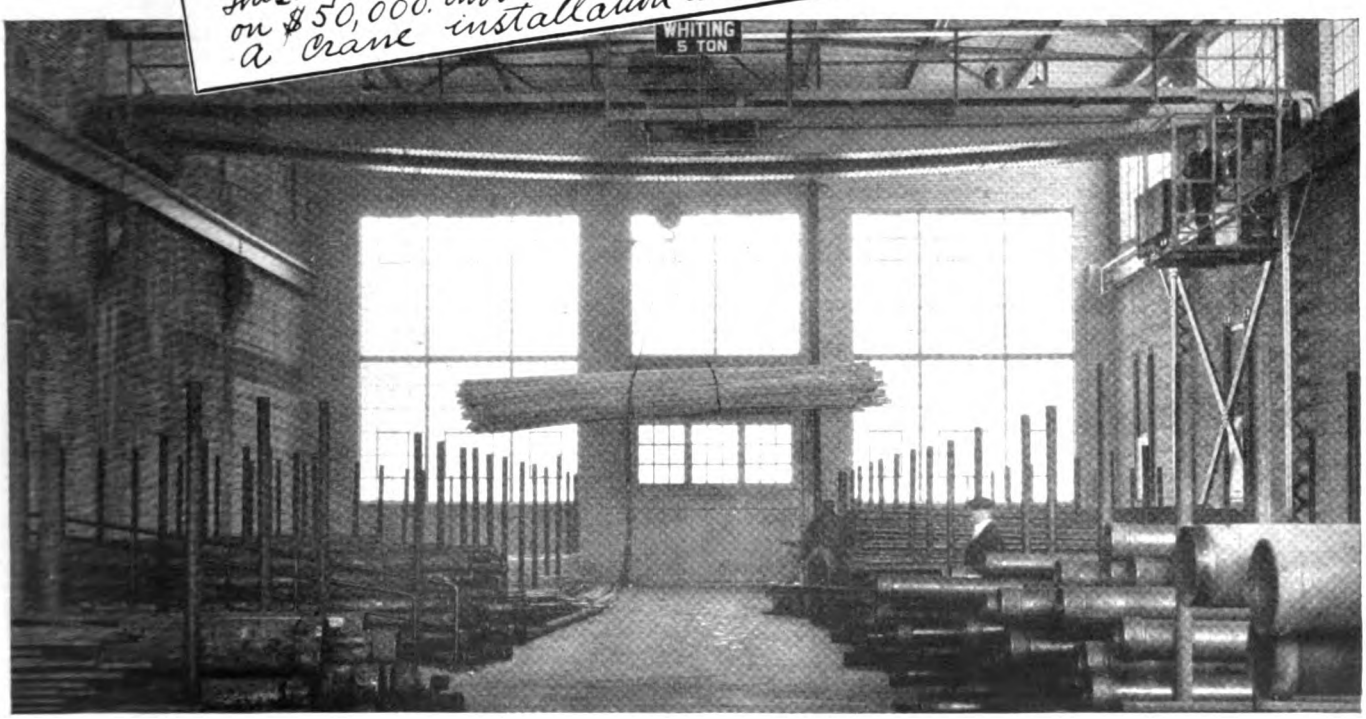
Warehouses of many types are finding Whiting Cranes profit builders through savings in labor cost and time. Better service to customers is also a common result of such a crane installation.

The crane's ability to cut aisle space and to stack higher, thereby further reducing floor space, is a big advantage.

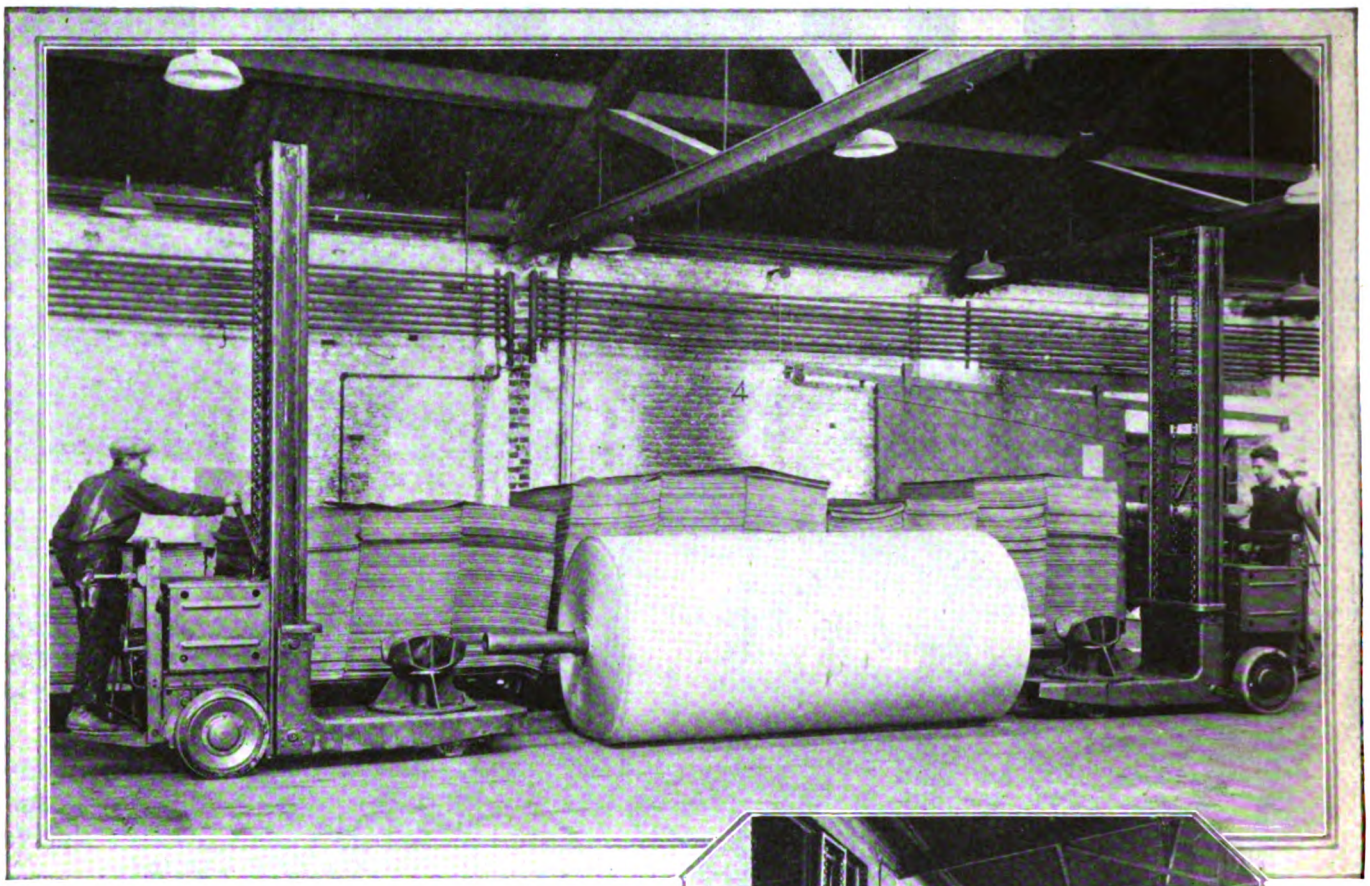
Have you made a careful study of your conditions and the possible benefit you might derive from a Whiting Crane?

Catalog No. 200 on request

Whiting Corporation
15651 Lathrop Avenue
Harvey, Illinois
(Chicago Suburb)



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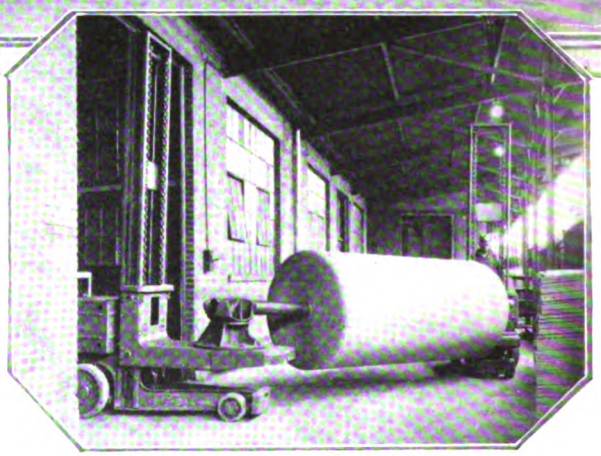


Lift Trucks That Work in Pairs

Handling 8,000 Pound Rolls of Cardboard

By Frank L. Eidmann

Associate Professor of Machine Design, School of Engineering, Princeton University

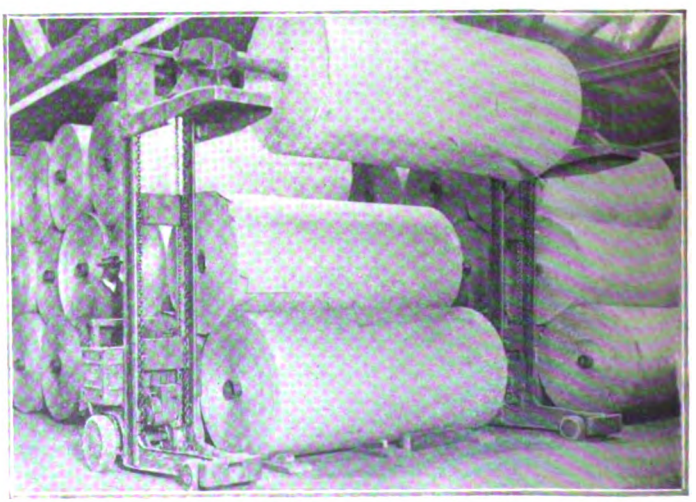


Note, above, how the flexibility of this method permits of "jockeying" the rolls around corners and doorways.

THE handling of rolls of cardboard without damage presents a difficult problem. The Fibre Container Company Division of the Philadelphia Paper Company has solved the problem in an ingenious manner, as illustrated here.

The rolls consist of the heavy waxed cardboard which is used for making containers for ice cream and other moist products. Each roll weighs 8,000 pounds.

Two elevating platform trucks are employed, the upright channels being 144 inches high, just clearing the doors of the plant. Each truck is provided with a capstan swivel, which is secured to the platform. To pick up the roll, a short length of pipe is inserted in each end of the hollow core of the roll, as shown in the large illustration. The load is then elevated a short distance by both trucks and is carried to the storeroom, where the two machines operate synchronically to pile the rolls three deep, as shown in the illustration at the right.



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530 Floor Sweeping Brush ("Old Faithful"). Made of special mixed hair body—high grade horse hair casing. Especially recommended for smooth and slightly rough floors. Can be furnished in widths from 12" to 18".

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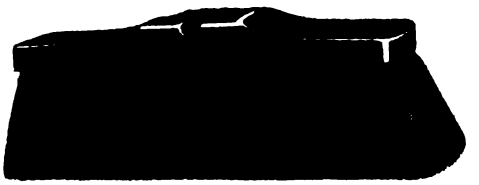
Wherever these brushes are used they show a marked decrease in the yearly brush expenditure.

Osborn brushes do better work, quicker and easier work because they are especially designed and constructed of the *right* materials for the job intended.

The Osborn trademark is the assurance of brush economy and satisfaction—and has been for the last 30 years.

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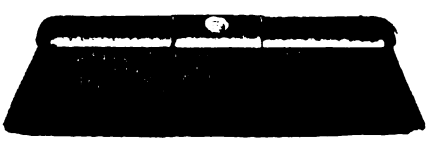
640 "Heavy Duty" Floor Brush. Made of select Palmyra Fibre—staple set. Large flare on sides and ends makes sweeping faster—very good for factories, garages, side walks or any heavy duty work. Widths, 14" to 30".



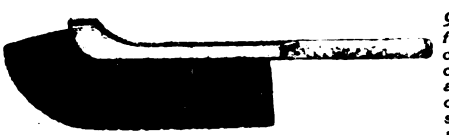
16 "Black Bird" Floor Brush. Made of pure black horse hair—staple set. A high grade brush. Widths, 14" to 24".



421 Counter or Bench Duster. Made of Mixed Grey Hair—staple set. Length of hair 2⅞"—overall length 8".



984 Floor Brush. Designed for use with floor sweeping compounds. A stiff fibre center gives cutting effect and body to the brush. The casing, made from extra stiff pure black horse hair, picks up fine dirt. Widths, 14" to 36".



399 Factory Bench or Machine Duster. Made of Grey Tampico Fibre—staple set. Length of fibre 2"—overall length 10".

Osborn Brushes



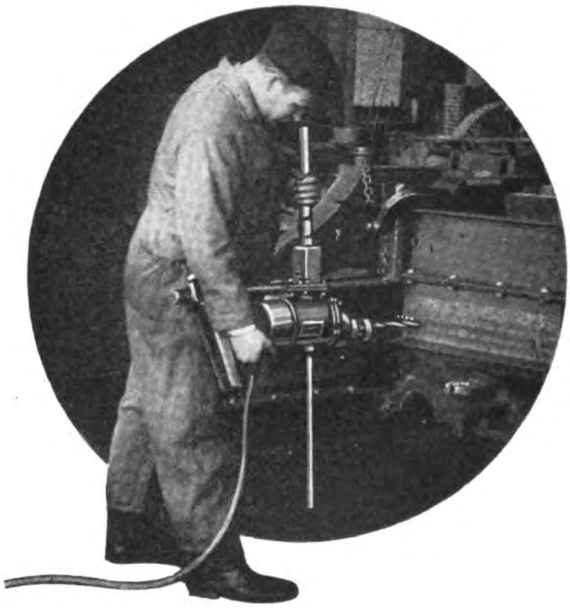
656 Counter or Bench Duster. Made of pure Black Horse Hair—staple set. Length of hair 2¼" overall length 8". A moderate price brush for factory or office use.

A BETTER WEARING BRUSH FOR EVERY USE

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Please send me construction details about Thor Electric Drills. Also information regarding 10 day trial offer.

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A Few Simple Success Rules

By Warfield Webb

OVER-CONFIDENCE is sometimes as fatal to real pended upon a ratchet pawl to hold the load in any assume to know some things, and fail to make good—the result will act as a handicap. Being sure of yourself is essential to real success. Some of us, however, go upon the idea that bluff will go far toward making us notable in the eyes of the world. This is an error that some young men of the present age make—with the idea that they can fool the public.

We should all have ideals—a goal that is worthy of attainment, and even of emulation by others. Our example, let it be understood, is far more powerful than a sermon. The young man in business can, by his close attention to the details of the position he holds, and by having the interests of his employers at heart, do much to make his present position secure and his future one that will become of moment to him. If we become imbued with the idea that our position cannot be filled by another—we have reached a very dangerous point in our career. It is the road that soon leads to failure—later to ruin.

By becoming eager to learn from those who have gained their knowledge in the severe school of experience we place ourselves in a receptive mood, and the information thus gained becomes to us something that cannot be taken from us—now or later. If we place two young men in the same establishment, side by side with the same seeming opportunities, one will advance continually—proving his worth and value to his employers, while the other will either remain in a rut, or soon be dismissed. The reason is plain. It demands no special explanation, for we can see readily enough why persistent effort will bring its own reward, while sloth and indifference will surely act as the millstone to drag the unfortunate to his industrial doom.

Let us have a care. Be not egotistical, over-confident or indifferent, lest we become our own worst enemy. Success never comes to the man who is unwilling to learn to labor and to prove his worth by the best that is in him always. A simple rule, and easy to follow.

A Go Getter Short Cut

A CERTAIN mill supply house has compiled a telephone list upon the following plan:

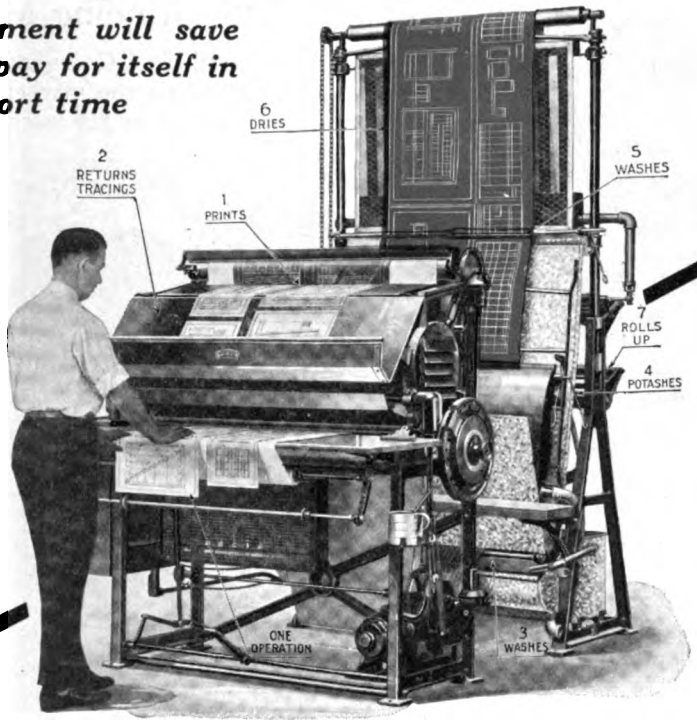
Each morning, a few patrons who usually require something almost every day, are called on the wire and orders taken to be sent out by the motor bus lines, or prepared and made in readiness for a representative of the mill or factory to call later in the day.

The idea is that this order might go elsewhere if no effort was made to obtain it. Or the telephone call might be delayed if left to the customer until parcel post, bus lines or other outgoing kinds of transportation had departed.

A second list is called individually every other morning. A third list is called twice a week, and a fourth, once a week. It has been found that this stimulates business and is much cheaper than personal representatives who solicit business.

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Pease Peerless Continuous Blue Printing Equipment



Free Catalog Shows How to Cut Blue Printing Costs

NO matter how many blue prints you use in a year, write for this catalog. It is a regular encyclopedia of blue printing information. Pictures and describes the complete Pease Line. No obligation.

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THAT is the question you want answered—and answered truthfully before you consider the installation of your own blue printing equipment.

Thousands of users of blue prints could make substantial savings if they had their own equipment. But they have never investigated the Pease Method. As a result, they are losing hundreds of dollars every year by making blue prints the old, slow method or by sending the prints out to be made.

Save Many Dollars

Pease Blue Printing Machinery will save you many dollars if you can keep it busy but a few hours each day. In fact, the equipment will pay for itself in a surprisingly short time.

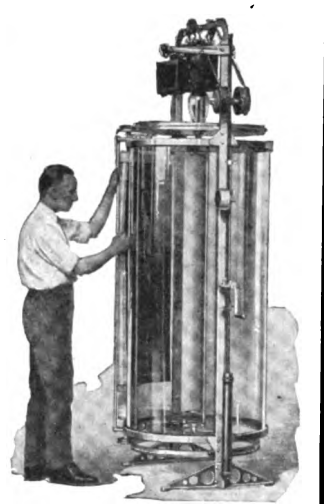
With a Pease Blue Printing Machine you can turn out finished prints, on Pease non-fading blue print paper—printed, washed, potashed, dried and ready to use—in *one-quarter* the time it takes with any equipment using independent methods of washing and drying. If you need prints in a hurry, you can depend upon a Pease turning them out. There are no delays. Think of the convenience of having a machine like this at your call.

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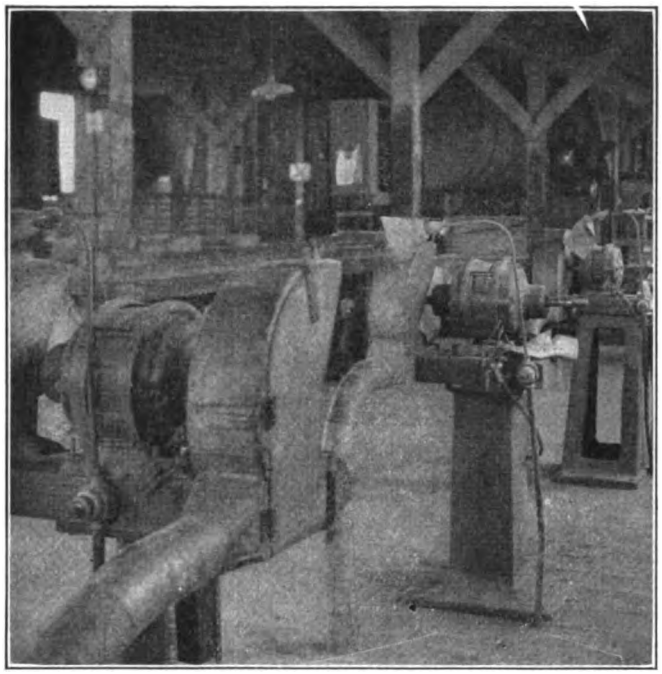
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BLUE PRINTING MACHINERY

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Now they are using Valley Motors in eight other plants

AN average of less than 15 cents a year for each motor has been the maintenance cost of 125 Valley Ball Bearing Motors which were installed four years ago in the shoe last factory of Krentler Brothers Co., the St. Louis unit of the United Last Co.

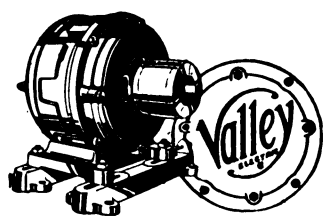
The only service necessary on the installation was the cleaning of a number of motors in which sawdust had accumulated. The total cost for this service in four years on the entire 125 motors was $73.00.

As a result of the trouble-free performance of this Valley installation, Valley Ball Bearing Motors have been adopted as the standard source of power in eight other factories of the United Last Company.

This is another one of thousands of satisfactory installations of Valley Motors reported to us over a long period of years.—Another demonstration of our claim that Valley Motors provide dependable and uninterrupted power at the lowest possible cost for maintenance.

Before you buy or recommend another installation of motors, it will pay you to get the facts about Valley Ball Bearing Motors. Write for descriptive booklet No. X.

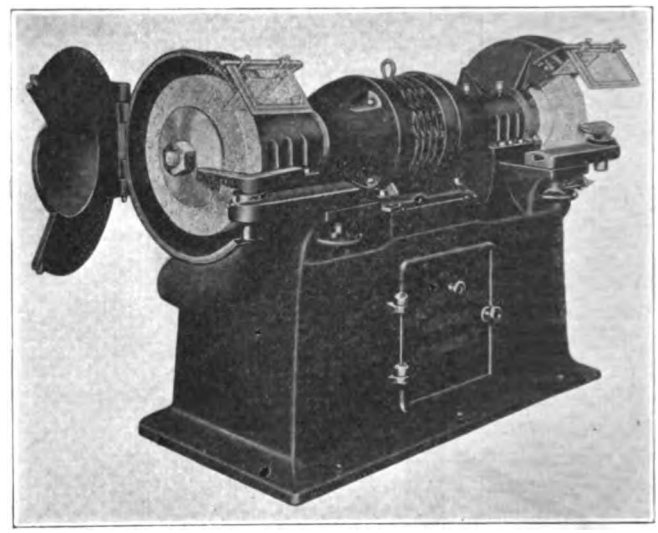
Motor Division
VALLEY ELECTRIC CO., ST. LOUIS, U. S. A.
Branches in Principal Cities



Valley Electric

Heavy Duty Grinding Machine

THE U. S. Electrical Tool Co., of Cincinnati, Ohio, has recently placed on the market a new line of high duty grinders, typified by the accompanying illustration. They are available in six sizes, from 18 in. by 3 in. to 30 in. by 5 in. Motors are supplied to suit the usual variety of current voltages, etc.



Prize Contest

Alvan T. Simonds, president of the Simonds Saw and Steel Company, announces the fifth annual prize contest for the purpose of advancing the study of economics. The contest is open to everyone, everywhere, and the United States Bureau of Commerce is coöperating in its advancement.

The subject is "Saving and Spending as Factors in Prosperity"—with special reference to the effect of Simplified Practice and the elimination of Waste on the Standard of Living. A first prize of $1,000 and two second prizes of $250 each ($1,500 in all) are offered for the best essays submitted, according to the following conditions:

The essays are to be in two parts—Part I, *theoretical*, dealing with the economic theory of Saving and Spending and setting up a thesis fitted to present conditions in the United States; Part II, *applied*, and illustrating by Simplified Practice and the Elimination of Waste the thesis developed in Part I. The parts must be so written that either part may be used as an independent unit. The essays should be written in a popular style, to interest "the man on the street," the average person, as well as the technical.

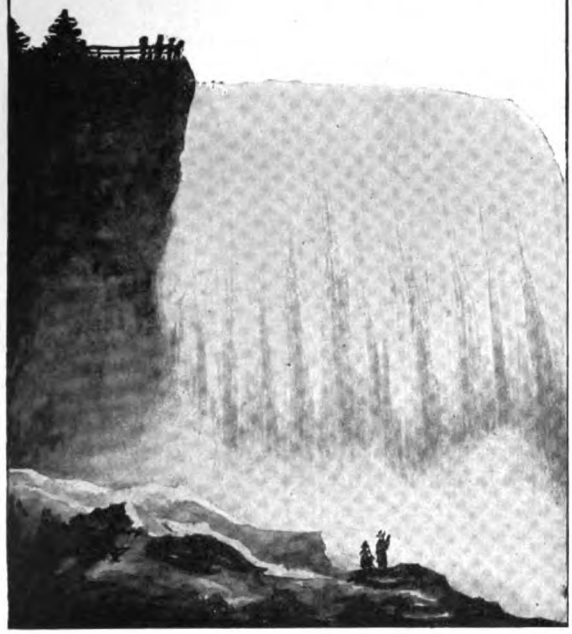
The essays must be original and not previously published and must not be published nor used in any similar contest before the prizes in this contest are awarded.

The prize-winning essays and the copyrights shall become the property of the donor upon payment of the prizes.

All communications should be addressed to the Contest Editor, Simonds Saw and Steel Company, 470 Main Street, Fitchburg, Mass. Essays to be considered should reach him on or before December 31, 1926. Their receipt will be acknowledged but no essays will be returned.

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Power



Power with Ease



CONTROLLING the power of Niagara Falls makes electricity possible at the touch of a button. This power turns night into day, revolves the wheels of industry and brings home-comforts to thousands of people. Super Power—is the result of the linking together of numerous Niagaras into one common reservoir of electricity, which makes electrical power more readily available for the use of man.

Jacobs Super Chucks

You may safely and economically specify Jacobs Super Chucks with their Super Power saving the lives of countless drills.

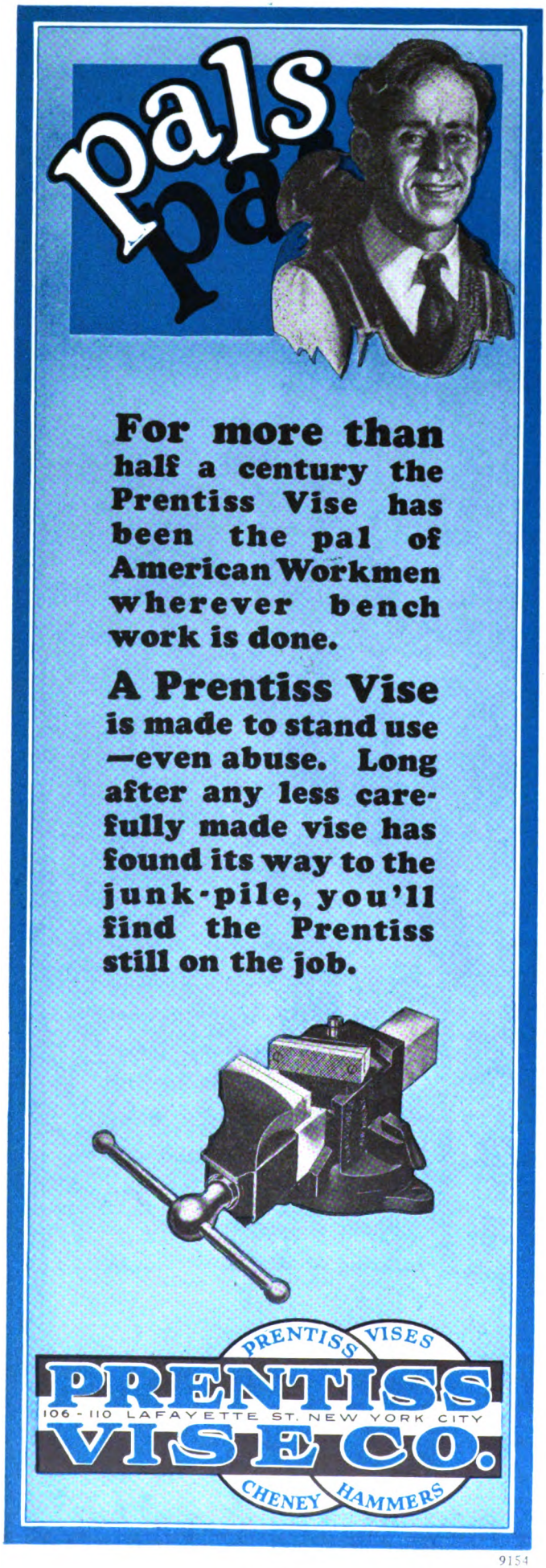
Now this is exactly what has been accomplished in the Jacobs Super Chuck, a combination of chuck powers that produces tremendous Super Power, always under control, yet available at a twist of the wrist, sufficient to hold any tool with an unbreakable grip without slipping of drills or marring of shanks.

THE JACOBS MANUFACTURING COMPANY

HARTFORD, CONNECTICUT

The World's Largest Producers of Drill Chucks

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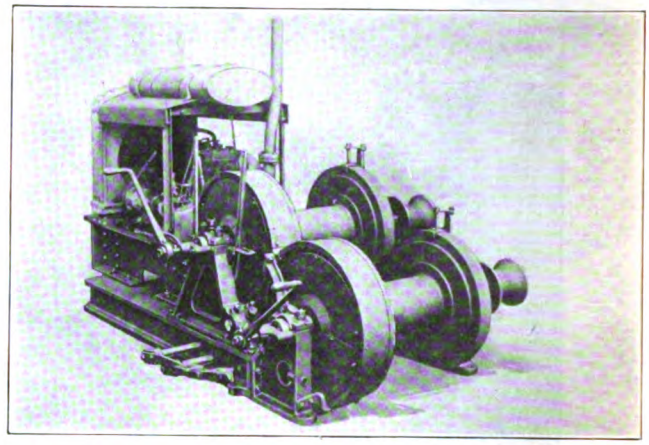


9154

New Model of "American" Gasoline Hoist

THE American Hoist and Derrick Co., of St. Paul, Minnesota, has recently redesigned its Gasoline Hoist, changing it from chain drive to gear drive.

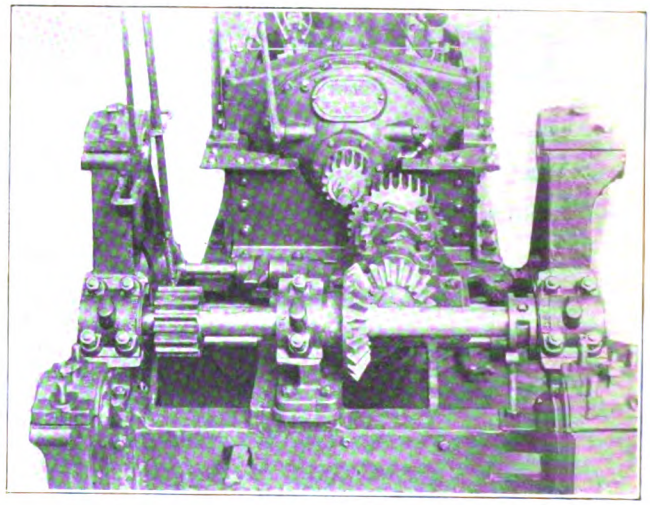
The new hoists are driven by means of spur and bevel gears with an intermediate longitudinal shaft placed at right angles with the pinion shaft, which is the crank



shaft on a steam hoist, the gasoline motor being mounted lengthwise instead of crosswise on the hoist.

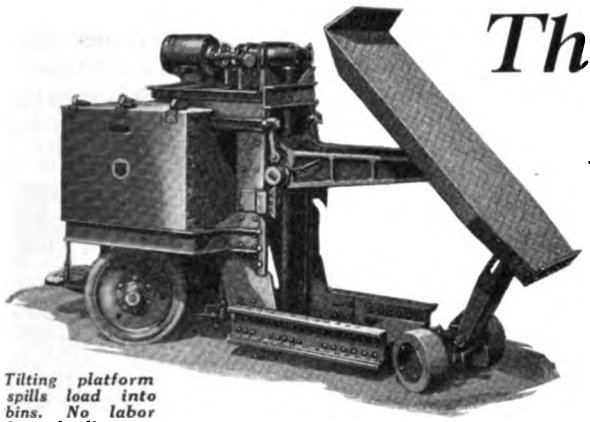
One of the accompanying illustrations clearly shows the gear drive arrangement with the gear guard and drums removed.

Equipping Gasoline Hoists with gear drive instead of chain drive gives a number of important advantages among which are speedier shipment of both hoist and driving mechanism repairs and ability to change the

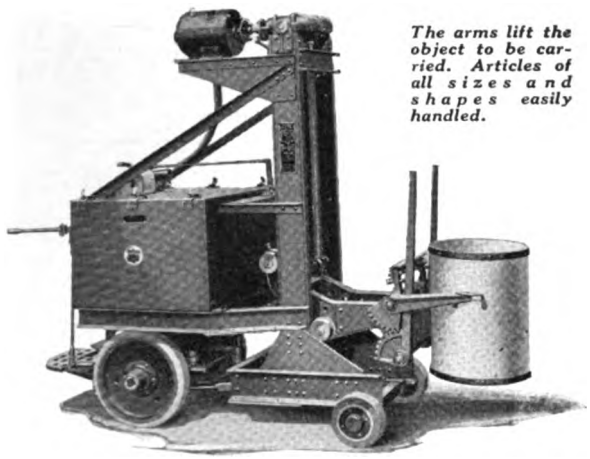


line speed to meet varying requirements without seriously delaying shipment. However, the principal advantage of the new gear drive over the old chain drive is that power is transmitted directly to the pinion shaft of the hoist, which is between the two rear drums, and from there to the friction gears by at least two teeth—one to each adjoining friction gear—whereas on the old arrangement power was transmitted to the rear drum and from there to the rest of the drums by only one gear tooth.

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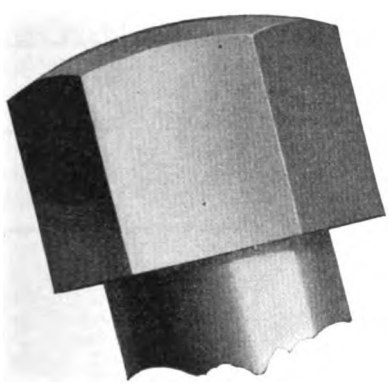
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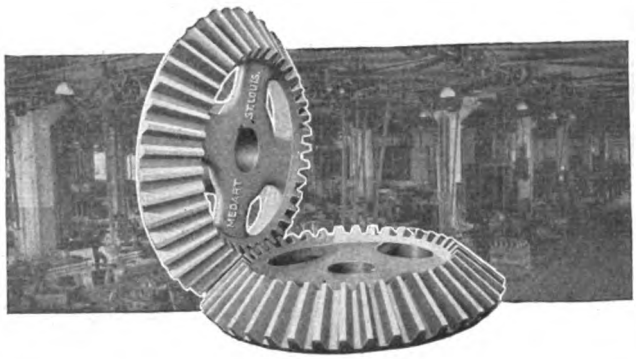
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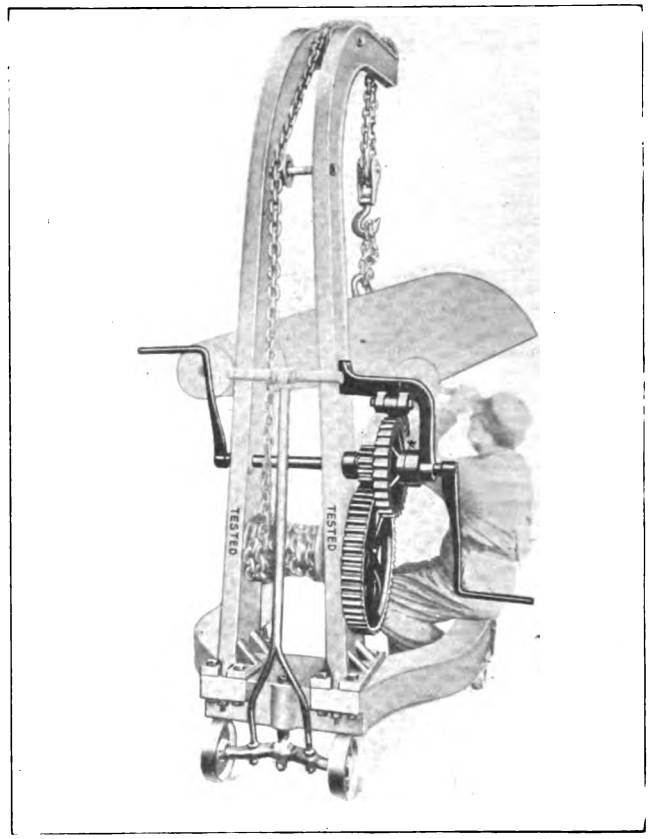
MEDART

Everything in Line Shafting Equipment

This Load Can't Run Away

HERETOFORE, most portable cranes have depended upon a ratchet pawl to hold the load in any desired position. The Canton Foundry and Machine Co., of Canton, Ohio, have recently developed a safety friction load brake, shown in the accompanying photograph.

This Load Brake is a friction Load Brake operating by means of friction discs in connection with a helix and



is so designed that the pawl is always engaged in the ratchet and it is necessary to wind the load down as well as to raise it. In other words, under no condition can this load get away from the operator—whether or not he lets loose of the handle.

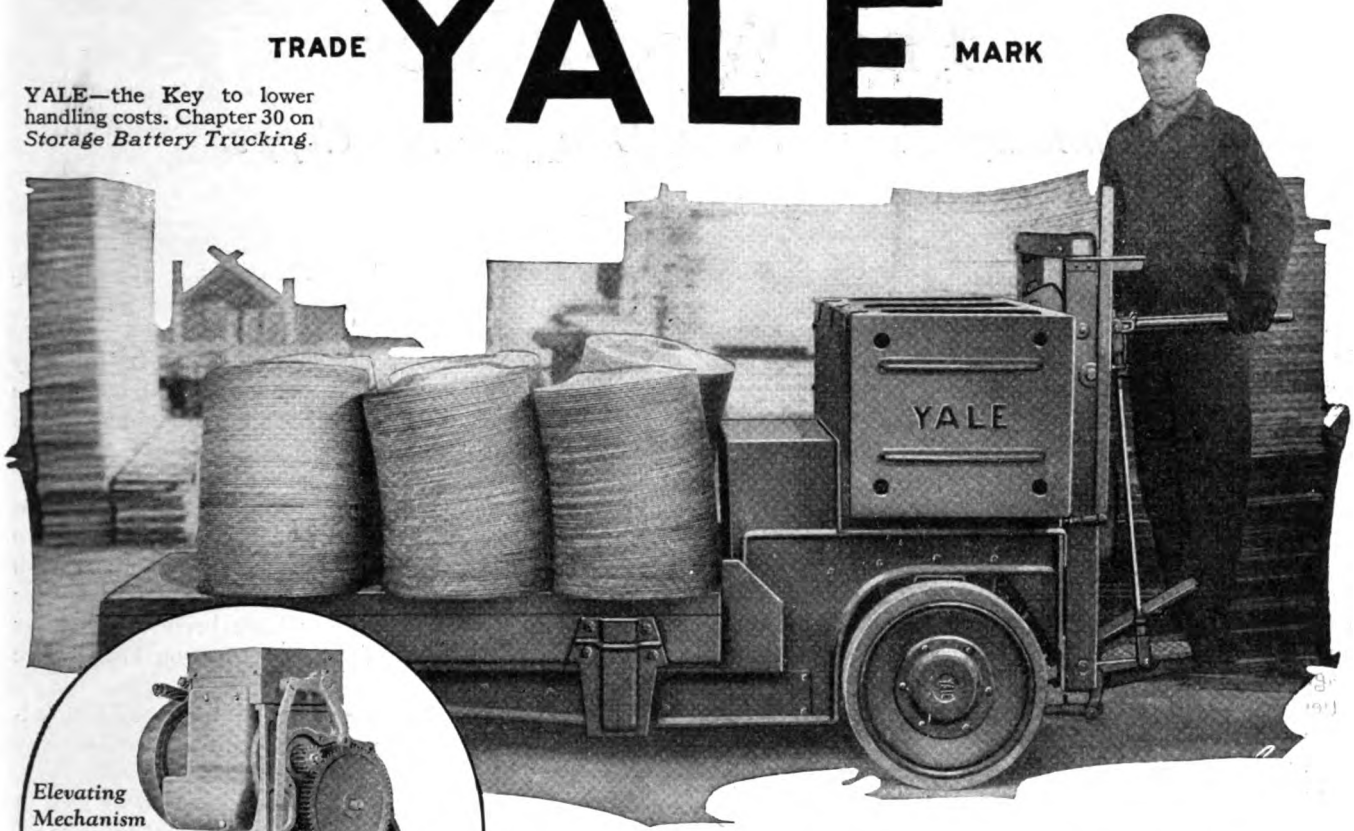
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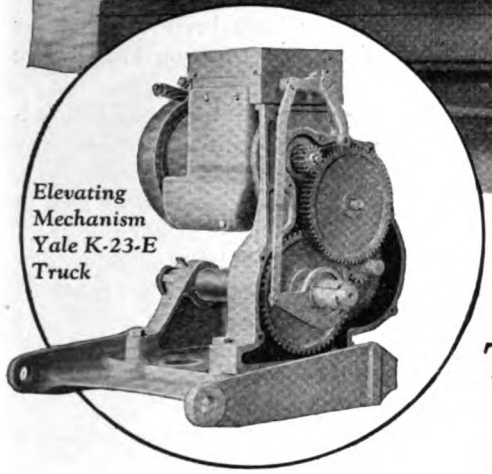
ON page 19 of the April number of INDUSTRY ILLUSTRATED appeared a short introduction to the article descriptive of the Cincinnati Milling Machine Company's plant. Due to the omission of a line of text, an obvious error occurred, in the first sentence of that introduction. To the very few of our readers who may not have supplied the omission themselves, we would point out that the Cincinnati Milling Machine Company specializes on milling machines and *grinders*.

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YALE—the Key to lower handling costs. Chapter 30 on *Storage Battery Trucking*.





Elevating Mechanism Yale K-23-E Truck

Use the Yale K-23-E

To Handle the Unusually Heavy Loads

Here is a new Yale truck for handling the unusually heavy loads. Its 6,000 lb. capacity with the usual Yale overload reserve, and the self-loading elevating platform, enables this truck to handle greater tonnage of extra heavy material and at a substantial saving in time and money.

Yale K-23-E is remarkably easy to handle and easy to steer. It lifts faster than other trucks of this type, which means that it does more work during a day's run.

The triple spur-geared elevating mechanism (illustrated in the circle), consists of essentially the same unit as is used in the Yale K-22 truck. The elevating platform is raised by means of two large eccentrics mounted on the hoist unit shaft, which draw the platform forward and upward on the platform links. Mechanical upper and lower limit stops assure simple and safe operation of the lift mechanism.

The drive unit, hoist unit, controller units and many other parts of the Yale K-23-E are also the same as used in Yale K-22 trucks, making the major replacement parts interchangeable between models.

Write for details. The Yale K-23-E Elevating Platform, 6,000 lb. Low-lift Industrial Truck will interest you.

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I-Beam Trolleys, Industrial Trucks } For Shifts

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YALE Hoisting and Conveying Systems

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The Wire-Puller

Blanding Traces Some Disappearing Copper

By Chester Lyndelle

THE night was dark; dark with the conclusive thoroughness of a coal mine or a London fog. Far down the valley where the river merged into the bay blinked the red and green lights of a small cruiser, occasionally eclipsed by a wavering white pencil as the craft's searchlight swept the stream for channel buoys or floating hazards. Once the oncoming boat veered suddenly to port, yawed sharply and resumed her course, but there was nothing in the recurring "plap-plash" of the wavelets as they broke on the banks to hint at an explanation of the manoeuvre. On the right shore sprawled a gigantic industrial plant, lifeless save where lazy smoke from a tall stack traced its gray plume against the diamond-studded sky and presaged the activities of the coming day.

Blanding made a vicious swipe at the hungry mosquito hordes, stretched his arms heavenward in what might have been a supplication, or merely a stretch, and peered at his watch.

"Four o'clock," he muttered, "guess it's time to call it a day. Might as well get home and steal a snatch of sleep before I haul down my flag."

The long tramp home from his vantage point on the river front, whence he had observed the cruiser's sudden shift, but served to strengthen his decision. For nine days, or nine nights, to be more exact, he had unsuccessfully pursued a most material will-o'-the-wisp.

The big factory he had been watching was the wire drawing division of the great Tidewater Copper Company. For months it had been losing copper wire, not in short lengths or weights a man might carry away under his clothes, but in quantities measurable in miles, or tons. It was to discover the hole through which this loss occurred that Blanding had been called back from his twice-deferred vacation, and at which he had already put in a most discouraging amount of fruitless work.

The resignation fully decided upon, it was with a feeling of disappointment that Blanding heard the man at the information desk reporting that Tidewater's president was out for the day, but that Mr. Neal had asked for Mr. Blanding, should he come in.

For a moment Blanding was minded to deny himself to Neal, another of the group he had known best during the four years at Tech, and it was only with a half-formed idea of making Neal serve as emissary to his chief that Blanding waited.

"Have you got it?" Neal blurted, as he came through the gate. And, without waiting for a reply: "It's high time. We lost two thousand feet of number twenty bare wire and twelve thousand feet of number nine last night! That's close to five hundred pounds of copper!"

"There you have my answer, Larry," Blanding returned, soberly. "Somebody stole nearly three miles of wire from you last night, and I'd stake my oath the only thing that got out of the plant after closing time was the smoke—and mighty little of that. It's too deep for me. I'm through, finished, quit."

Neal was concerned.

"When I heard how you untangled things for Crossley and the Spencer people I hoped you might be able to help us out," he placated, "I hadn't the slightest idea I was letting you in for anything like this——"

"Neither had I, or I'd still be carefree in Canada," Blanding vouchsafed. "Your intermediate stockrooms are all in the center of the plant, inaccessible unless the stock is carted through two or more departments, with a tight roof and no cellar. Your loading platform, your dock, and your railroad siding have been watched for months, as you yourself told me when you brought me here."

"True enough," the assistant to the president admitted, "our own police and Captain Nelson of the city force have watched the plant for a long time—in short, we were about to resort to a wholesale firing of men in an attempt to sweep the guilty one out when I heard about you and told President Morton of your other successes. We've been rather counting on you. Some of the directors are bitter against our present policy and are out to get the president's scalp any way they can. And with the plant losing a hundred dollars' worth of copper night after night, it's damn serious."

"You needn't rub it in, Larry," Blanding objected. "I have done everything I can think of. You can stop the leak in any given stock room by stationing a man there, as you have already learned, but that means a force of eight men to cut off the wholesale losses alone—and leaves the method undiscovered for use again when the excitement blows over. It beats differential calculus and the fourth dimension for intricacy and difficulty of solution. If we lived in an age of alchemy I'd say the copper changed to mercury and ran down the sewer. I don't see how otherwise to explain it."

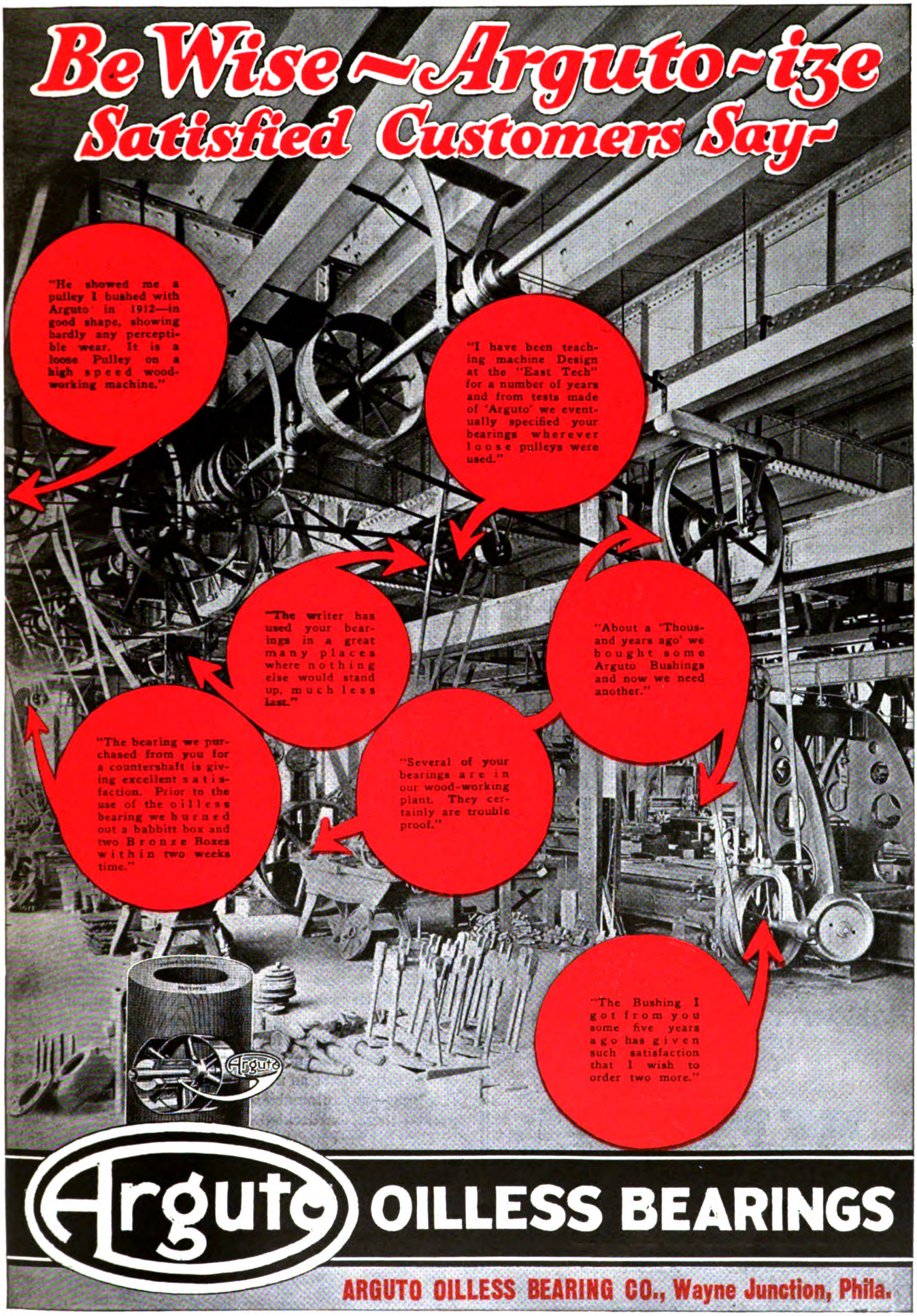
"I know it's asking a lot of you, Davey, far more than I foresaw. But President Morton is counting on you—won't you stick it out until he gets back—there's always a chance of stumbling on something——"

"'Stumbling' is right, if present progress means anything. But I suppose I might as well," Blanding agreed, moodily. Then, as an idea struck him: "You are a member of the Canoe Club, aren't you? That may help. Can you arrange for me to have a fourteen-foot canoe for the next few days, any time I may want it? Think I'll borrow a leaf from Uncle Sam and start a blockade offshore."

"You are more than welcome to the canoe," Neal promised, "but our own men and the city force watched the waterfront all the time they were on the job, and the loss went on just the same. Better keep your eye peeled for booze-runners, too. They'd just as soon run you down as not—maybe sooner."

"Guess I saw one of the tribe coming upriver last

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night," Blanding chuckled. "Did a sudden side-step about even with the plant—is there a buoy or something out there?"

"Not a thing—we are well within tide limits, and there is water enough clear across the river to float anything that can cross the bar farther down. It's all of forty feet deep amidstream here at high tide—never less than thirty."

"Funny, then. The boat I saw dodged back and forth like the Irishman's flea for a minute. Must have been a floating log."

Together the two went over to the boat house, Blanding chose a canoe to his liking, received keys to door and boat and, with Neal's help, launched the borrowed craft.

There was something refreshing in the buoyant lift of the light boat under the urge of the paddle, and Blanding found himself abreast of the Tidewater Copper plant before he realized it. A sudden whim prompted him to paddle inshore and make a thorough survey of the waterfront.

Flanking most of the property was a high brick barrier, alternating with the bare and almost prison-like walls of the various buildings; at the upstream end there was the high wire fence with a big gate spanning the one railroad track, and at the other the pier where water shipments were received and sent out. It was low tide, and the outlets of the sewers and drains could readily be located by the areas of grease and scum forming about them.

The plant's physical characteristics catalogued, Blanding paddled across the stream to rest at a small dock there—apparently a landing for the small river steamers during their season, and a convenient fishing vantage point. Two or three shacks were ranged on the bank above the wharf, with a gravelled road winding up the slope to a connection with the main road beyond.

The tide was still running strongly upstream that night when Blanding weighted his canoe with stones until the gunwale was within two inches of the water and again put out, paddling vigorously until he had reached the limits of the Tidewater plant. The two paddles stuck over the front seat to make an improvised rest, he snuggled down until his head and shoulder made a barely distinguishable blur and canoe and all looked like a slowly drifting log with a bump and two projecting limbs. Then, with his left hand in the water, he kept steerage way on his craft, gradually working upstream with the drift and in toward the copper works.

The scene was quiet, quiet with that intensity of nature which makes man-made noises inconsequent, trivial. At first Blanding felt absolutely alone on the surface of the big river, for as far as his eye could see the surface was undisturbed. Far across the river, about on the little wharf as nearly as he could judge, blinked a red light—an automobile with fishing or petting party parked there, he decided.

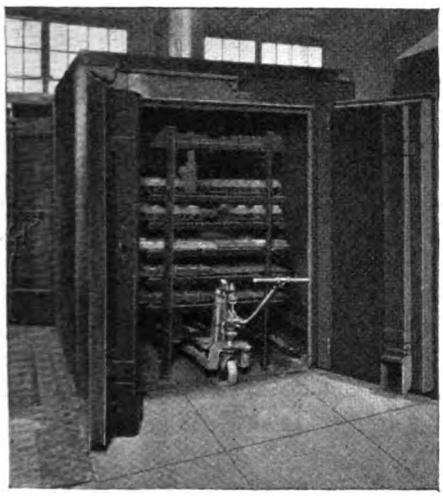
Then his ear caught the sound of oars, skillfully pulled, with some muffling material to deaden the sound of the oarlocks. Not for nothing had he spent his summers afloat in the wildernesses of Canada, and soon his eye caught what at first seemed to be merely a thinning of the shadow—eventually taking form as a trim rowboat with one occupant. Perhaps a hundred yards farther offshore than Blanding the boat came to a halt, the man shifted his oars and, if his motions meant anything,

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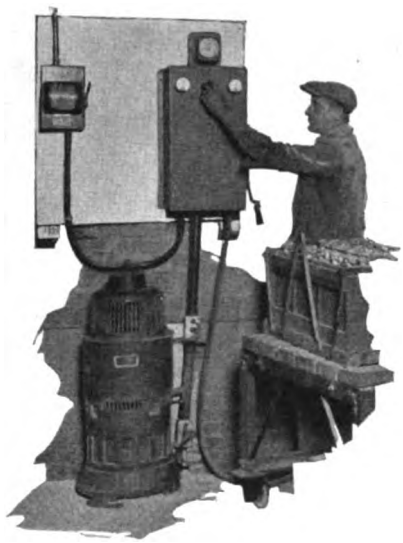
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threw overboard the end of a "trot" line, a heavy fishing line with baited hooks every foot or so.

Slowly the newcomer made his way downstream, sculling easily with one oar. At the lower boundary of the copper company's holdings he made a wide sweep to turn upstream, rowing more vigorously this time, and coming to a sudden stop almost directly opposite Blanding and his shadowy canoe. There was a short pull at the line hanging over the stern, a splash as of a fish striking the surface of the water, and then the man set off for the farther shore.

Whatever the stranger had caught, Blanding determined to follow him if possible. Shifting his position on the two paddles so as to lie on his stomach, he wielded his hands over the sides as paddles. The tide was at the turn and the river mill-pond still as he slipped noiselessly through the water in pursuit of the other. The subdued groaning of the oarlocks ahead grew plainer, as though the lone rower was straining harder at his task. As they neared the shore a light breeze sprang up, not enough to bother Blanding had his craft been light, but sufficient to send vagrant wavelets splashing over the low gunwale, and with power enough to blow him from his course.

There was nothing to do but slide the surplus ballast overboard, take up his paddle, and make his way back to the other side of the river. The lone oarsman had disappeared, and there was only the low hum of a motor to be heard; a four-cylinder engine, Blanding decided, as he silently dipped and feathered his paddle. The little red light still winked from the farther shore when he felt he was far enough out to lengthen his stroke, and he marvelled casually at the wastefulness of the motorist who would idle his engine for so long before starting his car.

As he dozed off to sleep, events of the night still uppermost in his mind, Blanding came alert with a start. The true significance of what he had witnessed was beginning to dawn on him. The realization was enough to take him to Tidewater Copper as soon as it opened and, with Neal, to go to the stock room from which most of the losses had occurred.

Outwardly the room was as it had been left the night before, but Blanding could scarcely conceal his eagerness when the tally clerk, after weighing the reels in the middle of the floor, made his report and Neal consulted a slip of paper he held.

"That means they got four thousand feet of number eight wire and a little more than that of number ten. Roughly, three hundred and fifty pounds of copper for a night's work! Blanding, *where* will it stop?"

"Right here, I think," was the rejoinder. And, in an undertone: "Get the men out of here for a few minutes. I'd like to keep what we find under our respective hats. No need to advertise chowder before we've caught our fish."

The room cleared of all save himself and Neal, Blanding went to the cast iron grating covering the nearest sewer inlet, pried it out of its recess in the pipe flange, and examined it closely. Apparently unsatisfied, he took up a second cast iron grill, scrutinized it carefully, and called Neal's attention to a shiny groove at the end of one of the slots in the grating.

Neal shook his head.

"I have worlds of confidence in you, David. But you

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These 5 products will save you money

Leading industrial plants have used them for years to reduce their maintenance expense

1 Lapidolith protects your concrete floors against dusting and wearing. This original concrete floor hardener is described below.

2 Lignophol will keep your wood floors from drying out, splintering, or rotting. See the complete description below.

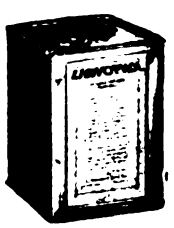
3 Cemcoat is a paint that will cut down your painting bills. It sticks to brick, wood, or concrete. It stays white long after other paints turn yellow, and may be washed again and again. Further details are below.

4 A treatment of Hydrocide Colorless will permanently waterproof the walls of your buildings. See full description below.

5 Stormtight will prolong the life of your roof and protect it against leaks. This rubber-like, adhesive liquid stops leaks instantly and permanently. A further description is given below.



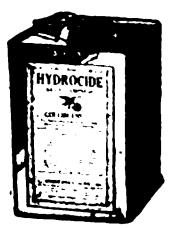
1 Lapidolith is the original concrete floor hardener. It will add years of wear to even an old concrete floor. It is a liquid, chemical compound that penetrates the porous cement, binds the loose particles together, and fills up the voids. It will make your concrete floors almost as hard as flint, and make concrete dust a thing of the past. Lapidolith is as easy to apply as water. Floors treated at night are ready for business in the morning.



2 Lignophol will add years of wear to old, worn-out wood floors. It is a preservative dressing that penetrates the wood fibres, and restores the natural gum and oils. It will give you smooth, hard, dustless wood floors.



3 When your next repainting job comes around try Cemcoat. The wearing qualities of this paint are remarkable. Even on brick, plaster, or concrete walls it will not crack or peel. It may be washed again and again. Because of its unusually heavy body it generally requires one less coat to a given surface than most paints. Cemcoat comes in white and colors for exteriors and interiors.



4 Hydrocide Colorless, applied to the exterior of a building, penetrates the brick or concrete and effectively keeps out all moisture. As it contains no paraffin it will not run in hot weather. It will permanently water-proof and damp-proof the walls of your buildings, and yet since it is invisible it does not detract from the natural beauty of the walls.



5 Stormtight is an adhesive, rubber-like liquid, ten times thicker than paint. It will prolong the life of your roof and protect it against leaks quickly and permanently. Stormtight quickly stops leaks that have already started. It is very easy to apply. It is not a temporary makeshift, but has saved the cost of new roofs again and again.

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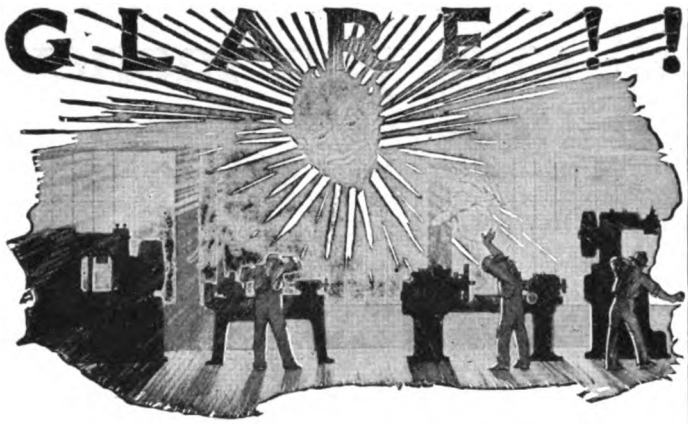
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ELIMINATE IT

Cut Heat 10° to 15°

Maintain 94% Light Intensity

Save Expense of Shades

Coat your glass with *Skyco No-Glare,* which softens the tiring glare and admits a cool *diffused light.* Glare is eliminated. You can even *look* at the sun. And actual thermometer tests show heat is reduced from 10° to 15°.

Goes on OUTSIDE of Glass

—yet rain or weather conditions do not affect Skyco No-Glare. Neither will it rub, or flake, off. Yet you can remove it easily with warm water and a brush.

Surprisingly economical—a single gallon covers from 500 to 600 square feet of glass and stays on from 4 to 6 months. The price is only $3.50 per gallon (less in quantities). It is guaranteed by the makers of the famous *Skybryte Liquid and Powder Cleaner.*

Special Trial Offer

To convince you of how economically and effectively you can banish glare and reduce heat we invite you to accept this trial offer:

Order one gallon of Skyco No-Glare at $3.50 F.O.B. Cleveland. Use as much as you wish. Check up how much better work goes on when glare is banished and heat lessened. Then, if you are not thoroughly satisfied, return the balance at our expense and we will cancel invoice.

THE SKYBRYTE COMPANY

1195 Keith Building · Cleveland, O.

Chicago Branch: 104 So. Michigan Ave.

SKYCO NoGlare

will never convince me the wire got out of here *that* way."

"Your faith is your own, Larry, my boy, and I wouldn't strain it for the world. All I want you to do is to go across the river, get not less than three State troopers—five would be better—and hide out on the hillside above the little wharf until I give you a signal. It may be a shout or a flashlight gleam, or merely a disturbance in the river, but whatever you do, grab every man on the dock!"

As on the previous night, Blanding ballasted his canoe with stones, but instead of floating gradually along the copper company's site, he let himself drift slowly across the stream until he occupied a place about two-thirds of the way to the left bank. Here he waited until the red tail-light appeared, coincident with which he twice caught the gleam of a flashlight, evidently searching the shore in both directions from the wharf. Again the rowboat set out, though on this occasion he could descry the figure of a man standing in the bow.

"Washington crossing the Delaware," he chuckled to himself, "going to a surprise party."

Keeping just within sound of the oars, Blanding soon learned the reason for the second man.

"Pull upstream a bit, Jim," the lookout called in guarded tones. "Perry says we'll have a double load tonight, and then we'll lay off f'r a spell."

Evidently the steersman's course was good, for a moment later the man in front lay down, fished alongside, brought a block of wood out of the water, and appeared to be reeling in a line attached to it.

This time the two bent to the oars and Blanding was speedily outdistanced, though the creak of the oarlocks told of a heavier load than on the night before.

A muffled bump announced when the rowboat reached the wharf, the scuffling of feet reported the fact that two or more men were unloading something from the boat, and again there came the muffled hum of the motor, shading into the crescendo chant of loaded gears.

Nearer and nearer shore Blanding edged his canoe, paddling carefully on the off-shore side of his canoe, lest the white flash of his hands betray him to those on shore.

Suddenly, as though seized by giant hands, the frail canoe swerved from under him, lifted high from the water, and overturned, all at the instant an automatic on shore began a sweeping fire toward the disturbance out in the stream.

Instinctively, Blanding dived deep, to come up in the shelter of the wharf. Overhead he could hear the whines of the prisoners and then Neal's voice.

"Give me a gun and let me guard your prisoners! Can't you realize there's a man out there in the water somewhere—wounded, or maybe killed!"

The troopers were still trying to find oars for the boat when Blanding clambered up the side of the dock and came forward. The scene that met his eyes was worthy of a movie scenario.

Under the rays of a trooper's flashlight huddled four hard-looking prisoners, two of whom Blanding placed as the rowboat's crew; while for a background loomed a big motor truck with two shining strands of copper—still dripping—leading from a large drum outward and downward to disappear into the river at the point where the canoe had upset.

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"HALLOWELL" Steel Bench Legs and Drawers



The *new* "Hallowell" Home Work Bench (shipped knocked down in 3 packages) is the thing you've been wanting for your own home

built to carry heavy loads

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PATENTS PENDING

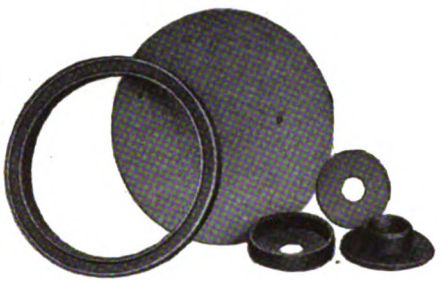
Just as our "Pioneer" hangers and "Hallowell" platforms have the quality that insures long service and the price that makes for easy buying, so, too, do our bench legs and steel drawers measure up. They're not best because they're cheapest, *they're cheapest because they're best!* They make it easy to rearrange the plant—benches are easily moved and never come apart. Moreover, "Hallowell"-legged benches actually cost less to build than wooden benches—and last much longer. "Hallowell" drawers are theft proof. Write for illustrated folders.

Standard PRESSED STEEL Co.

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Chas. A. Schieren Co., 31 Ferry St., New York.

Please send me your booklet and price list on Leather Packings.

Firm Name.....

Address .....

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.....

"Thank Heavens!" Neal shouted. "I thought they had done for you!"

"Nothing like that," Blanding denied. "As soon as I felt the canoe list I went overboard. Fool stunt of mine, anyway, running afoul of the wire when I knew it had to come up somewhere! Pretty clever trick they had, though, wasn't it?"

"Still a bit too clever for me," Neal admitted. "Diagram it so I can tell President Morton."

"That lone fisherman, coming closer to the copper plant than any fish would get on account of the acid in the water, set me to thinking, and when I puzzled out why he was making such a job of getting back here I knew he must be dragging something heavy. What? Wire, of course. Somebody on the inside would set a reel up on bearings, thread a wire through a grating—remember the shiny place I showed you?"

"It means something to me now," Neal admitted.

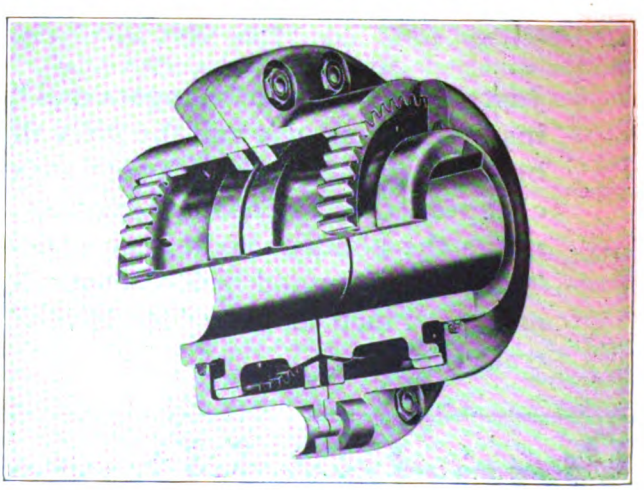
"He'd tie one end to a float, drop both into the sewer, and turn on the water. In a little while the float would get to the end of the drain and rise to the surface of the river. It was then a simple matter to pick up the float, hitch on the wire at the end of the cord that gave the float freedom to rise, and row over to this side. Once landed it was merely a question of the capacity of the drum on the truck winch. Your wire would feed across the river as long as there was a pull here and a reel there."

"But how did it get started?"

"When you check up on the sudden resignations tomorrow you'll find your inside leak was one or more of the three watchmen you have, or else he was an accomplice—admitting the wire-puller, who was clever enough to devise the plan and see to its execution. I wasn't so very far wrong either in my crack about your wire leaking out the sewer."

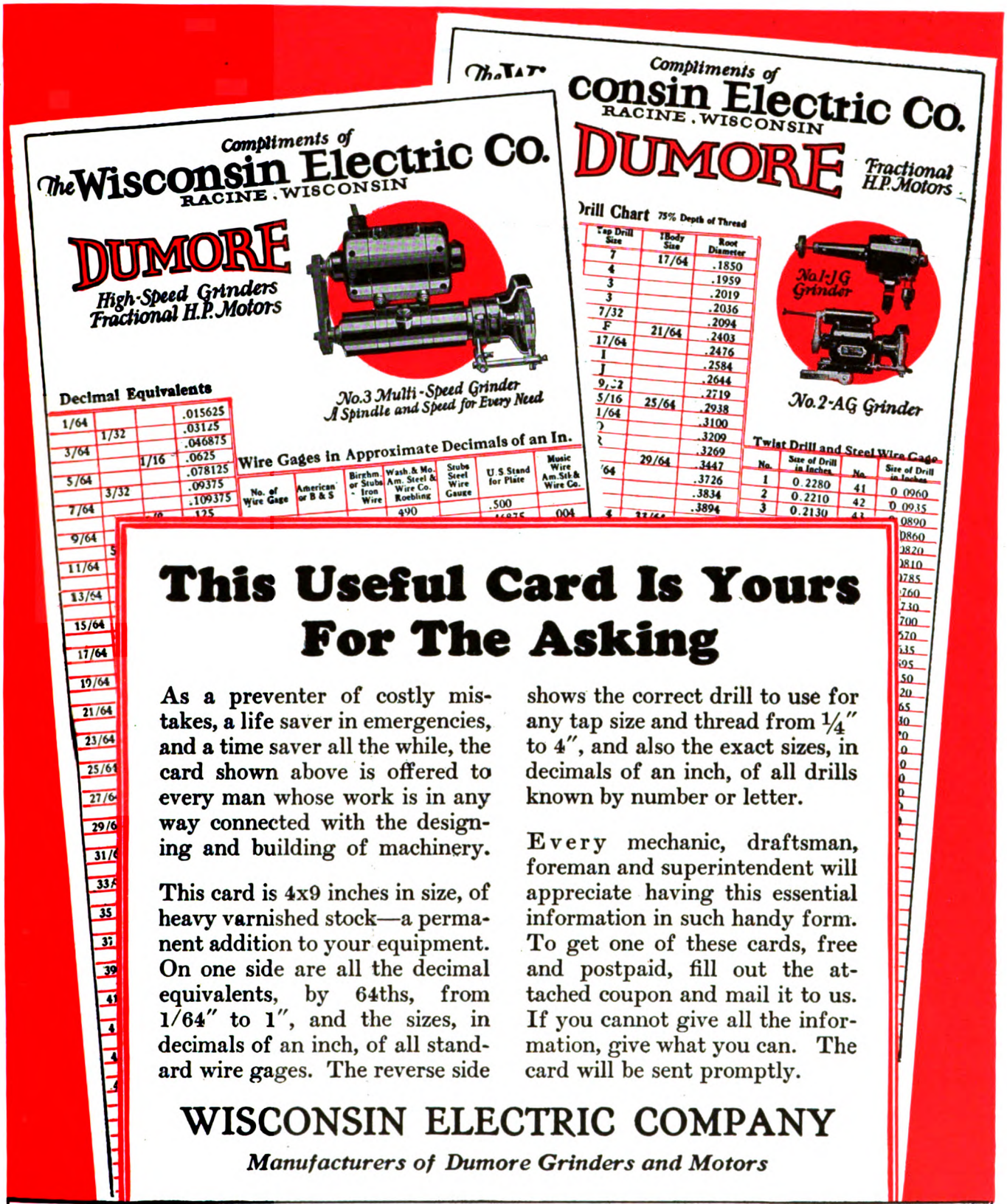
A Flexible Coupling of Rugged Design

A NEW flexible shaft coupling has recently been put on the market by The Poole Engineering and Machine Co., of Baltimore, Md. The accompanying illustration shows a section through the assembled coupling, which consists of six parts: two hubs, each having an



external gear; two sleeves with internal gears, and two aligning rings which are fitted in the sleeves. It is made in sizes from 1½ inch to 12 inch maximum bore, for horsepower from 10½ to 5,350 per hundred revolutions per minute.

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This Useful Card Is Yours For The Asking

As a preventer of costly mistakes, a life saver in emergencies, and a time saver all the while, the card shown above is offered to every man whose work is in any way connected with the designing and building of machinery.

This card is 4x9 inches in size, of heavy varnished stock—a permanent addition to your equipment. On one side are all the decimal equivalents, by 64ths, from 1/64″ to 1″, and the sizes, in decimals of an inch, of all standard wire gages. The reverse side shows the correct drill to use for any tap size and thread from ¼″ to 4″, and also the exact sizes, in decimals of an inch, of all drills known by number or letter.

Every mechanic, draftsman, foreman and superintendent will appreciate having this essential information in such handy form. To get one of these cards, free and postpaid, fill out the attached coupon and mail it to us. If you cannot give all the information, give what you can. The card will be sent promptly.

WISCONSIN ELECTRIC COMPANY

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Wisconsin Electric Company 70 Sixteenth St., Racine, Wisconsin

Please send me one of your Tap Drill Chart Cards for use in my work. Our shop is equipped with .....Dumore Junior Grinders, ...2 A. G. Grinders, ...No. 3 Grinders. We also use .....Grinders.

(how many?) (how many?) (how many?) (how many?) give makers name

These Grinders have been in use about.....years.

Name .....

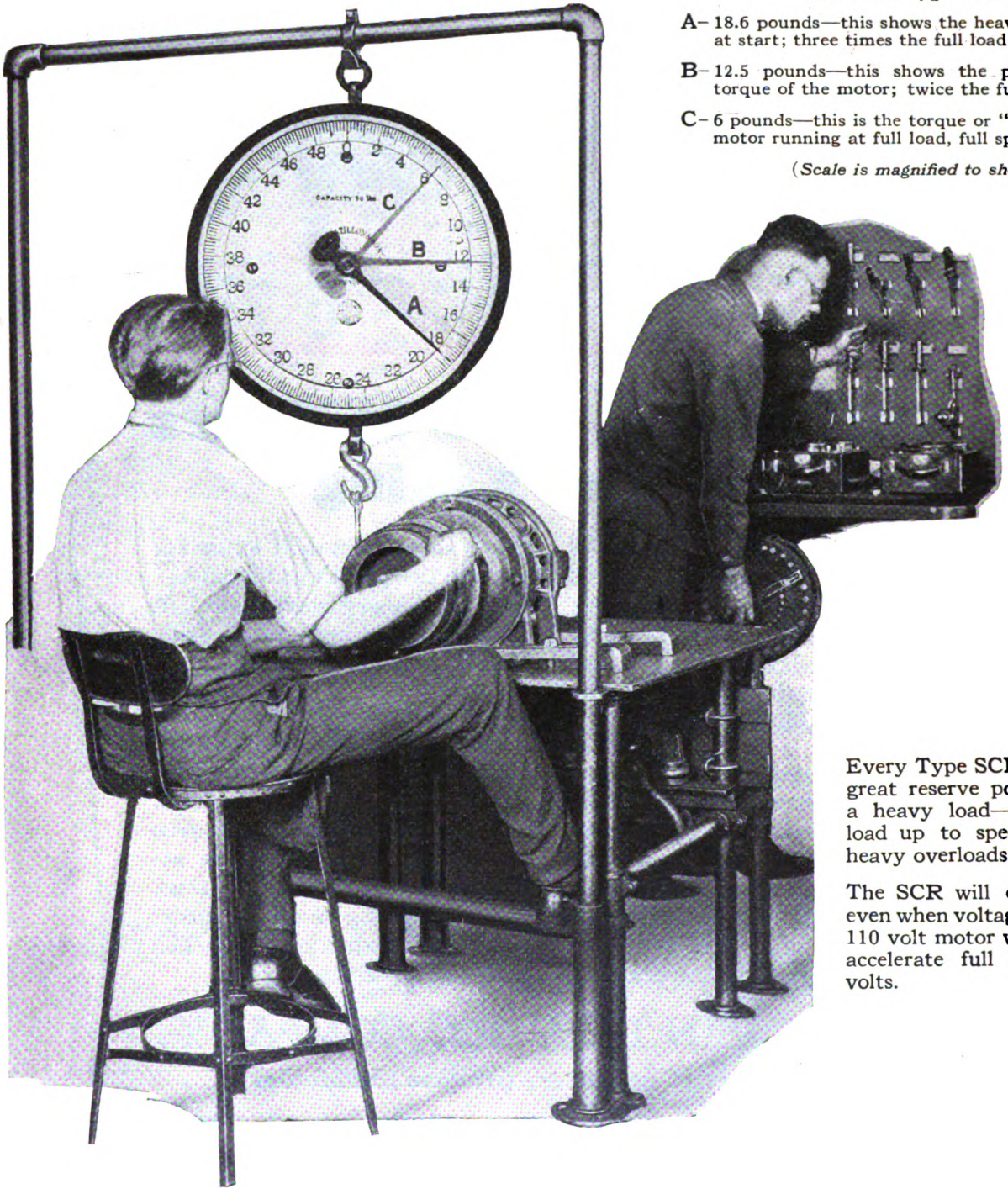
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The Reserve Power



Test of Type SCR Motor

A– 18.6 pounds—this shows the heavy pull of the motor at start; three times the full load value.

B– 12.5 pounds—this shows the pull-up and pull-out torque of the motor; twice the full load torque.

C– 6 pounds—this is the torque or "twist" on pulley with motor running at full load, full speed.

(*Scale is magnified to show readings*)

Every Type SCR Motor has great reserve power to start a heavy load—to bring the load up to speed—to carry heavy overloads.

The SCR will do its work, even when voltage is low—the 110 volt motor will start and accelerate full load on 75 volts.

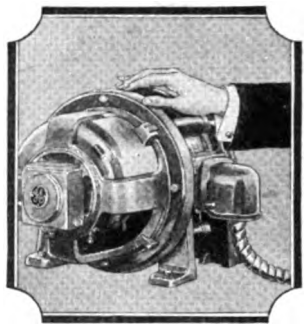
GENERAL

GENERAL ELECTRIC COMPANY, SCHENECTADY, NEW YORK

For products not advertised in this issue write Industry Illustrated

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Single Phase Motor
Type SCR

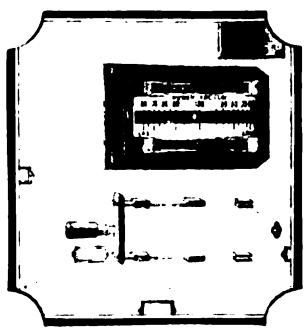


The SCR is cool running

Users of the Type SCR Motor say—

"Far superior to any single-phase motor we have had any experience with."

"Installed on all kinds of hard drive —not one complaint."



The SCR operates at high power-factor—near 100%

"Meets every requisite of the highest class of single-phase motor."

"It is the best single-phase motor ever built, so far as I know."

"I claim it is a wonder—I can't say too much for it."



The SCR is quiet—starting and running

"Just about perfect—the G-E may well be proud."

"Fully up to the mark set by other G-E products."

Full information at your nearest G-E office—or G-E Motor Dealer

Apply the proper G-E Motor and the correct G-E Controller to a specific task, following the recommendations of G-E specialists in electric drive, and you have G-E Motorized Power. "Built in" or connected to all types of industrial machines, G-E Motorized Power provides lasting assurance that you have purchased the best.

MOTORIZED POWER
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7E-2

ELECTRIC

SALES OFFICES IN ALL PRINCIPAL CITIES

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The New



Every Part Hardened

Ettco

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7. Self Centering.
8. Simple Construction

Send us your old drill Chucks. We will allow 15% on the exchange.

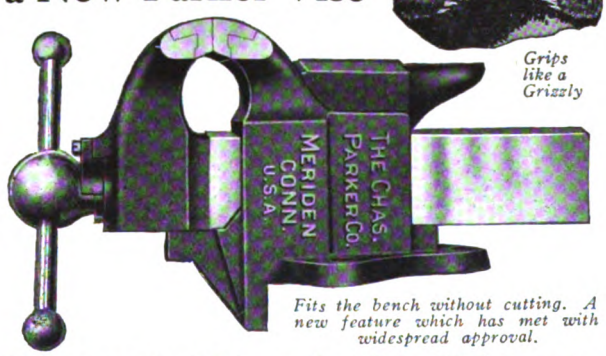
No. 1A	Ettco—0 to ¼ in.	$ 5.50
No. 2	Ettco—0 to ⅜ in.	6.50
No. 3A	Ettco—0 to ½ in.	9.00
No. 3½A	Ettco—⅛ to ⅝ in. ...	11.00

ETTCO Chucks Increase the Value of Your Electric Drills

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594-602 Johnson Avenue, Brooklyn, N. Y.

BIG BEAR
a New Parker Vise





Grips like a Grizzly

Fits the bench without cutting. A new feature which has met with widespread approval.

For general utility work, 15 to 25 lbs. overweight and carrying oversize screw and anvil.

	No.	Wt. Lbs.	Jaw	Vise Opens	List
Stationary Base...	134	76	4 in.	5½ in.	$17.50
	135	102	5 in.	6 in.	24.00
Swivel Base.....	234	89	4 in.	5½ in.	21.50
	235	112	5 in.	6 in.	32.00

Extra Strong with 7 exclusive "Parker" Features.

Write to W. R. B. for Catalog 57B.

The Chas. Parker Co., Master Vise Makers, Meriden, Conn.

PARKER VISES

GRIP LIKE A GRIZZLY

Why Not Eliminate Manual Labor?

By W. F. Schaphorst

THE difference between railroad and more recent methods of transportation via automobile, truck and airplane is that the slogan used by railroads has been "Can't" and the slogan of automobile people is "Can."

Not long ago I was in the West where considerable dairying is done and at one station my train was acutally held up for more than a half hour because of the time it took to transfer cream cans from one train to another. We made long stops at every station because of cream cans.

It was the duty of *one man* outside of the express car and one man inside to do all of the work. The train crew and a number of passengers including the writer stood and watched the poor fellow as he did his utmost to handle almost a carload of cream cans during the half hour. The conductor and flagman stood by with watches in their hands, apparently much perturbed over the rapidly passing time, but what else could they do? Their respective duties were to conduct and to flag and not to hustle cream cans.

Now if automobile manufacturers were confronted by a similar problem they would arrange things so that the entire roof of the express car would hinge and swing open and by means of a hoist all of the contents of one car would be transferred to another car, or the entire contents of a truck would be transferred to the express car in two or three minutes or less and there would be no necessity for delay.

What I am writing is not pure "bunk," either, because everybody has seen five and ten-ton coal trucks, fully loaded with coal, elevated by a special device in front of one's house so that the coal slides out through a chute in a few minutes; whereas the old-fashioned method was to use sacks, shovels, wheelbarrows, etc. Manual labor is out of date.

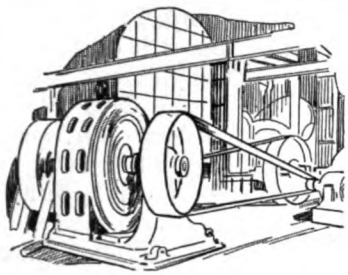
If it pays to put a hoist on a five-ton coal truck, it surely should pay to put a hoist on a 40-ton railroad car. However, most railroad cars today are built exactly like our grandfathers built them. The airbrake was about the last improvement.

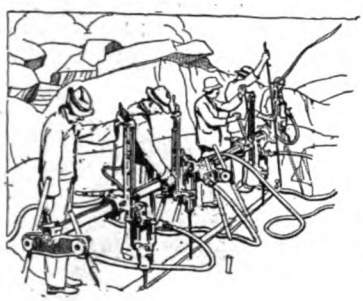
I could cite a great many more instances of railroad backwardness but I believe this one is enough. Their "future lies behind" as Elbert Hubbard used to say. They certainly are not progressing. Farmers out in the above mentioned dairy region ride in trains as little as possible these days because trains are too slow. Farmers use automobiles and therefore are not compelled to wait while cream cans are loaded and unloaded by the methods of 1825.

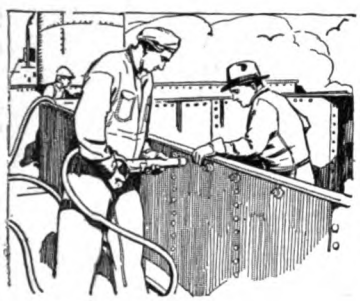


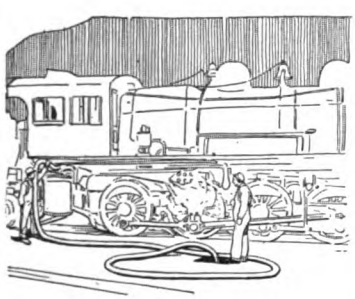
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Good rubber—an industrial necessity









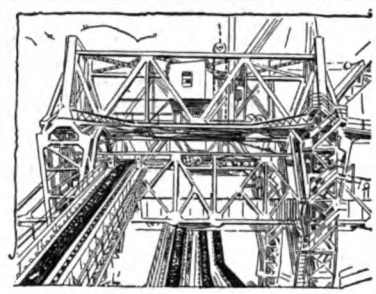
The steel which, rolled into rails and fabricated into hulls, transports our manufactures; the stone and brick which house our industries; the cast iron and brass of our machinery—these have fired men's minds by the sheer bulk of their creations.

Rubber is less spectacular, but it is as indispensable to our industrial life as any of these materials.

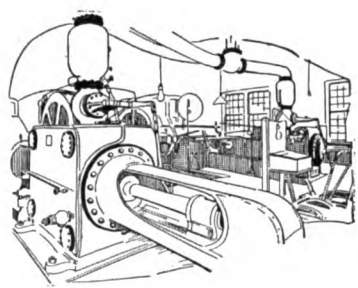
Rubber air hose, driving rivets by the million, gives form overnight to either factory or ship. Rubber packings and rubber insulated wire make possible our modern steam and electric power plants. Rubber hose carries to the drills of our mines, quarries and oil wells the pressure to operate and the lubricant to cool them. Rubber belting conveys the raw material at points of transfer, and drives machines which turn out finished products.

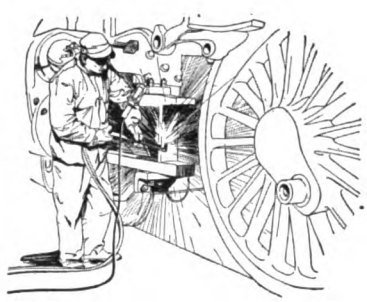
Such tasks deserve good rubber, and the United States Rubber Company has played a leading part in making good rubber a recognized industrial necessity. It has made important contributions to the development of almost all the rubber products used by industry. It has acquired extensive plantations to assure a permanent supply of high grade crude rubber. Looking always to the future good of the rubber industry and of industry as a whole, it has earned a name for high quality and well tested values.

Mechanical rubber goods can have no better guarantee than the "U. S." trade mark.











United States Rubber Company

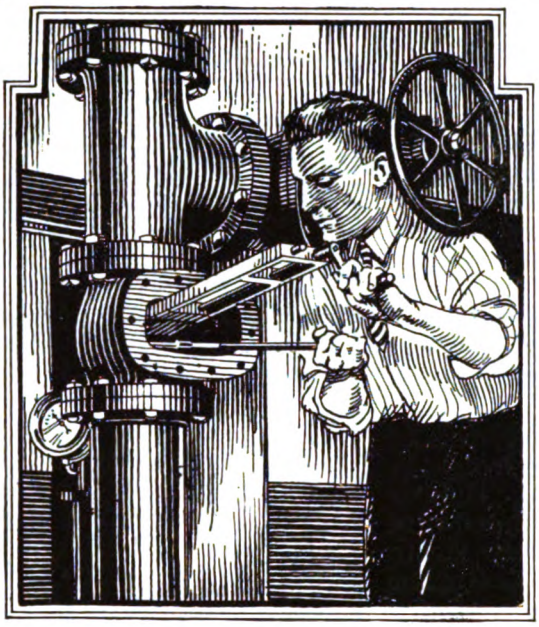
1790 Broadway, New York City

Branches in every industrial center

US — United States Rubber Company and Associated Companies — Rubber System

Trade Mark

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The Dexter Valve Repair Outfit is so easy and inexpensive to use there's no excuse for hissing, steam-wasting valves or frequent, costly replacements.

Tell us the number and sizes of the valves in your plant and we'll quickly prove to you that a Dexter Outfit will save you many times its cost.

Let us send you Catalog 23 containing complete information about Dexter Machines for reseating globe valves, gate valves and pump valves.

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Valve Reseating Dexter Machines

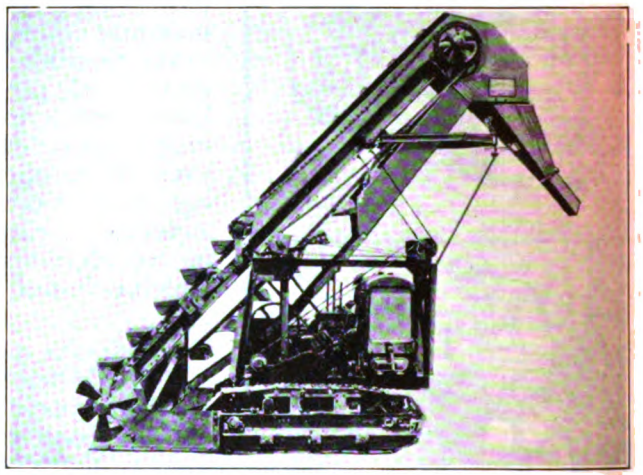
Link-Belt Company Announce Their New "Grizzly" Loader

A NEW crawler loader, known as the "Grizzly," has just been announced by the Link-Belt Company, of Chicago, Philadelphia, and Indianapolis.

Designed and built within the Link-Belt organization, this machine contains all that company's latest developments and improvements, in design and detail of construction, and is said to handle crushed stone, gravel, sand, phosphate and like materials at the rate of 1¼ yards per minute,—or about 140 tons per average hour.

This new crawler loader is a one-man machine. Its driving, its operation, and its care can be handled entirely by one worker of average intelligence.

Four units compose the loader, i. e., the elevator, the chassis, the power plant, and the crawler; the unit system of construction enabling the operator to inspect the



machine easily, and to make any adjustment or repair without tearing the whole machine apart.

Special attention has been given to the lubrication of all moving parts, all of which are provided with Alemite fittings or grease cups placed within reach of the operator.

The makers of the loader assert that any one can learn to operate it with but a few minutes' instructions. It can travel forward and reverse; and turn right or left when traveling in either direction.

The starting, turning, and stopping of the Grizzly is all controlled by two hand levers, which automatically apply brakes when stopping.

The elevator is controlled by separate hand lever, which operates a steel clutch, and disengages automatically when machine is started in reverse.



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PRESSURE



Beyond Measurement

It happens every time a fuse "blows". The fury of excessive current confined in one short strip of fuse metal-instant, intense heat! In the flash of an eye ~ cold metal is transformed into gas. Pressure, quick and tremendous has dealt the fuse casing a trip hammer blow.

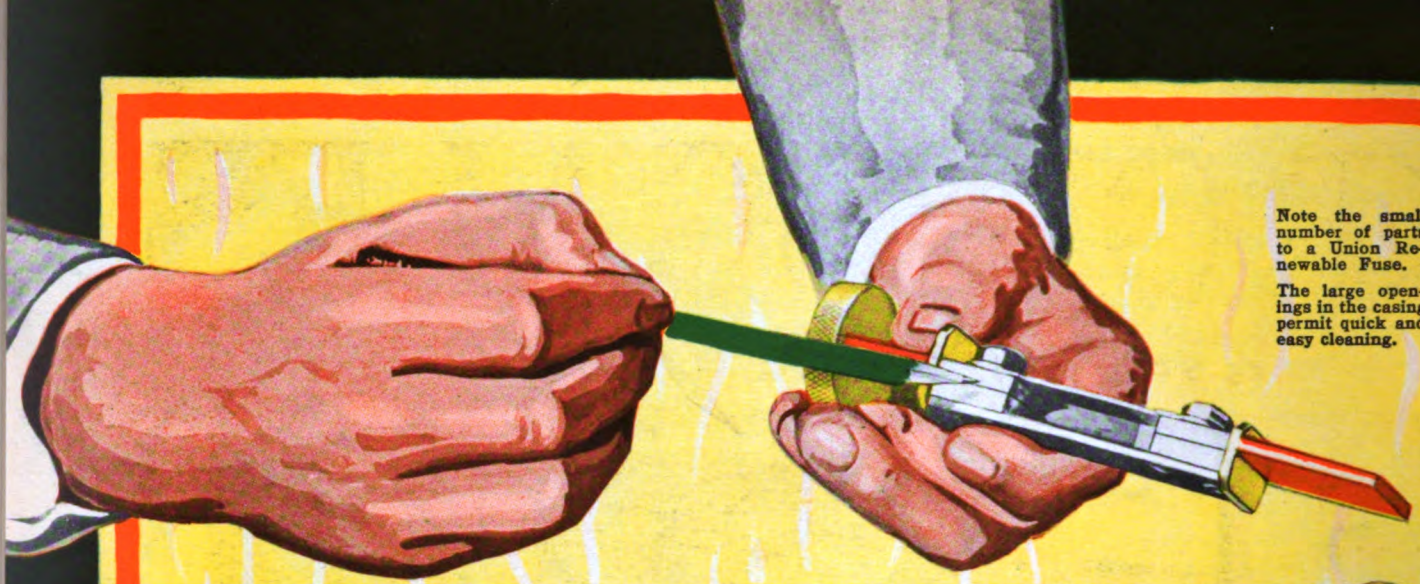
To appreciate the service fuses meet is to recognize the care with which they should be chosen.

It pays to specify "Union"

TRADE MARK UNION REG. U.S. PAT. OFF.

UNION FUSES

Because they are worth more they really cost less



Note the small number of parts to a Union Renewable Fuse.

The large openings in the casing permit quick and easy cleaning.



UNION
RENEWABLE FUSES
Stay in Service Longer

Heat and tremendous pressure are generated within a fuse casing at every blowout.

Renewable fuses must have unusual strength to withstand repeated shocks of this nature.

Union Renewable Fuses have the added strength that enable them to stay in service longer. The heavy gray horn fibre of which the casing is made takes the strain of innumerable blow-outs without impairment. Carefully designed longitudinal vents release pressure to the outside without permitting passage of flame.

The brass end-caps are securely fastened to the casing and cannot come loose.

Positive alignment of knife blades is assured.

The knife blade member is exceptionally heavy and rigid. The threads of the fuse element studs are not exposed and molten metal cannot cause them to "freeze."

Small number of parts reduce time and labor for renewing.

Union Renewable Fuses offer safety features coupled with a lasting durability that represents real fuse service.

A convenient chart for selecting the right Union Fuse for all types of service will be send for the asking.



Union Fuses both renewable and non-renewable in ferrule and knife-blade types may be secured for all standard ratings.

Gem Fuses with visible element represent the same quality in the plug types.

CHICAGO FUSE MFG. CO.
INCORPORATED 1889

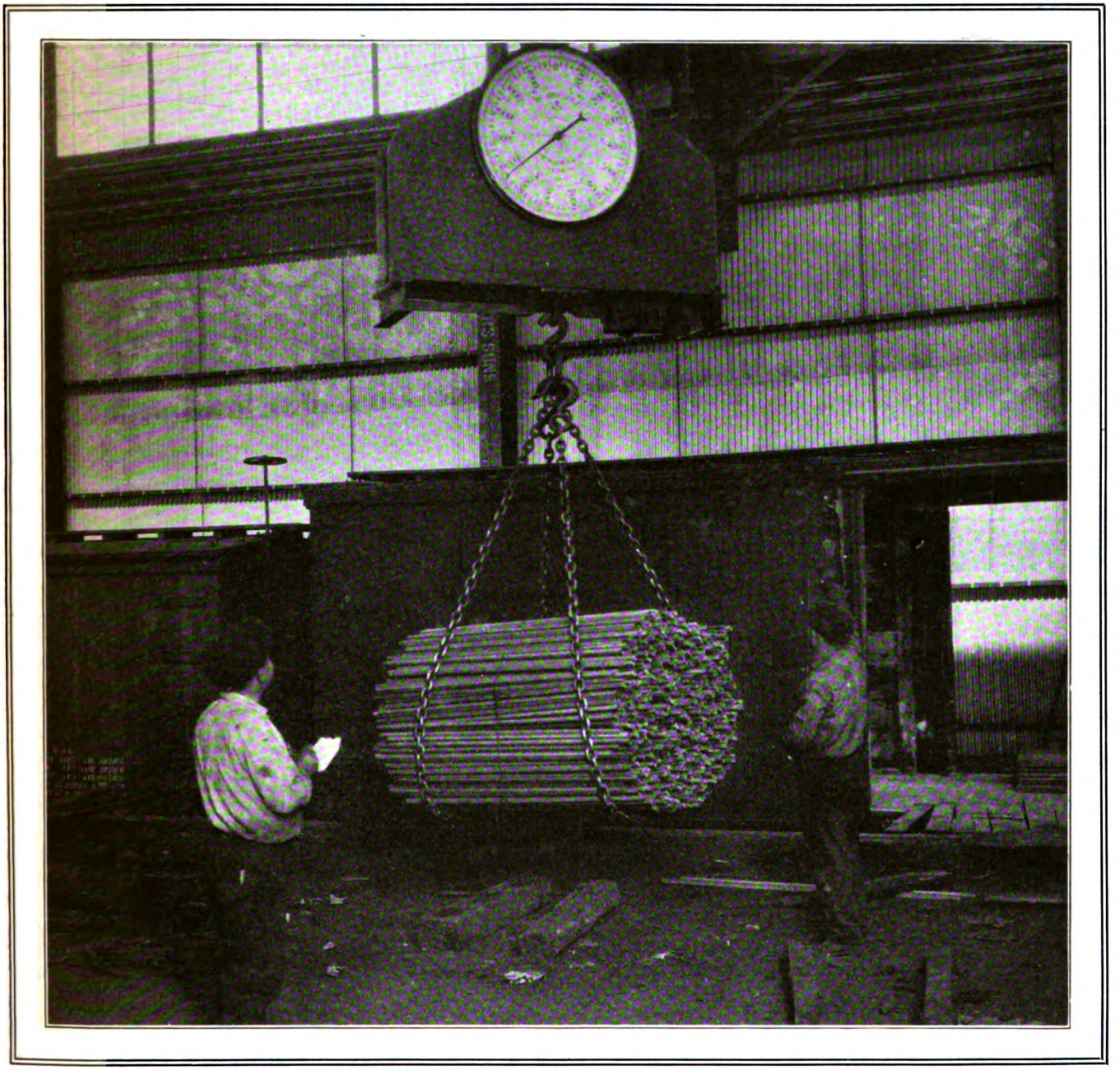
ELECTRICAL PROTECTING MATERIALS AND CONDUIT FITTINGS

LAFLIN & 15TH STREETS ✕ ✕ CHICAGO

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KRON SCALES

Weigh it While You Move



The Calumet Steel Company, Chicago Heights, Illinois, have eliminated all weighing troubles, errors, etc., since installing this KRON SCALE.

"We couldn't get along without Kron Scales," says L. H. Hook, Works Manager. With these scales attached to the crane they can pick up, weigh and load steel into freight cars, all in one operation.

Kron Scales will weigh anything instantly, accurately and automatically. Remarkably simple in construction—no weights to juggle—no beams—no springs. **Simply load and look.**

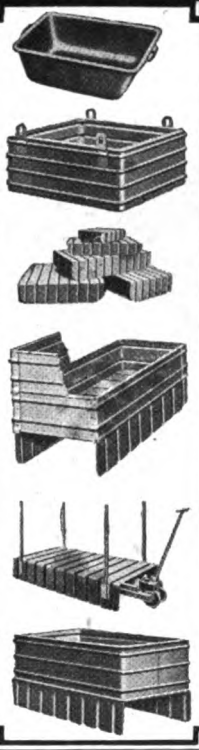
Write for a copy of our 62 page catalog describing all the various types.

KRON SCALES

The American Kron Scale Co.
430 East 53rd Street New York City

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POWELL
PRESSED STEEL
MATERIAL HANDLING EQUIPMENT

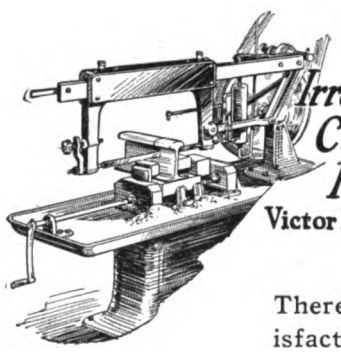


SEPARATE YOUR HANDLING COSTS

EXACT knowledge of material handling costs will disclose unrealized possibilities for savings that can be accomplished by the use of up-to-date pressed steel handling equipment throughout your factory.

Let our Engineering Department help work out your material handling problems.

The POWELL PRESSED STEEL CO.
HUBBARD, OHIO
Suburb of Youngstown



Irresistible Cutting Force!
Victor Power Blade

There is great satisfaction in buying a power blade that you know will do the work and can be relied on as a cutting certainty.

The constantly growing demand for Victor power blades proves beyond doubt that this blade is satisfying the cutting requirements of the metal industry today.

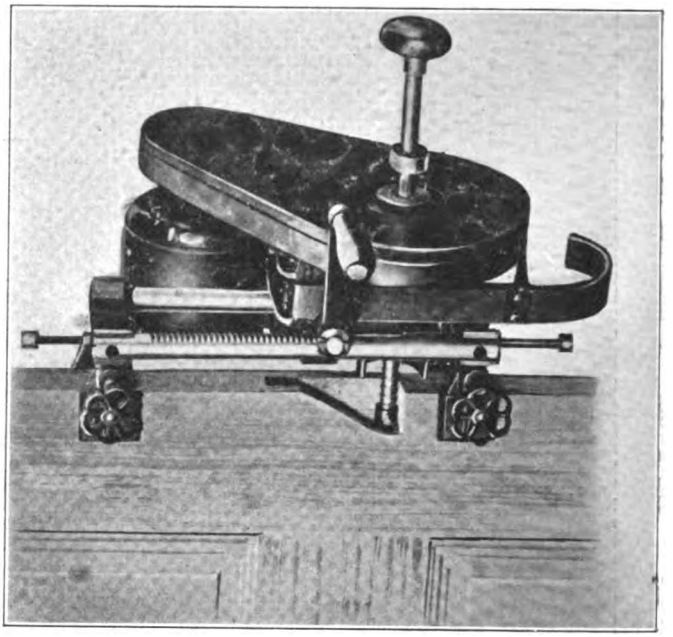
Let us send you free samples of this Wonder Blade

VICTOR SAW WORKS, Inc.
MIDDLETOWN, N. Y.

A Portable Electric Mortiser

A NEW portable electrically driven lock mortiser has been placed on the market by the Wappat Gear Works of Pittsburgh, Pa. This device, known as the Alta Lock Mortiser, the manufacturer states, can be operated by inexperienced men and cuts the time for mortising on doors and windows to 1/30 of the time previously required, the ordinary mortise being cut in one minute.

The outstanding feature claimed for this machine is its simple construction and ability to be carried from place to place wherever it is needed. This electric device is carried to the scene of the operation and clamped on the window or door in which the mortise is to be cut.

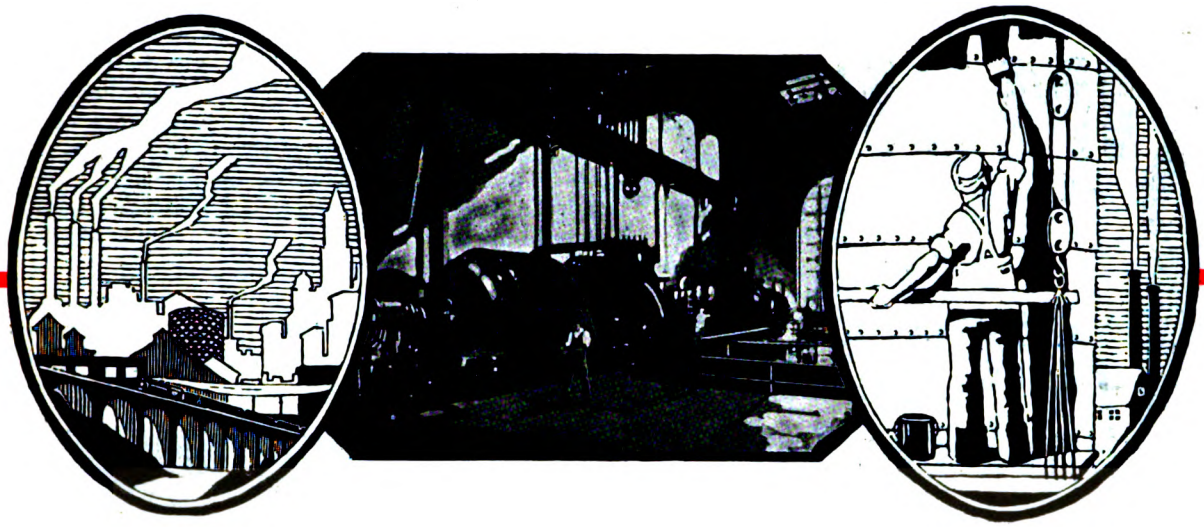


These clamps are self-centering and have wood face mountings to prevent defacing of the doors. An adjustable collar governs the size of the mortise and enables the machine to be used on all sizes of jobs. The cutters themselves are of the two-lipped type, of high speed steel and are provided with spindles for clearing away the chips. Easy running of the machine is assured through the use of a flywheel which governs the speed of the cutter.

Ample protection is provided for the operator. All gears are enclosed and the driving belt is well guarded. It is equipped with a Westinghouse 1/8-hp. motor to operate from the lighting current.

DURING the last five years, the trend of the relationship between money wages and the cost of living has favored the worker to the extent of giving him 37.1 per cent. higher real wages in 1925 than he received in 1913. This trend has continued during the first quarter of 1926, when the level of wages was stable and the level of commodity prices continued downward. Irving Fisher's index of commodity prices stood at 150.7 on April 10, as compared with an average of 152.9 for March. Fairly full employment at good wages, with lower prices on many of the commodities for which wages are spent, characterizes conditions in localities that surround many of the large cities and manufacturing centers.—*La Salle Extension University.*

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Every Surface Needs Paint

It is natural for every surface to need paint—without paint, real paint, any surface soon breaks down.

It is good economy to protect all exposed surfaces, and there are many around every industrial plant, but before painting the question arises "What paint should be used?"

There are so many kinds of paint—there are claims upon claims for the superiority of each brand, and all of this naturally confuses the buyer.

But, if the surface you are contemplating painting must have a waterproof covering—a paint that will absolutely protect that surface and for a long period of time, you can easily answer the question by specifying

Valdura Asphalt Paint

Or, should the surface be exposed to the attacks of acids or alkalis, you will find that VALDURA will serve to your entire satisfaction.

VALDURA is a natural preservative, an absolute waterproofing. The very nature of its ingredients makes it so. Genuine 99.5% pure Gilsonite natural asphalt forms its base. This is the highest priced, best quality asphalt mined. There is no coal tar, oil asphalt or other substitutes in VALDURA.

The quality materials used in its making—the painstaking and thorough methods used in its manufacture—every batch of raw materials, as well as paint in process of manufacture, tested and retested by graduate chemists, insures you of receiving a paint of uniform quality—a paint you can rely on to give *real* protection always.

A card or letter of inquiry will receive prompt attention.

AMERICAN ASPHALT PAINT CO.

844 Rush Street Chicago

Factories: LINCOLN, N. J.

Warehouses: OAKLAND, CALIF., CHICAGO, ILL.

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SIMONDS
High Tungsten Steel
HACK SAWS
Give Longer Service

SIMONDS

In every district there are some big concerns that have chemical laboratories and metallurgists. Any one of these can analyze the tungsten content in Hack Saw Blades. It is not necessary to make tests in a factory to determine their real efficiency or value. The tungsten content in a blade will determine the value of the tool to the user. Any constant user of tungsten steel knows the value which tungsten adds to the cutting efficiency of a tool, and Simonds Hack Saw Blades are made of SIMONDS HIGH TUNGSTEN STEEL from Simonds Steel Mill. We can furnish the analysis of the Simonds Hack Saw Blades. We urge all users of Hack Saw Blades to buy on QUALITY and not price, for ECONOMY AND EFFICIENCY.

SIMONDS SAW AND STEEL CO.

FITCHBURG, MASS · NEW YORK CITY · LONDON, ENGLAND
CHICAGO, ILL. · LOCKPORT, N.Y. · PORTLAND, ORE.
BOSTON, MASS · MEMPHIS, TENN. · SAN FRANCISCO, CAL.
DETROIT, MICH. · NEW ORLEANS, LA. · SEATTLE, WASH.

SIMONDS CANADA SAW COMPANY, LTD.
MONTREAL, QUE. ST JOHN, N.B. TORONTO, ONT. VANCOUVER, B.C.

Makers of
Hack Saws, Metal Band Saws, Inserted Tooth Metal Saws, Solid Tooth Metal Saws, Slitting and Slotting Saws, Files, Tool Bits.

A New Full-Revolving Shovel

RAILROAD-TYPE shovels, long the most adequate digging tool in ore and rock, have always had certain inherent shortcomings, which resulted in the frequent installation of small revolving shovels on work which was unquestionably beyond their capacity. The railroad-type shovel lacked mobility. It worked very close to the bank and its digging and dumping radius was limited. On the other hand, the revolving shovel lacked the strength, power and capacity of the railroad-type.

The Bucyrus 120-B, recently put on the market by the Bucyrus Co., of South Milwaukee, Wis., is built to combine the advantages of both the railroad-type and



the full-revolving shovel. This new shovel is said to combine five qualities never heretofore found on one machine.

1. The speed of action of the railroad-type shovel.
2. The mobility of single truck caterpillars.
3. The full-revolving swing.
4. Big dipper capacity, four yards.
5. Ruggedness and power greater even than the railroad-type shovel.

The machine has a dumping height of 20 feet. Its dumping radius is 36 feet. The boom is 29 feet long and the rear end radius is 17 feet.

The steam machine includes features which are said to be entirely new in steam shovel design, such as fire brick arch and superheater as standard equipment. The electric machine is equipped with Ward-Leonard direct current, generator field control. It has been possible in the design of this machine to eliminate the necessity for compressed air on the machine.

CONTINUED large commitments for new construction seem to be influenced by the general stability of the prices of materials and labor, both of which give no indication of change in the near future. Orders and shipments for lumber still run ahead of the cut.

Exports of all forms of wood, manufactured and unmanufactured, totaled $12,330,565 in February this year, as compared with $11,187,282 in February last year.

The continued activity in construction and in contract lets is one of the most encouraging features of the situation in the guaranty it offers of uninterrupted payments of wages, consumption of building materials, and demand for those thousand and one articles which make up the furnishing and equipment of all manner of buildings.

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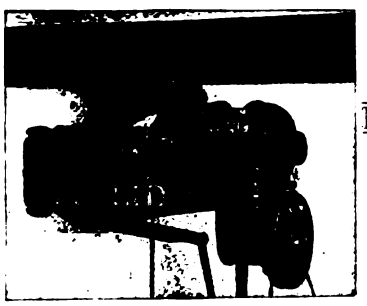
EUCLID
CRANES HOISTS
"RAISE PROFITS"

In Breakdown Tests They Beat Them All!

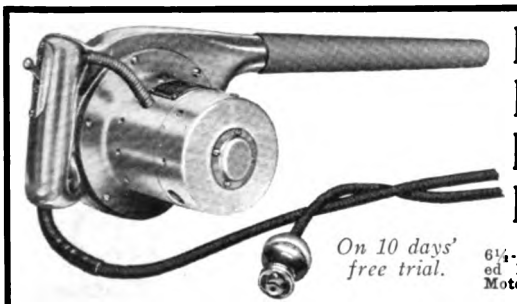
"Before standardizing on Euclid Hoists we made an exhaustive study and test of practically every electric hoist on the market. One of the tests consisted of operating the hoists three times per minute until failure. On this and other tests Euclid Hoists proved superior."

This company, one of the largest manufacturers of automobiles in the world, now employs more than 100 Euclid Cranes and Hoists. They standardized on Euclids, not because of personal opinion, friendship or good salesmanship but because Euclids made good, in the severest tests, against all competition.

Whether your lifting problem be large or small you can capitalize on the experience of this company (name on request) and be assured the highest quality of efficient equipment at the lowest consistent cost. Write us today for catalog. Tell us your problem and let our engineers assist you.



THE EUCLID CRANE & HOIST CO.
102 Chardon Rd., Cleveland, O.
Sales Offices in All Principal Cities



Ball Bearing Portable Blower

On 10 days' free trial.

6½-lb. Air Cooled Ball Bearing Motor $45.00 Net

This "MARVEL" Portable Blower is designed for blowing dust and dirt out of WOOD-WORKING MACHINERY, MOTORS, GENERATORS, SWITCHBOARDS, LOOMS, KNITTING and all kinds of MACHINERY. Has 20 feet high grade cable and armored plug. Perfectly balanced. Has TOGGLE SWITCH in handle, operated by thumb. Gives 16-in. water column pressure.

Note the Metal Conduit carrying wires from motor to handle.

Motor operates at 10,000-R.P.M. on "NORMA" BALL BEARINGS. This blower is a great time and labor saver, and its mechanical and electrical design gives assurance of a very long life, with a minimum of attention.



Made with UNIVERSAL motors (A.C. & D.C.) for both 110 volts and 220 volts. SHIPPING WEIGHT 18 lbs. Shipped on 10 days' trial, ANYWHERE.

A Complete Set of VACUUM CLEANER ATTACHMENTS for $10.00 additional

Manufactured by

Electric Blower Company
152 Atlantic Ave., Boston 9, Mass., U.S.A.



The Century Wins

The Approval of Employees and Employers—Why?

Employees like the Century Sanitary Ice Cooled Fountain because it furnishes them with thirst quenching water of a satisfactory coolness. It keeps them on the job and full of pep during hot weather.

Employers like the Century because it is economical in operation and requires practically no attention. The Century patented bubbler is economical and fool proof. The bubbler bowl is white vitreous, porcelain enameled. The coils are made of seamless copper tubing tinned inside and out. The drinking water does not come in contact with the ice.

The ice compartment is made of copper base iron galvanized to make it rust proof. It is insulated with tightly packed granulated cork. Lid and base are insulated with heavy sectional cork-board. The ice consumption is less than one pound per day per person. Beautifully finished in gray enamel rust proof paint and easily connected to Pressure Water Systems.

Made in many sizes to serve 10 to 100 persons per day. Prices $44.00 to $90.00.

Write for our new catalogue which gives complete specifications

Century Brass Works, Inc.
402 N. Illinois Street Belleville, Ill.

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Join with

Before Joining

After Joining



QUALITY BELT LACING

For products not advertised in this issue write ***Industry Illustrated***

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Clipper Lacings

In nearly every branch of manufacturing the proper connection of joints is a problem worthy of serious consideration—and each manufacturer has his own individual joint problem.

Practically every factory man is familiar with the present accepted method of joining machinery belts with Clipper Lacings. He recognizes the superiority of Clipper Hooks, Clipper Pins and the Clipper Lacer.

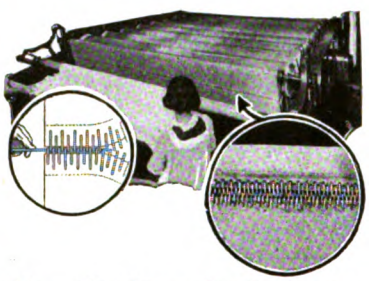
But why apply the wonderful efficiency of Clipper Lacings only to belts? A Clipper Lacing can be used with equal success in many other cases where flexible materials require a smooth, firm, quickly joined connection.

Study the joints in your factory equipment or in your product itself and consider them in terms of Clipper Lacings. Experiment with your Clipper Lacer where you now glue, nail, rivet or sew. You may find in Clipper Lacings, as many have already found, an ideal solution to your joint problem.

We will be glad to cooperate with manufacturers in the application of Clipper Lacings to their purposes.

Clipper Belt Lacer Company
GRAND RAPIDS MICHIGAN

New Uses Found for Clipper Lacings



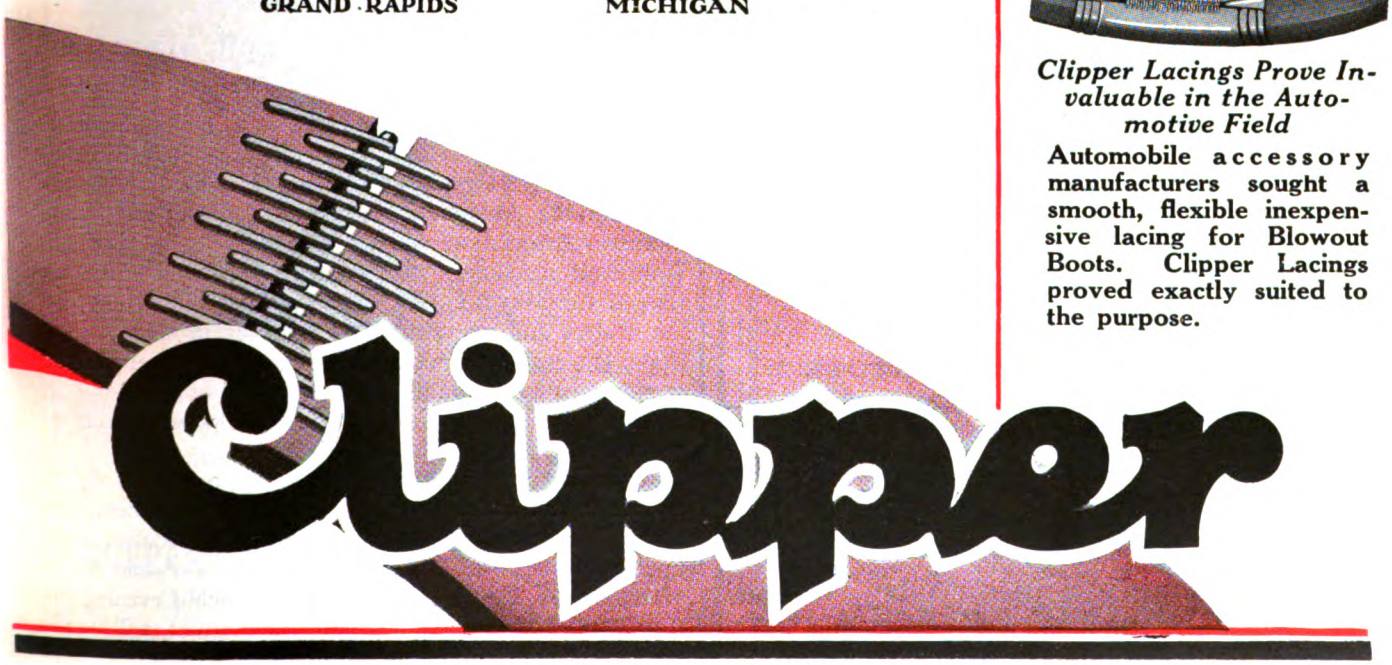
How the Laundry Industry "Joins with Clipper"

Clipper Lacings are rapidly replacing old methods of joining Laundry Aprons. Inestimable savings in time, efficiency and costs are being made.



Clipper Lacings Prove Invaluable in the Automotive Field

Automobile accessory manufacturers sought a smooth, flexible inexpensive lacing for Blowout Boots. Clipper Lacings proved exactly suited to the purpose.



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Use

BRISTOL'S STEEL BELT LACING
PATENTED

When you put on a new belt

For repairing breaks

For taking up slack



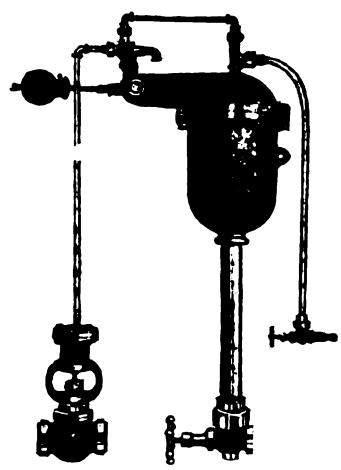
A Hammer is all you need

If you are not using Bristol's let your Master Mechanic try them out. And let us send him bulletin CE-719 direct from the factory. THE BRISTOL CO., Waterbury, Conn.

SIMPLE — QUICK — PERMANENT

O.K.

The experienced power plant engineer knows that a constant water level in boilers is essential if the plant is to be run economically.



So he puts his O. K. on

VIGILANT

Feed Water Regulators

They eliminate careless hand feeding and assure a constant water level. Boiler strain is reduced, steam production is increased and fuel economy is secured.
Play safe with a Vigilant.

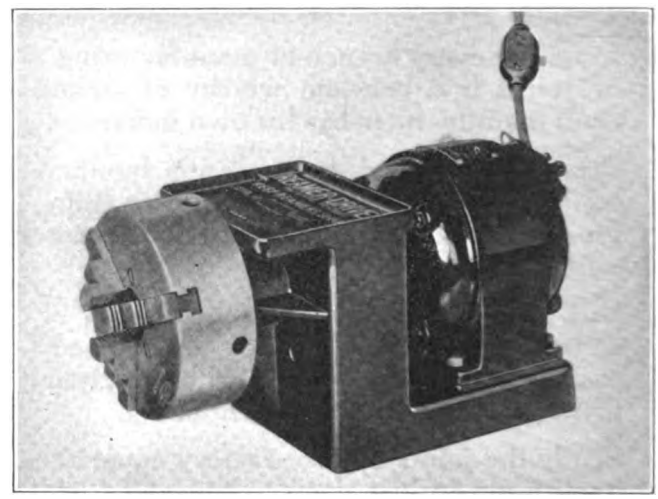
Write for catalogue.

The Chaplin-Fulton Mfg. Co.
28-36 Penn Ave., Pittsburgh

Power Operated Reamer Drive for Bench Work

DESIGNED to grip firmly and to electrically operate reamers when reaming such parts as bushings, spring shackles, connecting rods, pistons and the like, is the new power machine manufactured by the Geo. H. Blettner Co., of Chicago, Ill. This machine is claimed to be powerful enough to remove .020" stock with each pass of the reamer from bronze bushings up to 1½" and babbitt up to 2½" in diameter. The spindle is provided with a geared scroll chuck, which accommodates reamer shanks up to 1¼" in diameter.

The manufacturers say that the adaptability of this electrical device to bench work is the outstanding feature,



and makes it a handy tool in machine shops, and automotive and railway repair shops. It is easily and quickly mounted on the bench and occupies a space of only 7 by 15 inches.

This machine is operated by means of a Westinghouse ¼-hp. motor mounted on a base provided for it. A regular running speed of 38 rpm. is accomplished by means of a balanced gear reduction running in oil. All gears are totally enclosed in suitable casing to protect the operator at all times.

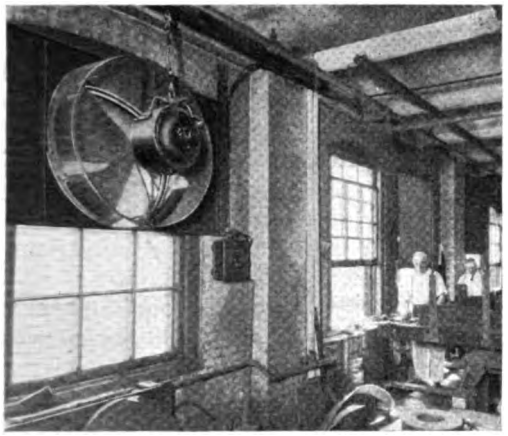
Dual Convention of Mill Supply Makers and Distributors

THE Hotel Statler, St. Louis, is to be headquarters for a meeting of the dealers and the manufacturers of the Southern Supply and Machinery Dealers Association and the American Supply and Machinery Manufacturers Association, who are engaged in supplying mills with their machinery and supplies. The meetings, arranged for May 18, 19 and 20, will, each morning, get the dealers and manufacturers together in separate sessions, but each afternoon will get them together in joint sessions.

The topics to be discussed will include subjects of general interest to the allied trades.

As indicating how happily these two principal organizations in the industry coöperate in their business relations, it might be mentioned that the executive committees of each will hold a joint executive session on the afternoon of May 17, and on the following evening the members of one committee, with their wives, will be the guests of the other committee at dinner.

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DIEHL EXHAUST FAN IN PRESS ROOM OF LEATHER BELTING COMPANY

Diehl Exhaust Fans will give your workers a supply of fresh, clean air. Remove the impure air from your factory work rooms, offices, etc., and you improve working conditions considerably. There is a Diehl Exhaust Fan to meet every ventilating condition.

Send for descriptive bulletins—now

DIEHL MANUFACTURING CO.
ELIZABETH, N. J.
Atlanta Boston Chicago Detroit New York Philadelphia

DIEHL

BUILDERS OF FANS AND MOTORS SINCE 1888



For Quick Hoisting Use the ROEPER Electric Hoists

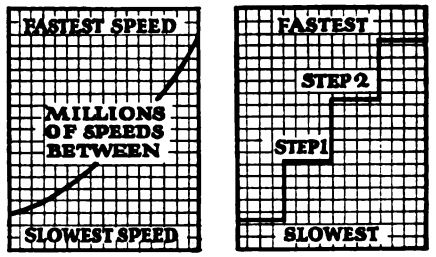
Made in a variety of types to meet most every requirement.

State your need and we will send you description and quote you prices.

ROEPER CRANE & HOIST WORKS, Inc.
1728 N. 10th St., Reading, Pa.

Traveling Cranes Electric Hoists Trolleys

INDUSTRY COMES TO REEVES FOR ACCURATE SPEED CONTROL



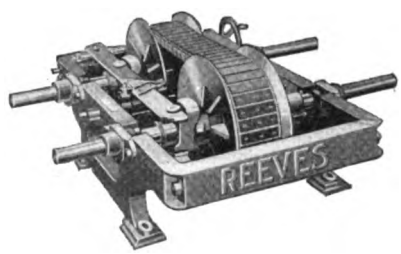
Get this ***Not this***

WHAT if your automobile would run at only four steps in speed—10, 20, 30, and 40 miles per hour—with *no* speeds in between? Ridiculous, isn't it? And yet, there are machines in your plant that need speed flexibility just as greatly as your automobile, but they can now run at only one, two, three or four *steps* in speed.

The REEVES Transmission will control the speed of your machines and conveyors just as quickly and easily as the accelerator controls your automobile. You can get *any* speed between fastest and slowest at *any* time on *any* machine that is REEVES-equipped.

REEVES PULLEY COMPANY

Established 1887
COLUMBUS, INDIANA



Ordinary speed changing devices give just *steps* in speed, but steps are not *exact* enough for best results. Often the speed you need is *between* the steps, and the REEVES Transmission is the only way of getting the "inbetween" speeds accurately. It gives literally *millions of speeds*—*any* speed between fastest and slowest, even to the smallest fraction of a revolution. Accurate and dependable, *always*.

REEVES
Variable Speed Transmission

The easiest way to write for our new catalog, L-66, is to clip this coupon to your letterhead and mail.

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WOLVES OF INDUSTRY



Depreciation—Wasted Floor Space—Excessive Storage and Finding Costs

Thousands of industrial firms are guarding against these wolves of industry. Combustible wooden shelving and lockers that harbor vermin and rodents are being replaced in the modern, up-to-date plant.

Durand Steel Bins, Racks, Shelving and Lockers, when installed, eliminate depreciation, excessive floor space and expensive up-keep. This equipment is stronger, will carry more and heavier loads and will last indefinitely. Steel doesn't warp or sag under heavy loads. Joints do not pull apart and cause up-keep expense.

Durand steel equipment is adjustable and interchangeable. Shelves can be moved up or down, added to or adjusted to provide for every storage purpose and to meet every condition.

Lockers are made in a variety of sizes to meet any need or arrangement.

Durand products are manufactured under the direction of successful engineers, specialists in their line, who will gladly submit plans for correct installation or work with you in solving your storage and locker problems. Get all the facts.

Write for our catalog No. 21 which describes and illustrates Durand Steel Lockers, Bins, Racks and Shelving.

BRANCH OFFICES:

New York, N. Y. — **Newark, N. J.**
Los Angeles, Calif. — **Philadelphia, Pa.**
Detroit, Mich. — **Pittsburgh, Pa.**

Representatives in all principal cities

Manufacturers of Steel Lockers, Shelving, Bins and Racks

DURAND STEEL LOCKER CO. INC.

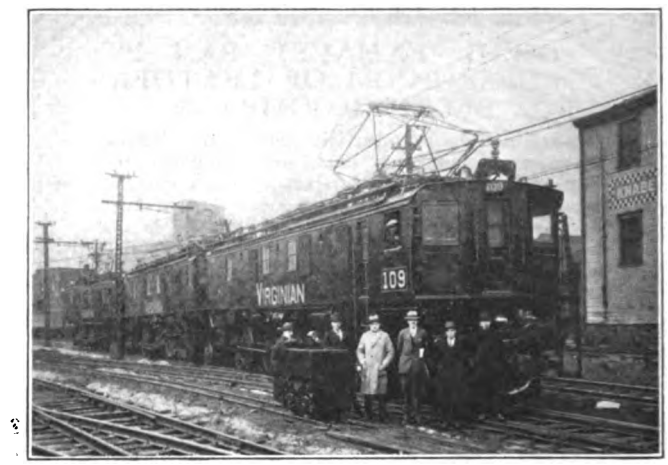
1539 Ft. Dearborn Bank Bldg., Chicago, Ill.

The "Long and Short" of Electric Locomotives

THERE were some striking contrasts when the Midget and the Giant of the electric locomotive world were compared at the East Pittsburgh Works of the Westinghouse Electric and Manufacturing Company recently.

With a capacity of 4½ horsepower, the Midget serves the purpose of a mechanical mule in various mining operations.

The Giant of the rails was designed for the Virginian Railway, with a capacity of 10,000 horsepower, is the world's largest and most powerful locomotive. It will



be used to haul a loaded train nearly two miles long over one of the heaviest grades in the country.

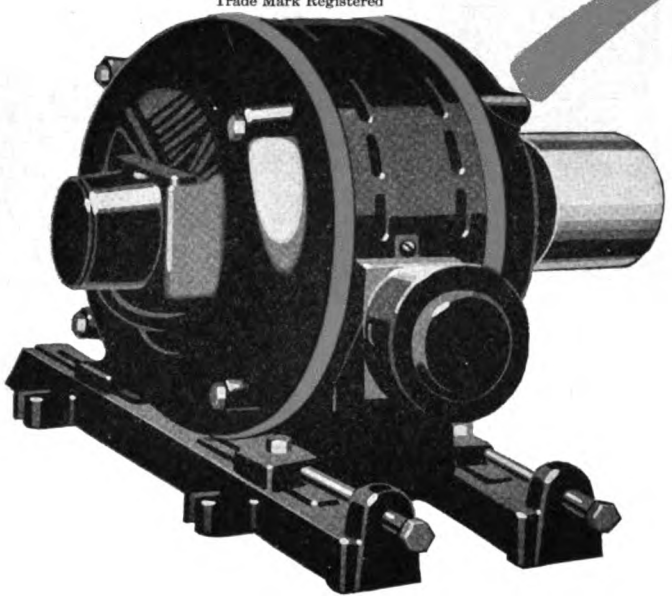
The contrast between the Virginian electric locomotive and its smaller prototype of the industrial field is indicated by the following figures: Midget, 41½ inches long; its larger brother, 152 feet in length; weight of Midget, 1½ tons; weight of Giant, 637.5 tons. Midget's drawbar pull—400 pounds—Virginian locomotive drawbar pull 270,300 pounds. The smaller one derives its power from a 60-volt storage battery; the larger one from 11,000 or 22,000 volts trolley.

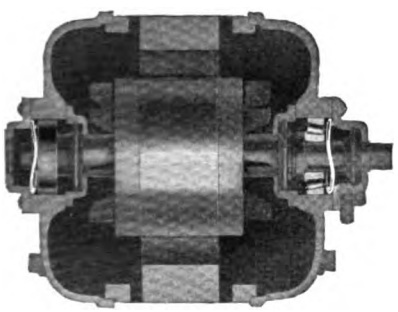
TWO outstanding industrial records were established last month—one in steel output and the other in cotton textile manufacture. Production of steel ingots was at the rate of 166,359 tons a day, which compares with an average of 158,525 tons in February and 161,482 tons in March last year. This brings the average daily output for the first quarter up to 161,686 tons, or about 2½ per cent. above last year's figure. While neither output nor sales were maintained at last month's high level during the early part of April, the curtailment was not severe. Steel prices have held firm, despite some rather marked declines in prices of pig iron.—*The Guarantee Survey.*

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Give Red Bands your hard jobs

Trade Mark Registered





The Howell Automatic Bearing Adjuster
(Patents Pending)

By a new application of an old idea, Howell engineers have made Red Band Motors even more staunch, more dependable than ever. By using a bearing adjuster, which is designed like a compression spring, with Timken Tapered Roller Bearings, wear is automatically taken up, all unnecessary noise is eliminated, bearings are kept snug at all times and practically all chances of bearing trouble are removed.

From Bearing *to* Bearing
The Finest Material *and* Workmanship—
For Longer, More Dependable Use

Howell Red Band Motors cost no more than ordinary electric motors—yet they are constructed from bearing to bearing of the finest materials that money can buy and painstaking experience create.

They embody features that are not found on other motors regardless of price—features that have been developed by Howell engineers after years of research that mean longer, more dependable use for every Howell motor application.

A representative from the nearest Howell branch office will gladly explain to you the many benefits of Red Band Motors, will aid you in solving your motor problems and give you complete data on the new line of Howell Motors equipped with *Timken Tapered Roller Bearings* and the Howell Automatic Bearing Adjuster that practically eliminates all bearing troubles.

Howell Electric Motors Company
Howell, Michigan

Howell RED BAND ELECTRIC Motors (74)

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Payroll Labor Bill Cut $1200 a Year

By Using the McCaskey System

MAKING up the payroll, usually means that your clerks have a mass of job tickets to total, check, and re-check. Errors are bound to creep in as this work is often done in a rush and at night. Templeton Kenley & Company, Ltd., Chicago, have simplified the handling of cost and payroll records by installing a McCaskey System. Read what Mr. C. A. Crane, Jr., Works Manager, says about their experience with the McCaskey System!

"A McCaskey Register System for handling cost and payroll record tickets on the production of about 40 types of Simplex jacks was installed 3½ years ago. Originally we used a daily time card for each operator, covering his day's production. This system required much time for gathering and sorting the data, increased chances for error, and made it impracticable to secure much valuable cost data now obtained. These troubles were only partly overcome by using separate tickets for each operation.

"Now when an operator starts a job, the timekeeper's office makes out a McCaskey ticket in duplicate, showing operator, order, part, machine, etc. When the job is completed the number of pieces is entered on the McCaskey ticket and the wage figured in dollars. The tickets are filed in a McCaskey cabinet, where each operator has two slips—one for white piece work tickets and one for yellow work tickets.

"As the total of each man's wage is carried forward on the top ticket, the payroll is constantly figured through the preceding day. On Monday morning the complete payroll is ready through the preceding Friday, without working overtime on Saturday. As each man's tickets are always together, misunderstandings and errors are infrequent. Much handling, sorting and totalling are also eliminated for the cost department, saving labor and reducing errors.

"The McCaskey System saves at least $1200 a year in clerical labor over the old time card system."

You Can Simplify Your Record Keeping

—write for Complete Facts

No matter in what line of manufacturing you are, the McCaskey System will save time and money for you. The System is in use today in thousands of plants. We shall gladly send you surveys showing how the McCaskey System provides a perpetual inventory system, simplifies the routing of shop orders, keeps an accurate record of the time spent on every job or operation, eliminates the loss of tools, speeds up work, and gives you facts and figures that really mean something. Simply mail the coupon and the information will be sent you without cost or obligation. Mail the coupon now!

Mail the Coupon

The McCaskey Register Co.,
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Please send more information about the McCaskey System showing how firms have applied your methods.

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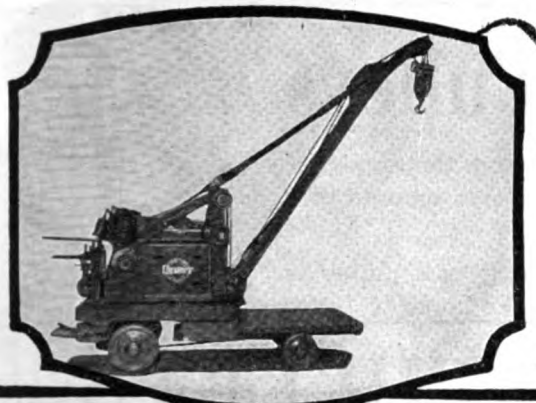
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McCASKEY ONE WRITING SYSTEMS

THE McCASKEY REGISTER CO.
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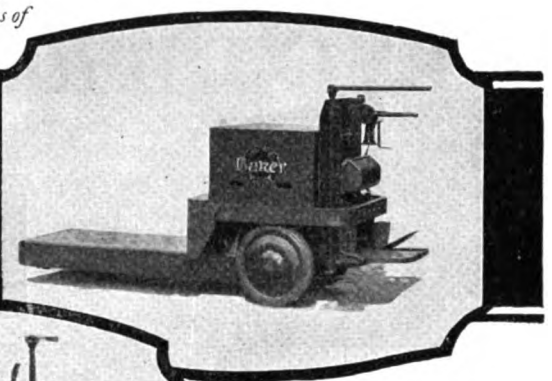
The fixed charge for a Baker tractor, truck or crane amounts to only $5.00 per day, including depreciation, interest, maintenance and power.

Locomotive Type Crane—Combines the advantages of both truck and crane.

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THE BAKER-RAULANG CO.
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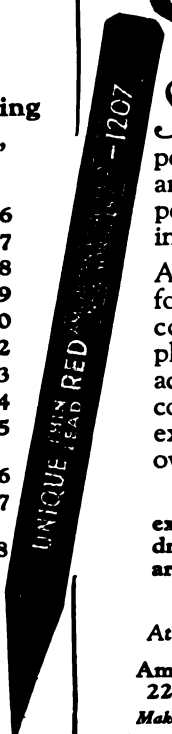
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Hence the selection of so simple a thing as a pulley is important and should not be left to price alone.

PYOTT *Red Face* PULLEYS

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in either the plain cast iron or in the ball bearing tight and loose types (grease tight) are recognized standards of power transmission. Inbuilt in them are the elements of balance, uniformity, and true running that make them perfect pulleys.

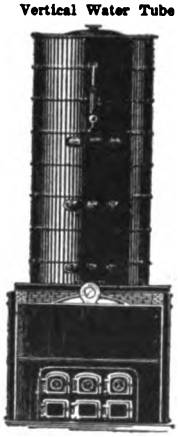
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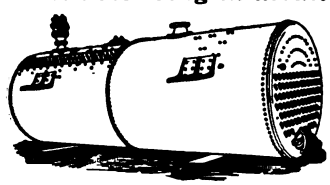
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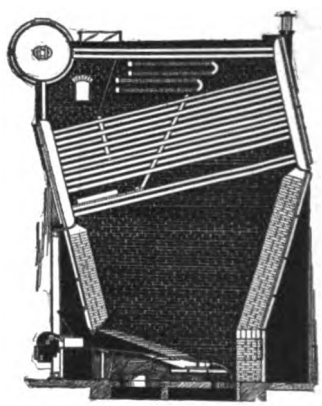
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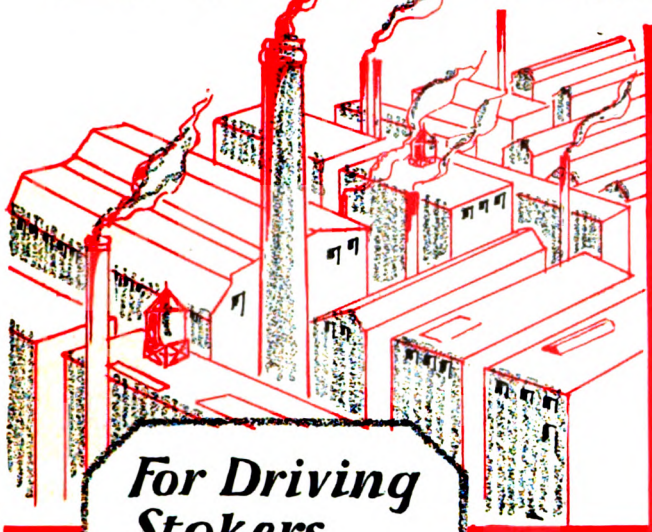
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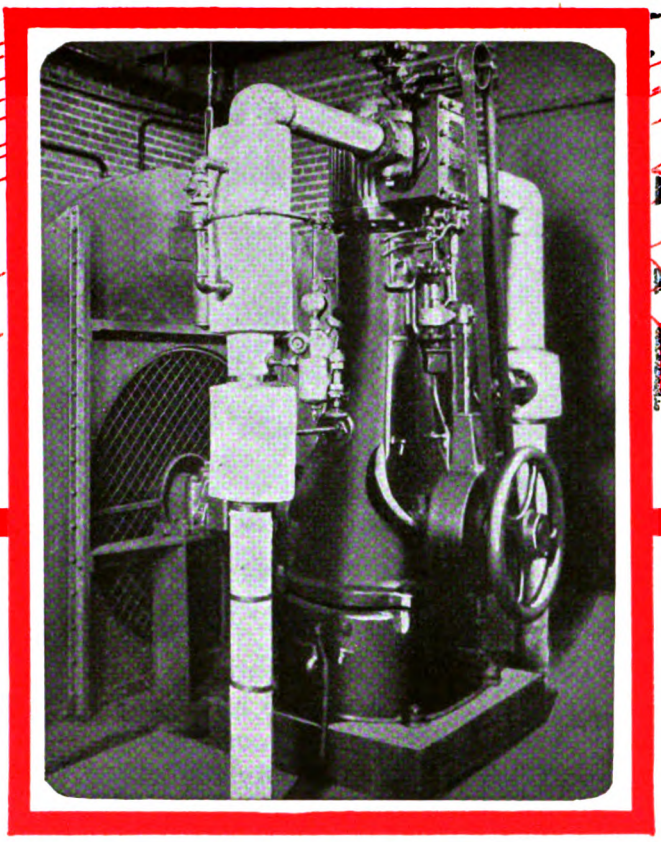
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For Driving
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The Economical Drive For Forced Draft Fans—

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Because of the rugged construction, the self-oiling feature, these heavily built, enclosed steam engines very seldom are out of service, even for the minor repairs, that most engines need from time to time. One of the main causes of shutdowns—condensation in the cylinder—is entirely eliminated. A balanced flat steam valve automatically relieves the cylinder of any condensation that may accumulate.

That is why TROY Engines are known as Safe Engines.

Troy Engines have served industry during the past 35 years. Built in a plant which specializes in the making of good engines only, the result has been, high quality engines sold at a reasonable price. Economical production methods, ideal labor conditions, the location which makes low freight rates possible, are all factors which have helped to lower the cost of manufacture.

Built in sizes up to 200 H.P. in both horizontal and vertical types.

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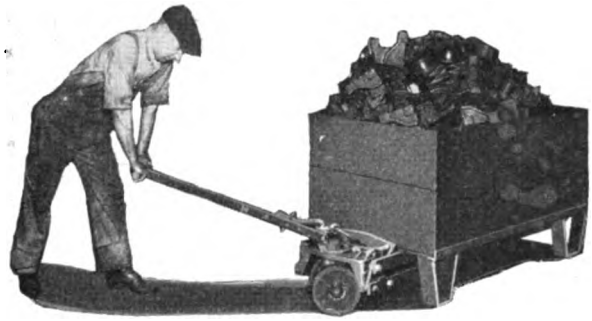
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50% speedier handling
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Write for FREE Trial Offer and booklet which describes savings you can make in material handling.

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BARRETT-CRAVENS COMPANY—1330 West Monroe Street, Chicago, Ill.—Grand Central Palace, New York—Sole Licensee for Canada, Riley Engineering & Supply Co., Ltd., 360 Dufferin St., Toronto—Paris, Factory, Barrett-Cravens Co., 9 Rue de Rocroy. Distributors in all principal cities of the world.

EASIEST LIFT—BY ACTUAL TEST

What Price "Horse-play" in Factory Management?

By Leslie Childs

WHERE a factory, or other industrial enterprise, has a happy contented corps of workers it has a thing of value. In fact, there is no way of estimating the worth of a satisfied personnel, where good will and a friendly spirit of coöperation exist among the employees, and in their contacts with those in authority.

And without doubt the social temperament of employees will govern the atmosphere of their departments, in a very large measure, in respect to friendly intercourse therein. In matters of this kind, one jovial, sunny dispositioned employee, who is also competent in his work, may create an agreeable working environment within the radius of his contacts that, while intangible, may mean more in cold cash to his employer than the actual work he performs.

However, managing executives should not lose sight of the fact that workers, who are optimistic and socially inclined, may become an actual source of danger to the employer. This is true because the traits of character, that make an employee of social value in an organization, may also incline him to horseplay, practical jokes, skylarking, and sportive escapades in his intercourse with fellow employees; and, if while engaged in such pastimes, a fellow worker suffers injury the employer, may become liable.

Employers Frequently Liable for Injuries

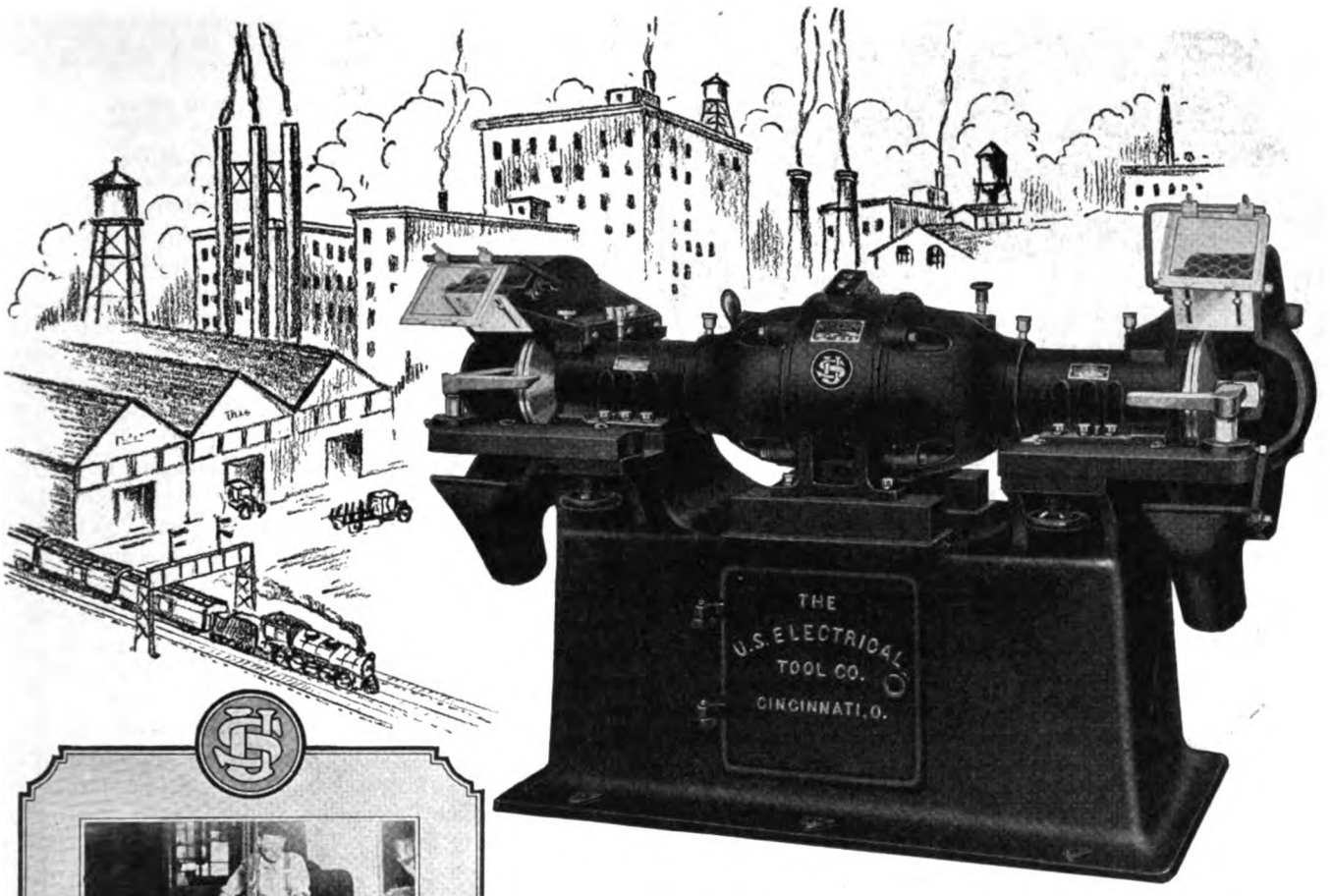
In fact, it is surprising how frequently employees of industrial plants suffer serious injuries in the course of skylarking and horseplay; it is equally surprising how frequently employers are in turn held liable for such injuries under workmen's compensation statutes, on the ground that the injuries arose out of the employment.

Cases of this kind have arisen under a great variety of circumstances; workmen have been struck in the eyes by missiles thrown sportively by fellow workmen; jostling and wrestling has contributed its share to the total of such accidents; in fact serious injuries have resulted to employees from all the stock forms of practical jokes resorted to by workmen with a bent of this kind.

However, as a class, the so-called "air hose" cases have perhaps been the most serious, and expensive from the employer's viewpoint, of them all. Accidents of this character, arising through the horseplay of employees with air hose, are peculiarly liable to happen in factories and industrial plants where equipment of this kind is in every day use. For, it seems, the presence of an air hose offers an outstanding temptation to the employee addicted to skylarking, which impels its application to the bodies of fellow workmen, especially when they assume a stooping posture.

Needless to say, this form of practical joking may result in serious injury, and, if the facts of a given case bring it within a workmen's compensation statute, the employer may be forced to assume a substantial liability. The reasoning of many courts in assessing dam-

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A U. S. Portable Surface Grinder being used in finishing a line on a manganese steel switch mate. The line is 12 ft. long and approximately $^{1}/_{64}$ in. of metal is removed in two hours.



Finishing the inside of the double end of a manganese steel switch base with a U. S. Portable Surface Grinder. Approximately $^{1}/_{16}$ in. of metal is removed from 2 square feet of surface in one hour.



A U. S. Portable Surface Grinder being used to grind lines at crossing points on a manganese steel inserted switch. One-eighth inch of metal is removed from 4 sections $^{1}/_{2}$ ft. long in 5 hours.

Peripheral Speed Maintained

Regardless of Wheel Wear

on A. C. or D. C.

U. S. Heavy Duty Adjustable Speed Grinders have paid for themselves in many shops within one year—through the savings in grinding wheels and constant production.

Wheels can be used profitably on this machine long after they would ordinarily be discarded. A touch of the lever increases the peripheral speed and maintains constant production.

There isn't a better grinder built today than this U. S. Heavy Duty Adjustable Speed. The experience and craftsmanship of the oldest builders of electric drills and grinders in the world makes it impossible for any other manufacturer to equal the quality of this machine.

Write for Catalog "E."

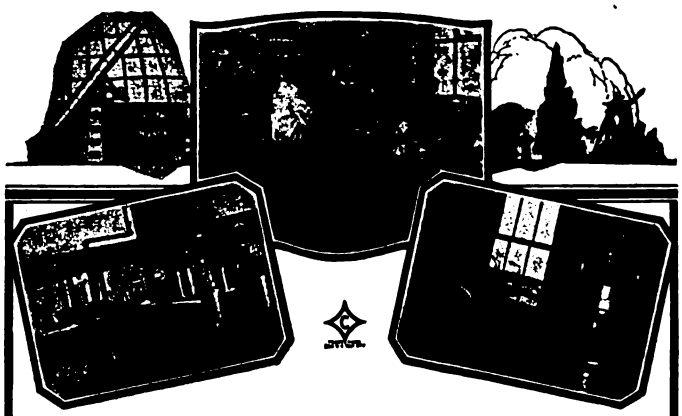
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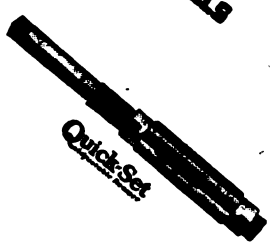
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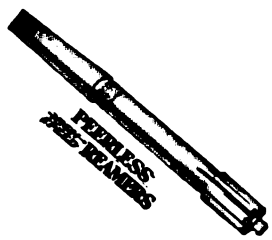


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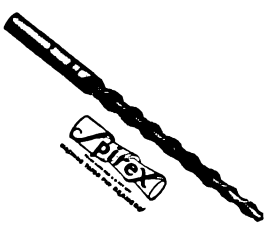
Research and Development













OUR last advertisement referred to the Chemical Laboratory. The photographs above also are a part of the "Laboratory" maintained to insure the highest possible perfection in "CLEVELAND" twist drills and reamers.

At the left, the equipment shown is for the purpose of testing steel for carbon; the photographs at top and right show machines for testing the hardness of tools.

UNIFORMITY is an important word in this establishment. Here we exert every effort, and use every available device, to make it mean that each tool produced must be as nearly like the one before it as possible.

With the aid of many *hidden* factors—the things you do not see when you buy small tools—"CLEVELAND" twist drills and reamers are maintained at an evenness, or uniformity, of quality (or *performance capacity*) not often equalled.

The CLEVELAND TWIST DRILL COMPANY CLEVELAND NEW YORK CHICAGO LONDON

Manufacturers of Carbon and Cle-Forge High Speed Drills for every purpose; "Mezzo" Super-Carbon Drills; Hand, Jobbers' and Shell Reamers; "Peerless" High Speed Reamers; "Paradox" Adjustable Reamers; "Quick-Set" Reamers; "Spirex" Machine Taper Pin Reamers; Chucking Reamers for Turret Lathes; Counterbores; Countersinks; Sockets; End Mills; and the "Ezy-Out" Screw Extractor

ages in cases of this kind may be illustrated by a brief review of one of the so-called "air hose" cases. With this in mind the Nebraska case of Socha vs. Cudahy Packing Company, 181 N. W. 706, will serve.

Workman Injured by Air Hose

In this case one Socha was in the employ of the packing company, and his work required him to push meat across a table to other employees. In doing this he assumed a stooping position, and, while in such position, he suffered an injury caused by the sportive application of a compressed air hose to his body by a fellow workman. The assault caused a rupture of the intestines, which culminated in septicemia, or blood poisoning, from which Socha died.

Following this an action was brought, under the Nebraska Workmen's Compensation Act, against the employer to recover for the death of Socha. This then raised the question of whether or not the accident arose "out of" the employment within the meaning of the statute. In passing upon this point the court, in stating the rule as to when an injury arises "out of" an employment, quoted from McNicol's Case, 215 Mass. 497, in part, as follows:

"It arises 'out of' the employment, when there is apparent to the rational mind, upon consideration of all the circumstances, a causal connection between the condition under which the work is required to be performed and the resulting injury. Under this test, if the injury can be seen to have followed as a natural incident of the work and to have been contemplated by a reasonable person familiar with the whole situation as a result of the exposure occasioned by the nature of the employment, then it arises 'out of' the employment . . . ."

In accordance with the reasoning of the foregoing rule, the court, after a review of the authorities, turned to the facts of the instant case to determine its application. In reasoning on the question involved the court used the following language:

The Language of the Court

"The very fact that injuries of this nature, resulting from the sportive use of compressed air under like circumstances, have been before the courts in a number of cases is worthy of note. Such a combination of elements seems to present a situation attractive and suggestive to a youthful, or to a rude and untutored, mind having no knowledge of the serious or fatal consequences liable to result. This combination of elements may arise out of the nature of the occupation.

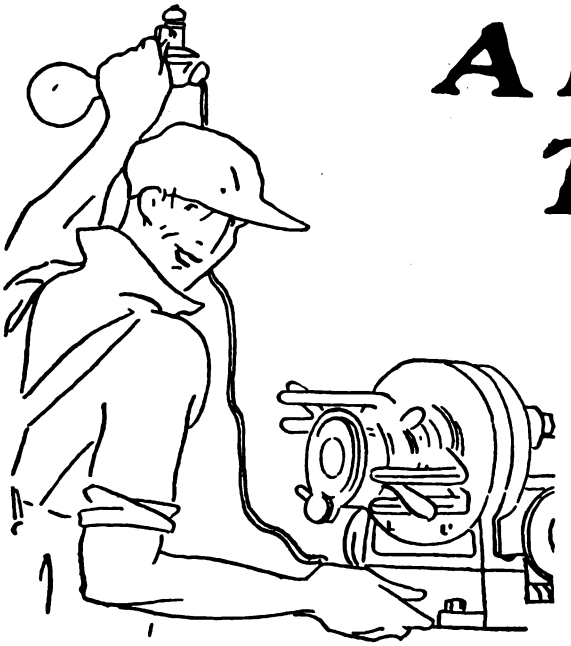
"The liability to perform such acts by the employees was known to the employer, since, as we have seen, warning notices in a language foreign to that of the workmen had been placed upon the bulletin board; and the fact that the men had previously played with the air hose, but not in this manner, was known to the foreman, Schultze, Socha's immediate superior. . . .

"If a person familiar with the whole situation could reasonably contemplate that such an accident might result from the peculiar nature and circumstances of the employment, and the nature of the place where the injured man was required to work, then it may reasonably be said to arise out of it. . . . .

"We are of the opinion that, under all the facts, such a happening might reasonably have been foreseen, and,

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The Power Boy Makes A Hit In Two Places



I.—With the Men

The Power Boy makes their job easier—saves back breaking pulling on die stock and fitting and leaves them as fresh at the end of the day as in the morning. No wonder they're for it.

II.—With the Boss

One man can thread, cut off or make up fittings while his partner is busy at something else. Keeps the good work up the whole shift through where a man cannot possibly work at top speed for one fourth that time. Operates from ordinary light socket at insignificant cost.

If your supply house is unable to demonstrate the Power Boy, return the coupon below for List No. 58 which illustrates and describes this great time and labor saver.

OSTER

THE OSTER MANUFACTURING CO.

Manufacturers of the most complete line of Pipe threading equipment in the world

2103 East 61st Place, Cleveland, Ohio

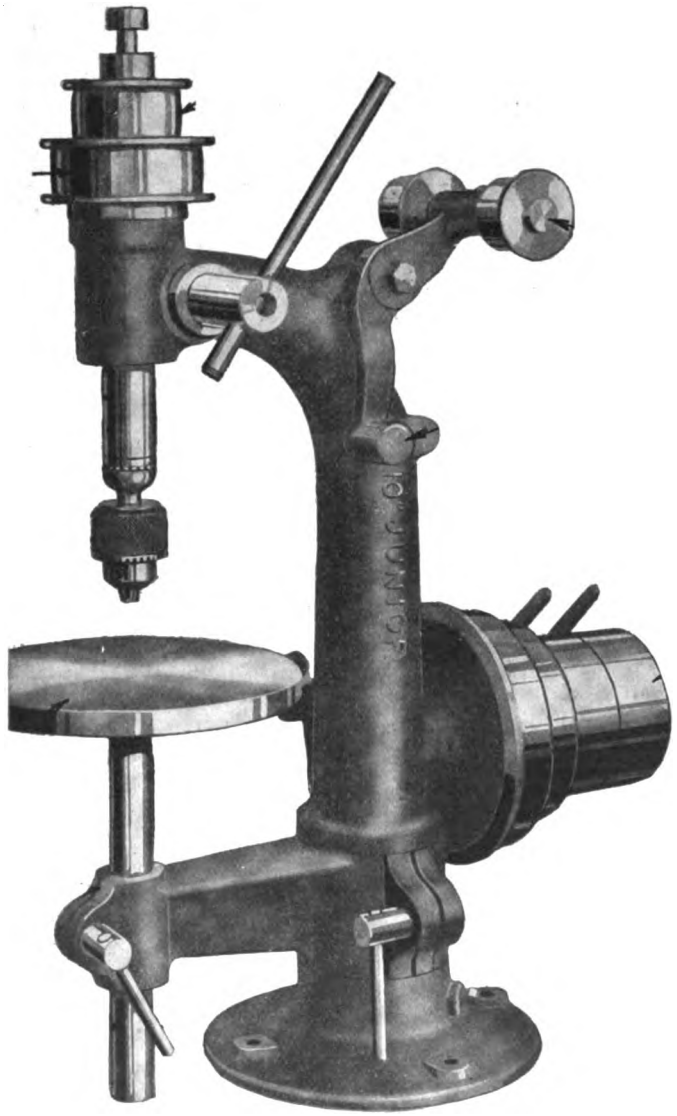
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Production drills that stand the gaff



"Buffalo" Buffalo 10" Junior Drill is an accurate production tool having more than a dozen unusual features. Many concerns are now standardizing on this sturdy bench drill. If your Jobber does not handle Buffalo Tools write us for catalog and prices.

BUFFALO FORGE COMPANY
440 Broadway, Buffalo, N. Y.
In Canada—Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

in fact, was anticipated by the employer in this case, and that the accident arose out of the employment. . . . ."

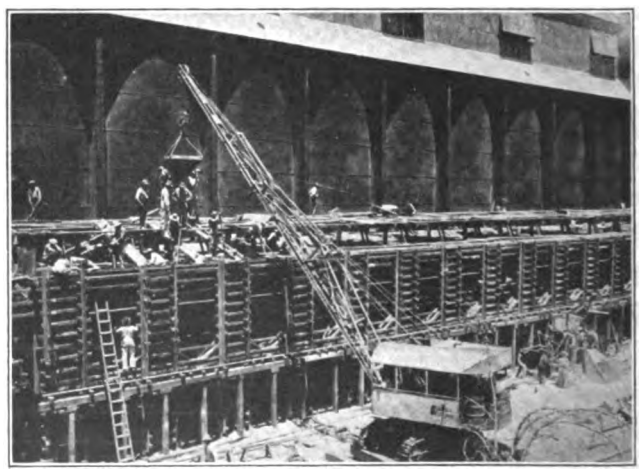
A Matter for Managerial Tact

From the foregoing brief review of the subject, it is obvious that the supervision of sportive, skylarking and practical joking employees presents a problem to managing executives. That while an employee of this character may be a competent workman, and contributes in a substantial manner to the friendly family atmosphere so desired in industrial establishments, yet, unless his fun hunting escapades are kept within reasonable bounds he may be the direct cause of a serious accident and a resulting loss to his employer.

It follows, that managing executives in factories, and other industrial plants, may well keep tab, as it were, on the sportive tendencies of their employees while upon the premises. If a workman of this character is popular, a leader perhaps in his department, his activities in the line of fun making may prove harmless and of actual benefit to his employer. On the other hand, if such performances tend to be unrestrained, and indulged in without the exercise of mature judgment, the employer may be saving money in the long run by tactfully dispensing with the other's services.

Crane Handles Concrete for New Building

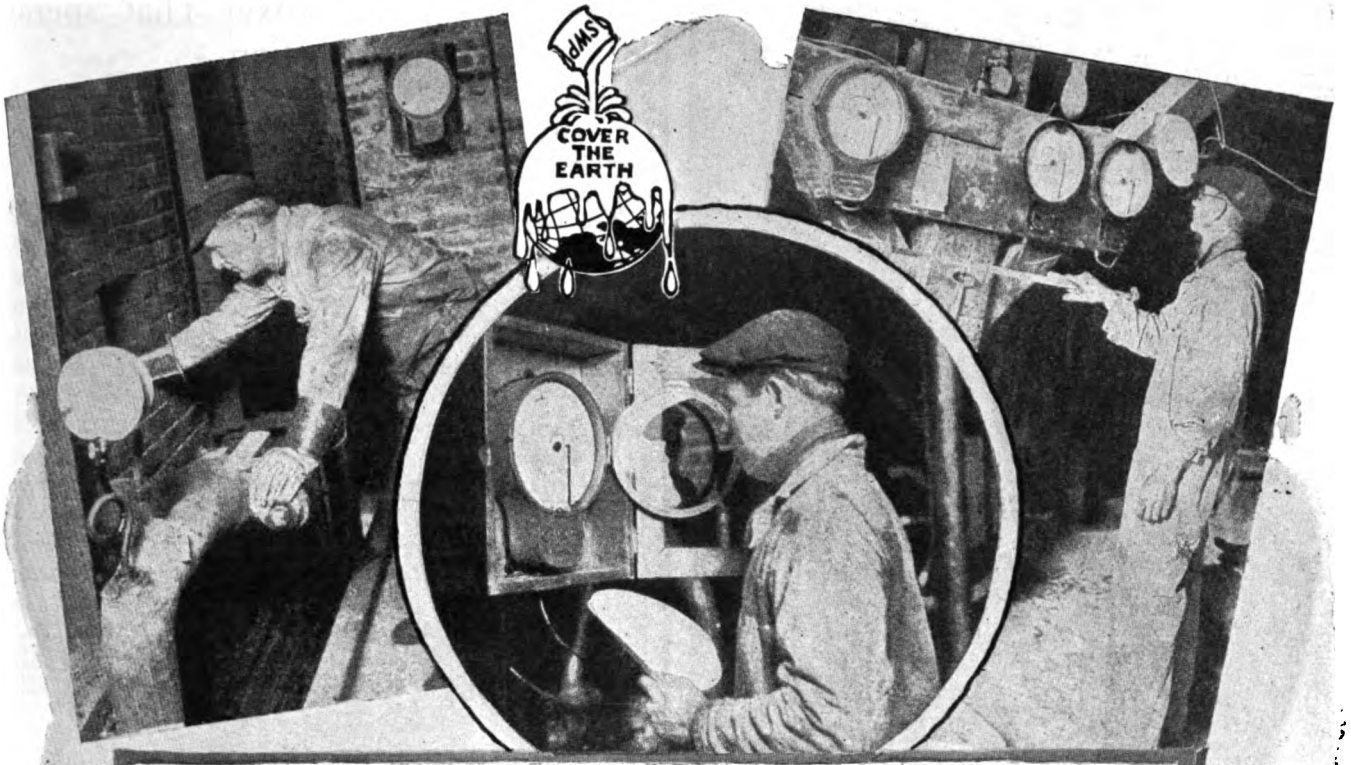
IN the construction of a new leaching plant for the Inspiration Copper Company, at Inspiration, Arizona, it was necessary to erect a monolithic structure 40 feet high and nearly 200 feet long. A crane was used



to hoist the hoppers containing the concrete from the mixer to the points where pouring was done. The machine was equipped with a 38-foot beam with a 12-foot extension. The workmen were divided into three eight-hour shifts. The crane made an average of one cycle every 2.7 minutes through a period of 106 hours.

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At the World's Largest Paint Factory Quality Products Assured by the use of *Tycos Instruments*

Scores of *Tycos* Instruments—indicating and recording—are in use in the Chicago plant of the Sherwin-Williams Company, world's largest manufacturers of paints and known the world over for the high quality of their products.

Temperature control is an important part in the process of paint making. On some processes the temperature is varied from 5 degrees above zero to 220 degrees Fahrenheit. Some of the chemicals are held at uniform temperature for hours at a time. All this demands accurate and unfailing temperature control. *Tycos* Instruments respond to every demand.

Wherever temperature must be watched and controlled, in the making of steel, sugar, leather, textiles, furniture, in annealing, baking and heat treating, or for dozens of other purposes, *Tycos* Instruments take the place of labor and eliminate all the faults and loss due to dependence on the human element.

What is your temperature control process or requirement? We shall be glad to give you the benefits of our experience in this field. Write for a *Tycos* Catalog.

Taylor Instrument Companies

ROCHESTER, NEW YORK

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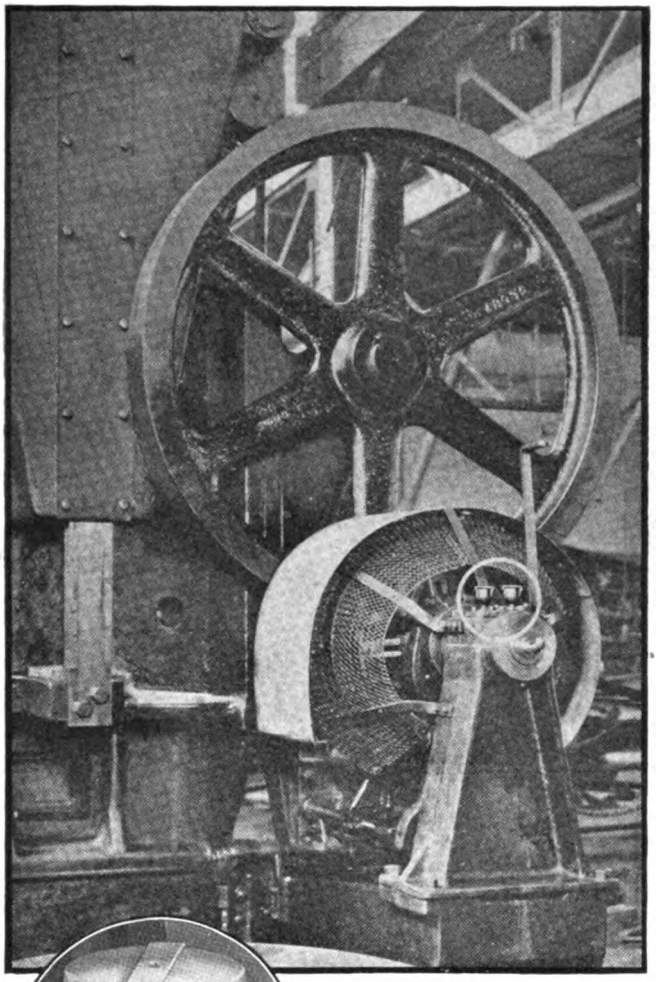
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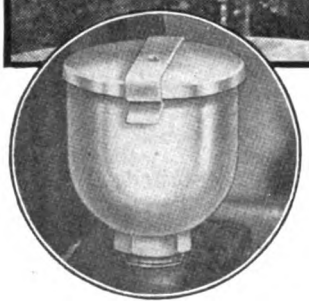
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Knorr Lubricators have a range of applications as broad as industry. Wherever wheels move and shafting turns, lubricating and maintenance costs can be materially reduced by their application.

Knorr Lubricators, by feeding the minimum amount of grease at the right time, constantly by positive mechanical means actuated by the machine itself provides correct lubrication at all times.

Their list of users is testimony of their worth and efficiency. So much so that you are justified in sending for our illustrated booklet showing installations. Send for it together with price now. It's a move you'll never regret.

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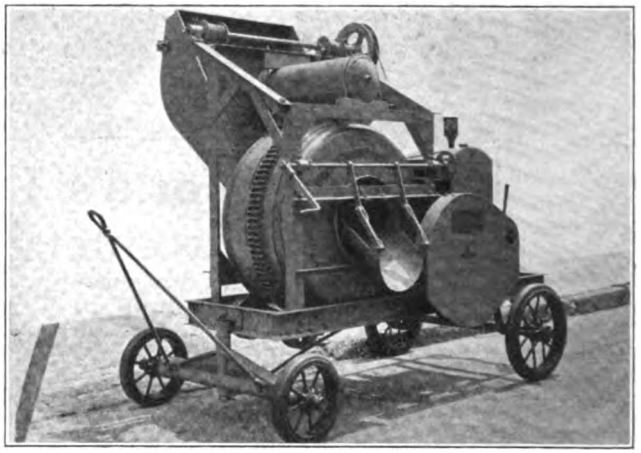
KNORR LUBRICATOR

A Small Concrete Mixer That Speeds Production

THE accompanying photo shows a small concrete mixer mounted on a four wheel trailer that has many devices for producing automatic operation. It was designed and built by Norris Davis, of San Francisco.

The side loader hoist is automatic in operation. The operator after throwing the hoist lever forward can walk away if he desires to do other work, because when the skip reaches the discharge position the hoist clutch is disconnected and the brake applied automatically. A slight forward pressure on the hoist lever permits the skip to return to the charging position by gravity under brake control.

Another new feature is the arrangement of the discharge chute for operation from either side of the mixer. The operator turns the wheel or pulls the lever and the chute is automatically locked until the reverse motion is applied. The accompanying photo shows the arrangement that makes this double operation possible. This photo shows the discharge chute in position for discharging the contents of the drum. When in this position the chute is projected into and past the center of the drum. When not discharging it swings out and clear of the drum, but at the same time is in such a position that all the adhering concrete drains back into the mixing drum, not on the ground.



The blades of the drum are the central suspension type that use the entire drum for mixing, yet centralize the batch. As the material is gathered by the blades at the bottom it is carried upward, and, due to blade construction, rolls, falls and slides to the center, where it is poured on the backs of the descending blades, imparting a cutting under, elevating, sliding, pouring and spreading action that gets the utmost value out of the cement used. Here is a saving—better concrete with less cement due to perfect mixing. A space is left between the drum shell and the bottom of the blade, permitting a wash under that constantly washes the drum clean—there are no pockets for solidification. All these features make this a self-cleaning drum.



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The best will always be made of wood —steel-bound—

—steel-bound to protect all wood surfaces from wear. The selected wood stock itself is plenty strong enough to carry the weight any giant might handle.

Wooden trucks are light, flexible, easily manipulated, perfectly balanced; and wooden grips are indispensable during cold weather.

Ask the men what trucks they prefer—then get our booklet on models and prices.



The **Fairbanks** Company
New York City

"Ask the man who does the pushing"



Saves! $8000 in Handling Costs

That is the annual savings made in the handling of clay at a plant of a well known manufacturer of sparks plugs. A ROURA Dump Bucket handles 40 tons of clay daily in this plant.

ROURA DUMP Buckets can be used with your lift trucks. Many well known manufacturers now use them for handling parts, scrap, and other materials.

Dodge Bros., Buick, Chevrolet, Ternstedt Manufacturing Company, National Screw, National Carbon, Central Forge Company, Champion Porcelain Company, and many others, now use ROURA Dump Buckets for handling sand, clay products, castings from moulding floor. ROURA Buckets can be employed wherever pressed metal boxes are used.

Let us tell you how you can put a ROURA to work in your plant for handling and toting any product.

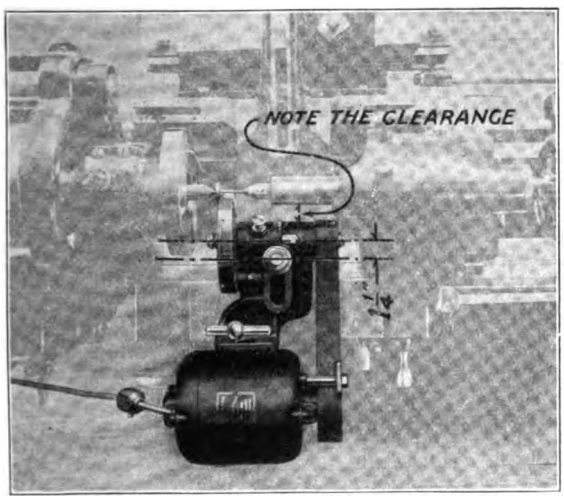
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facilitate the handling of all materials



The Smallest piece ground between centers--

These profitable machines may be used for internal, external, surface, thread and extra-deep-hole grinding. Extra pulleys provide speeds of 3,000 or 14,000 r. p. m.

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PICK out your dirtiest windows. Brush on "Formula 269," the wonder cleaner. Watch how fast the most tenacious dirt is loosened and dissolved. Rinse off with clear water. That's all. Quick! Economical! Unfailing! Formula 269 is not only fast—it's also safe. Won't harm wood, paint, putty, sash or worker. Prove it without risk on your own glass. Send for barrel, half or quarter barrel on our unqualified guarantee of results or complete refund.

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Specialists in Industrial Sanitation

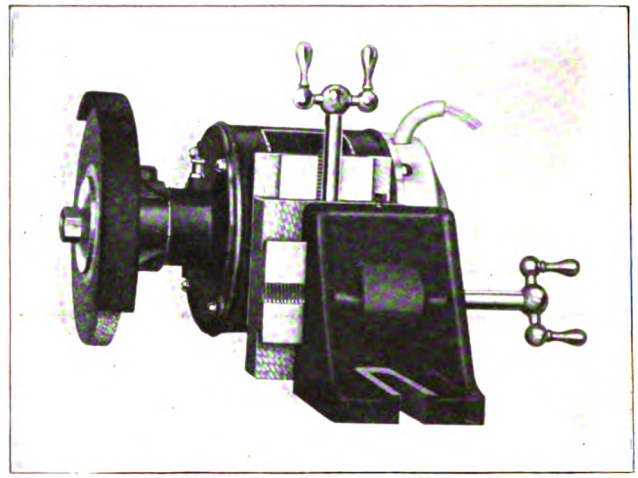
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"A Cleaner for Every Purpose in Your Plant"

For those preferring a paste to a liquid window cleaner we recommend our new SUNBURST Paste.

New Angle Plate Grinder

THE Hisey-Wolf Machine Company, of Cincinnati, Ohio, announces a new double slide angle plate motor driven grinder. This is provided in two types,



one for alternating, and one for direct current. Screw teed motion of the wheel is provided both vertically and horizontally.

A Conveyor That Increased Production 30 Per Cent.

THE Ideal Laundry in San Francisco has recently installed a conveyor in the pressing department of their cleaning and pressing plant, which has increased the capacity of pressers 30 per cent. The conveyor delivers garments to the pressers and carries the same garments after the pressers have completed their pressing operations to the inspector. The conveyor is geared

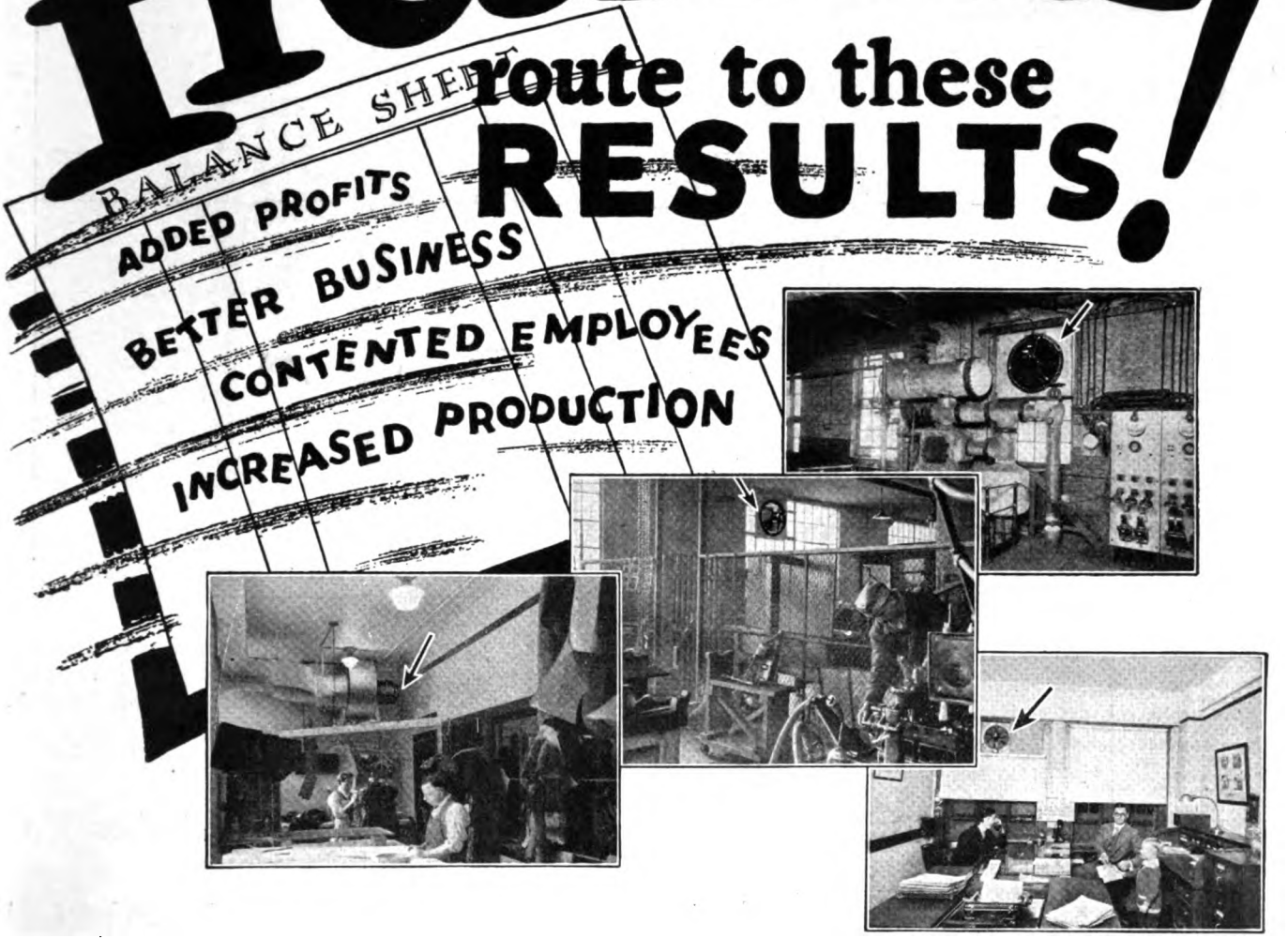


down to move very slow, thus delivering the garments to the presser and takes the finished garments away so that it is never necessary for the operators to make one step to receive garments or deliver same.

The pressers work in front of the machines shown at the left in photo. Just back of the pressers is the conveyor. The inspector stands at the far end of the room shown in the photo.

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In offices, factories, garages and shops, American Blower Ventilating Fans make working conditions pleasant and comfortable regardless of outside weather conditions—and they increase production per man.

They have their effect on sales, too. Customers enjoy buying from wide awake, intelligent clerks in cool and fresh places of business—crowds throng to the well ventilated theaters—and goods are fresher looking in places where soot and dirt are carried away by American Blower Ventilating Fans.

American Blower Ventilating Fans are made in various sizes and types to care for every ventilation need. They are the result of years of experience by the American Blower Company—an organization that has been a leader in the scientific development and manufacture of air handling equipment for over 45 years.

For complete information, prices and advice on American Blower Ventilating Fans, write direct to the factory or ask your electrical dealer.

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"Sirocco" VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT

MANUFACTURERS OF ALL TYPES OF AIR HANDLING EQUIPMENT SINCE 1681

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"More will follow.."

"There is one industry in America, which, by results, has proven itself to stand at the forefront of all industry in efficiency of production and marketing, and in the quality of management which results in what is called *waste reduction.* It is the automotive industry. . . .

"Farseeing and open-minded industrial executives in other fields," continues John H. Van Deventer in INDUSTRIAL MANAGEMENT, "are asking themselves, 'What can we learn from the automotive industry?' Some of them are already applying to their own work various of the ideas which have proven so successful. More will follow. . . ."

In no industry have Oakite methods or materials played a more important part in waste reduction in cleaning than in the automotive industry. Yet it is only one of over 300 different manufacturing industries in which Oakite service, methods and materials also play an important part in saving time, money and labor.

Right now, find out what our service men can do for you. Get the benefit of whatever constructive ideas they may have concerning your work. One of these specialists in cleaning is near you. A request to have him call involves no obligation on your part.

Oakite Service Men, cleaning specialists, are located at

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*Atlanta, Ga.
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*Boston
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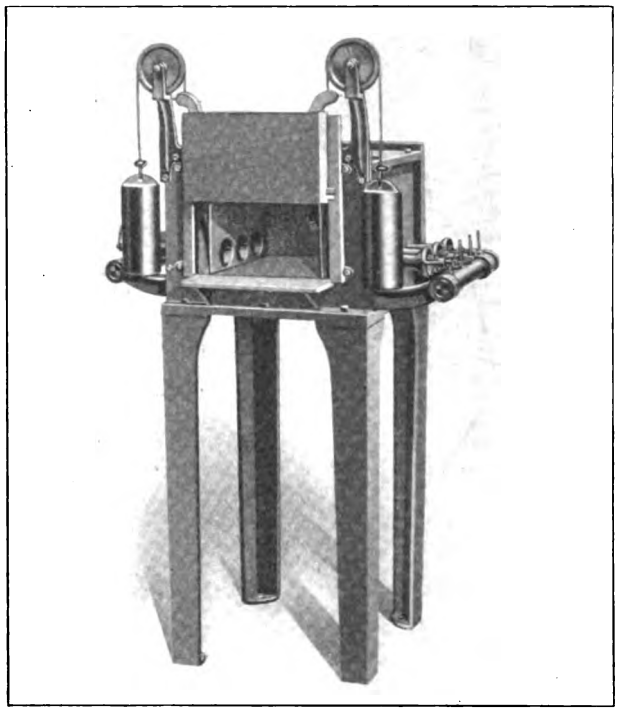
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Industrial Cleaning Materials and Methods

OAKITE IS MANUFACTURED BY OAKLEY CHEMICAL CO
40A THAMES ST., NEW YORK, N.Y.

A New Heat Treating Furnace

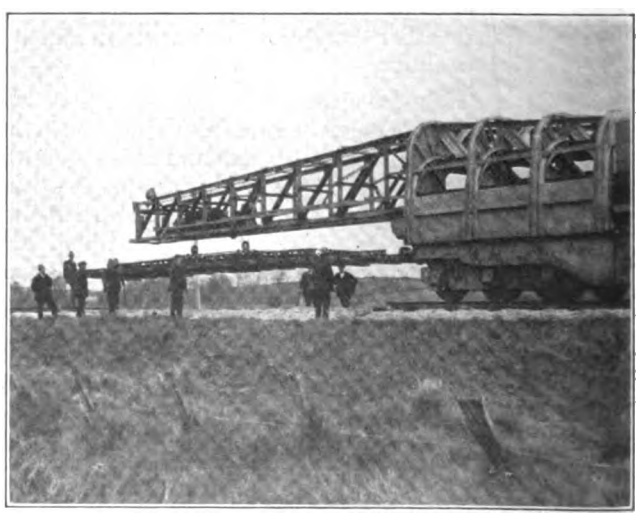
THE Johnson Gas Appliance Company, of Cedar Rapids, Iowa, has recently announced a new size oven furnace for annealing, carbonizing, hardening, etc. Gas-fired, without the use of air pressure, this furnace



is said to provide a very fine degree of heat control for any temperature up to 2,350° F. The firebox is 7" x 11" x 14" and the furnace requires 27 inch square floor space. Overall height is 48 inches.

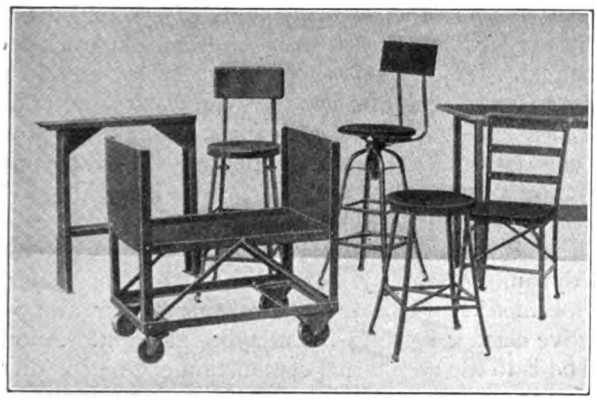
A Machine That Lays or Takes Up Track in Units

A TRACK-LAYING system has been perfected and put in use in England that makes it possible to relay from 150 to 200 yards of track per hour where 45-foot rails are used. An even greater speed is at-



The cantilever trolley picks up an old length of track, to be loaded on the train.

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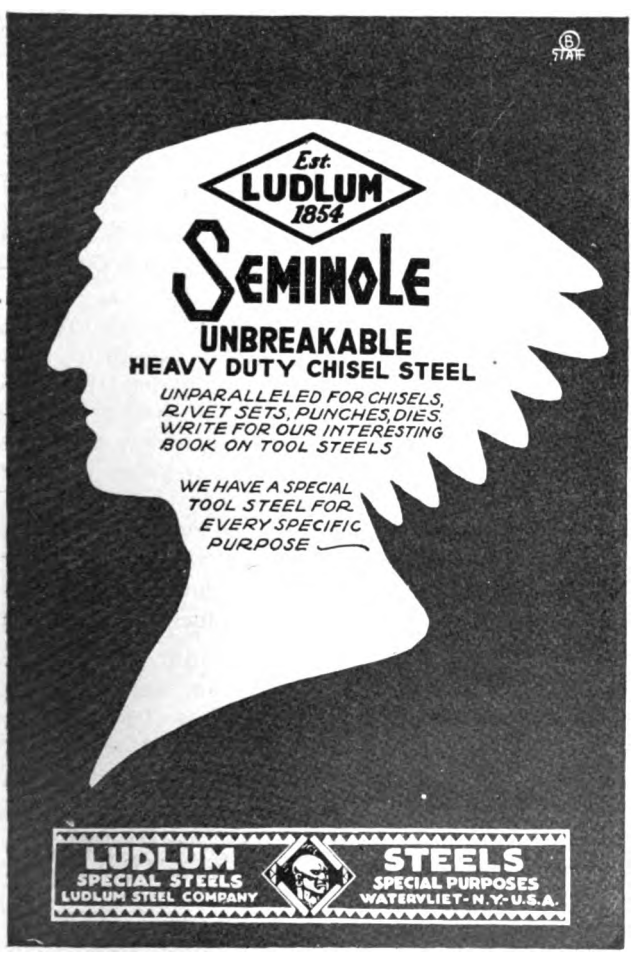
Standardize on Hughes Furniture and Equipment for Greater Production

Hundreds of large factories in every industry have now adopted Hughes Chairs, Stools, Tables, Bench Legs and Factory Trucks.

Frames of all-steel securely riveted together, they are guaranteed for long life and dependability. Hughes Shop Furniture are made to meet modern requirements and aid in giving better working conditions—thus assuring greater production. ¶ Write for illustrated catalog.

Hughes Steel Equipment Co.
Allegan, Michigan

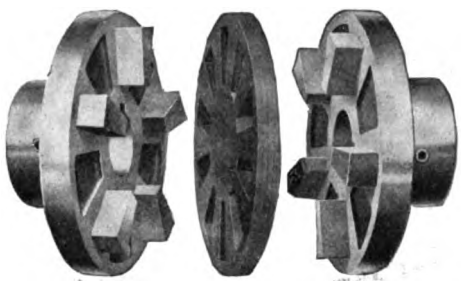
Chairs Stools Trucks
Tables Bench legs



UNIVERSAL GIANT

Type "B"

Flexible Coupling



THE Universal Giant Type "B" Flexible Coupling embodies all the advantages of an ideal coupling. Built along lines of correct engineering principles, with the usual Wood's quality material and workmanship, we have here a flexible coupling that is a product of 69 years' experience in the manufacture of power transmission appliances.

Type "B" or disc couplings consist of two cast iron flanges with lugs cast integral. The intermediate driving member is a leather disc, made from selected stock, with plies cemented and stitched together, which provides flexibility in every direction and acts as an insulator.



This coupling is strong and durable. Its performance is especially fine when directly connecting motors to machines. Flanges and hubs are finished to insure true running.

While primarily intended for high speed service, they work equally well at low speeds. Your local dealer will be glad to show you the advantages of this and other Universal Giant Power Transmission Appliances. If he sells the Universal Giant Line, he is a good man to know.

Literature on request

T. B. WOOD SONS COMPANY

Chambersburg, Pa.

Makers of Power Transmission Appliances Since 1857

Cast Iron Hangers and Pulleys, Flexible Couplings, Friction Clutches, U. G. Short Center Contactors—a complete line of Power Transmission Appliances.

Cambridge, Mass. Greenville, S. C.

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The shaded areas represent those countries of the world where "Americans" are used.



A Never Setting Sun

EAST or WEST, southland or iceland, on every continent washed by the seven seas, you will find "American" Pulleys, playing an important part in the economical transmission of power.

In forty-four countries—wherever industry flourishes—"American" Pulleys are used and may be bought from nearby dealer stocks.

If the sun never sets on American Steel Split Pulleys, it is because there are definite, recognized advantages in their design and construction.

This is further attested by the fact that more "American" Pulleys are used than any other make of pressed steel pulley.

For additional information consult the nearest "American" dealer (you will find his name and address in MacRae's Blue Book) or write to us.

The American Pulley Co.

Manufacturers of Steel Split Transmission Pulleys, Pressed Steel Shaft Hangers, and Pressed Steel Shapes

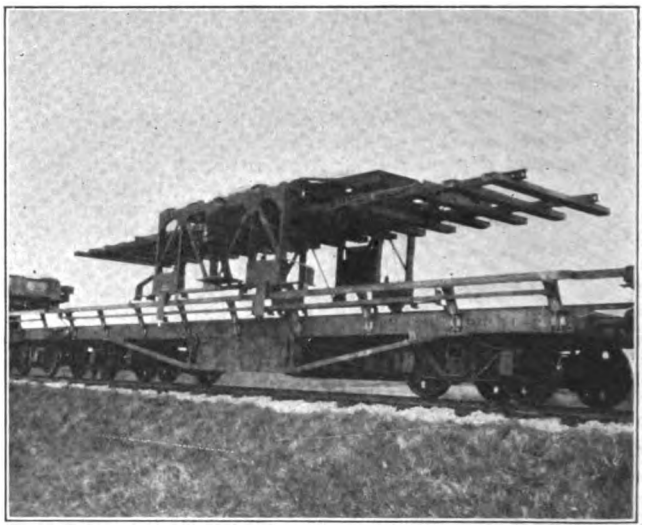
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PRESSED STEEL HANGERS | STEEL SPLIT PULLEYS
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tained with 60-foot rails. Under this system each mile of track is treated as so many units of assembled track, both as regards new track to be laid and old track to be taken up. A central supply station is established, equipped with a 15-ton electric overhead crane, and all materials are loaded and unloaded in bulk by power. All new track is assembled, with the help of the crane power, in complete units, fully fastened, and loaded in bulk by power on the supply train.

The power unit consists of a fifty-horsepower engine and dynamo, driven by steam direct from the boiler of the locomotive. This insures reliable power and very effective electric lighting for relaying at night. Another method is to use an internal combustion engine for direct-driving the generator.

Before relaying, the ballast is cleared out between the old sleepers. Then while the first section of completely assembled old track is being lifted by the track-layer,

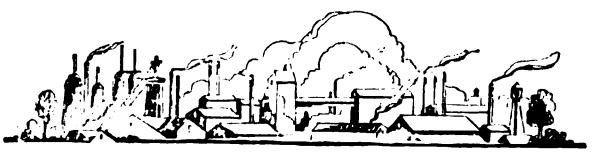


The train-trolley carrying a section of track along the train.

the train-trolley has proceeded to the leading loaded car and conveyed the first tier of assembled new track to the track-layer. The interchange between old and new track takes place under the rear cantilever of the track-layer.

On the new section of track being lowered into place, the whole train moves forward one rail-length over the old track, while the train-trolley at the same time deposits the old section of track on the loading car. This simple operation is repeated until all the new track has been laid and the train simultaneously loaded with the old track units.

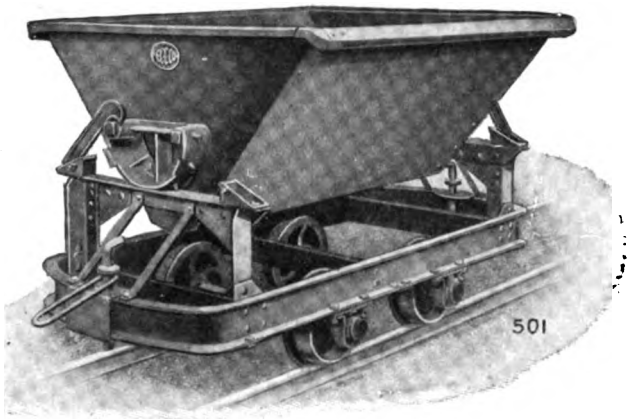
It is claimed that by the new method the saving of labor has in actual practice amounted to about fifty per cent. as compared with the old method, and there is also much less risk of injury to workmen or of damage to materials.



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ROCKER DUMP



Capacities 18 to 54 cubic feet
Gauges 24" to 36"
Carried in Stock
But built in various capacities, gauges,
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EASTON CAR & CONSTRUCTION COMPANY

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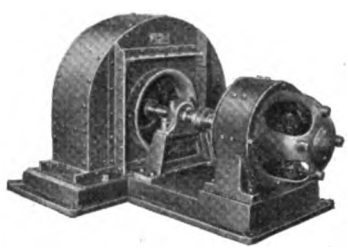
In Lay Brooms the selected fibres are held as in a vise by staples, not nails. They are metal reinforced and sewn with heavy flax thread.

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Manufacturers' Bulletins and Catalogs

Helpful new literature for the man who selects and directs industrial equipment

Metal Cutting Band Saw Machines and Metal and Wood Cutting Band Saw Blades

This equipment, in addition to the Napier Coping Saw Blades, Reliance Self-Lubricating Bushings and Bearings, and Automatic Screw Driving Machine, is described in a 16-page illustrated booklet, which has been issued by the Metal Saw and Machine Co., Inc., Springfield, Mass.

Centrifugal Pumps and Air Compressors

Bulletins Nos. 127 and 207, illustrating and describing Pennsylvania Direct Connected Synchronous Motor Driven Air Compressors and Pennsylvania Multi-Stage Centrifugal Pumps, respectively, have been issued by the Pennsylvania Pump and Compressor Co., of Easton, Pa.

Water Softeners

Zeolite Water Softeners are described and illustrated in Bulletin No. 665, which has been issued by the Cochrane Corp., Philadelphia, Pa.

Continuous Sash

Catalog No. 12, containing 44 pages, illustrates and describes Pond Continuous Sash, Pond Roof Design, Pond Operating Device and other Lupton products. This booklet has been issued by the David Lupton's Sons Co., of Philadelphia, Pa.

Asphalt Paint

"Asphalt and Its 3,000 Years of Useful Service" is the title of a booklet which has been issued by the American Asphalt Paint Co., 844 Rush St., Chicago, Ill.

Worm Gear Speed Reducers

Two bulletins, Nos. 251 and 261, which describe and illustrate Horsburgh & Scott Worm Gear Speed Reducers, and loads, shafts and bearings as applied to Worm Gear Speed Reduction, have been issued by The Horsburgh & Scott Co., 5114 Hamilton Ave., N. E., Cleveland, Ohio.

Heating Equipment

Catalog No. 92, the Gorton Heating Handbook, has been issued by Gorton & Lidgerwood Co., 96 Liberty St., New York. This booklet contains illustrations and description of the Gorton Single Pipe Vapor Heating System, the Gorton Quarter Turn Packing Lock Valve, and also a Miscellaneous Data Section.

Taper Pin Reamer

An illustrated folder, which describes the Morse Spiral Fluted Taper Pin Reamer has been issued by the Morse Twist Drill & Machine Co., of New Bedford, Mass.

Thermometers and Pyrometers

Catalog No. 92 contains 20 pages of illustrations and description of Brown Resistance Thermometers. An 80-page booklet is entitled "Instructions for the Installation and Care of Thermo-Electric Pyrometers." Both of these booklets have been issued by The Brown Instrument Co., of Philadelphia, Pa.

Recording Instruments

An illustrated booklet entitled "Do You Use Your Plant Newspaper," which also contains a description of Tag Recording Instruments, has been issued by the C. J. Tagliabue Mfg. Co., 18-88 Thirty-third St., Brooklyn, N. Y.

Metal Partitions

Sanymetal Products, including partitions for offices, factories, and hospitals, metal wainscot, gravity roller hinges, etc., are illustrated and described in a 40-page booklet, which has been issued by the Sanymetal Products Co., Cleveland, Ohio.

Ventura Fan and Permanent Wall Fixture

An illustrated bulletin describes a method of installing No. 2 1/3 Reversible Ventura Fan and Permanent Wall Fixture. This has been issued by the American Blower Co., of Detroit, Mich.

Signs for Accident Prevention

A catalog containing colored illustrations and description of Stonehouse Signs for Accident Prevention in all industries has been issued by Stonehouse Signs, Inc., Denver, Colo.

Traffic Spots

"Bridgeport" Traffic Spots, a method of directing internal traffic in large industrial plants, are illustrated and described in a folder entitled "Pointing the Way," which has been issued by the Bridgeport Brass Co., of Bridgeport, Conn.

Fire Protection

Bulletin No. 38, which describes Fire Protection for Industrial Plants, has been issued by the Pittsburgh-Des Moines Steel Co., Curry Bldg., Pittsburgh, Pa.

Refractory Gun

The Quigley Refractory Gun for quick repairs and maintenance of furnace linings, including hot patching and surface coating, is described and illustrated in a booklet which has been issued by the Quigley Furnace Specialties Co., Inc., 26 Cortlandt St., New York.

Fans

The 1926 Fan Catalog, illustrating and describing Fans for alternating and direct current circuits, has been issued by the Graybar Electric Co., 100 East 42nd St., New York.

Mine Pumps

A 20-page booklet, which illustrates and describes the selection and application of centrifugal pumps to mine pumping, has been issued by the De Laval Steam Turbine Co., Trenton, N. J.

Barometer and Vacuum Recorder

Bulletin No. 150, which illustrates and describes the Uehling Barometer and Vacuum Recorder for Steam Turbines, has been issued by the Uehling Instrument Co., 473 Getty Ave., Paterson, N. J.

Chuck Work

Book II. in the series on Modern Tooling Methods for Turret Lathes contains Section One on the subject of Chuck Work. The fundamental principles of increasing production are given, followed by a chapter on holding devices, and typical layouts. This book has been issued by the Warner & Swasey Co., of Cleveland, Ohio.

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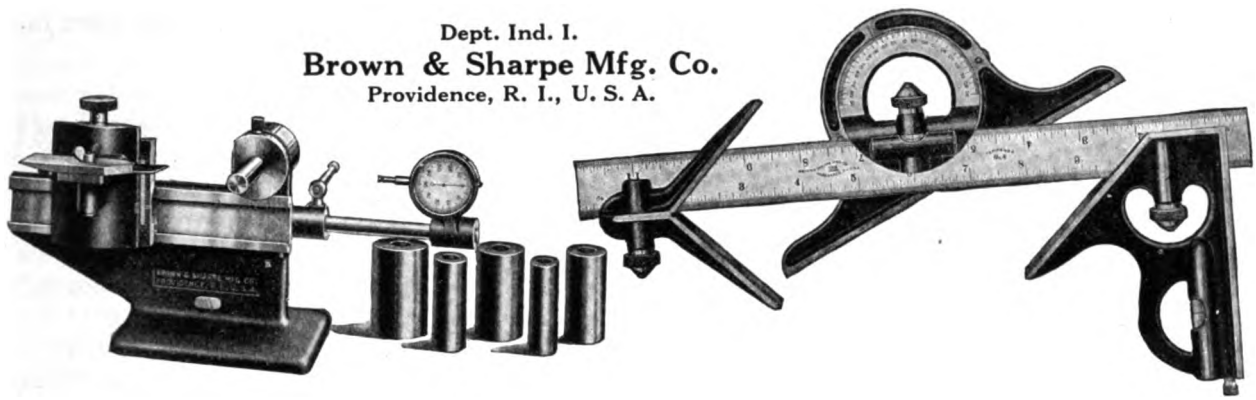


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In buying equipment, you should first consider its relative ability to do your work. *Good performance* is what makes one piece of equipment better than another—and for good performance you cannot find better equipment than that bearing the name of Brown & Sharpe. It's the reliable performance of Brown & Sharpe Tools and Cutters that has won for them universal recognition.

Send for Small Tool Catalog No. 30. Your copy will be sent gladly upon request.

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Providence, R. I., U. S. A.



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To the Minute!

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There are many plants and institutions where watchmen must visit certain spots at exact times. For such requirements the Detex ECO Portable Watchclock System is uniquely fitted. It records the time of registration practically to the minute. No other watchclock built is so precise.

In addition to its ultra-precision, it is a durable clock and makes a beautifully clear-cut punch record, which cannot be imitated, altered or tampered with in any way. For plants requiring such exact time recording for 6 to 20 stations, the ECO has no rival.

Write for literature describing this unusual watchclock system

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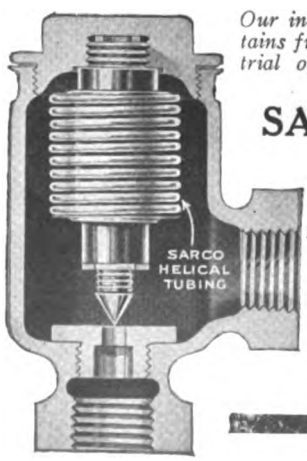
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Refrigerating and Other Machinery

"A Novel System for Full Automatic Operation of Refrigerating and Other Machinery" is the title of a booklet which has been issued by the patentees and constructors, Henkerbak Syndicate, Ltd., 13 Madoerastraat, The Hague, Holland. Descriptions include Automatic Hydro-Electric Switches, Thermostatic Liquid Flow Regulating Controllers, Brown Boverie Refrigerator and Cooling Chamber, etc.

"Steel Plus Rivets Equals Strength"

A profusely illustrated circular, with the above title, describing Kewanee Steel-Riveted Products has been issued by the Kewanee Boiler Co., of Kewanee, Ill.

Gasoline Locomotive

The 4-ton Davenport-Fordson Gasoline Locomotive is described in an illustrated circular which has been issued by the Davenport Locomotive Works, Davenport, Iowa.

Underfeed Stokers

Detroit Multiple Retort Underfeed Stokers are described and illustrated in Bulletin No. 103 which has been issued by the Detroit Stoker Co., General Motors Bldg., Detroit, Mich.

Gasoline Crawlers

Book No. 895, containing 48 pages, illustrates and describes the Link-Belt All Purpose Crawler. This book has been issued by the Link-Belt Co., Chicago, Ill.

Air-Cooled Engine

The "New-Way" Air-Cooled Engine is illustrated and described in a circular issued by The "New-Way" Motor Co., Lansing, Mich.

Ohmmeters, Megohmers and Tachometers

Standco Instruments are illustrated and described in Bulletins A and B, which have been issued by Herman H. Sticht & Co., 19 Park Row, New York.

Phosphor Bronze

Price List No. 29 on Elephant Brand Phosphor Bronze has been issued by the Phosphor-Bronze Smelting Co., 2200 Washington Ave., Philadelphia, Pa.

Equipment for Coal Handling

The Gifford-Wood Trolley Bucket Conveyor System is illustrated and described in a circular which has been issued by the Gifford-Wood Co., Hudson, N. Y.

"Common Sense in Steel Dollars"

is the title of a 16-page illustrated booklet which describes the combination of pressed steel parts with welding, and which has been issued by the Heintz Mfg. Co., Front St. and Olney Ave., Philadelphia, Pa.

Portable Elevators, Liftrucks and Barrell Racks

Two circulars illustrating and describing the Hand Power Model Revolvable Base Revolvator and the Non-Revolvable Base Portelator, respectively, have been issued by the Revolvator Co., Jersey City, N. J.

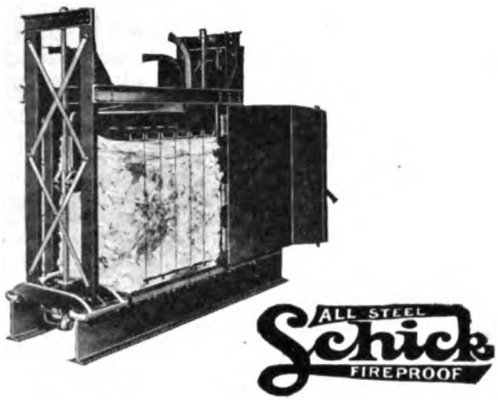
Baffle Walls

Beco Baffle Walls are illustrated and described in a 4-page circular issued by the Boiler Engineering Co., of Newark, N. J.

Motor Driven CO_2 Recorder and Water Meters

The Republic Motor-Driven CO_2 Recorder is described in an illustrated folder which has been issued by the Republic Flow Meters Co., Chicago, Ill. Republic Water Meters are described and illustrated in another booklet which has been issued by this company.

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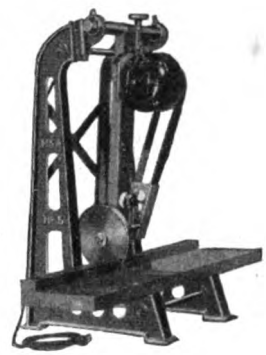
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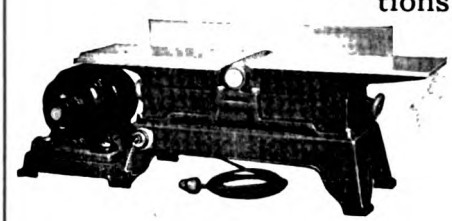


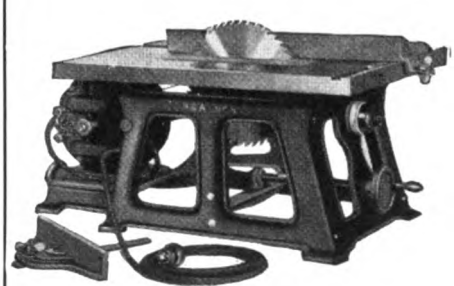
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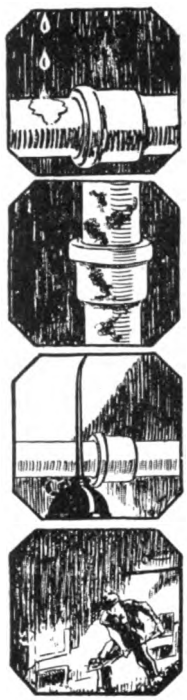


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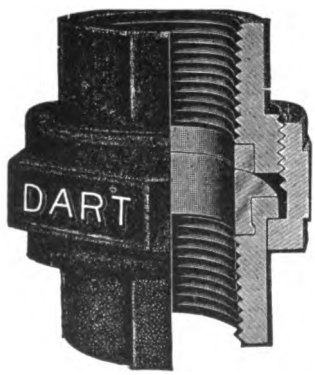
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You're safe and we're safe in buying Darts under this guarantee. Dart Unions always stay tight—can't rust—can't let steam escape—because of the bronze to bronze seating surfaces which are ground together into an absolutely tight seating ball and socket joint.

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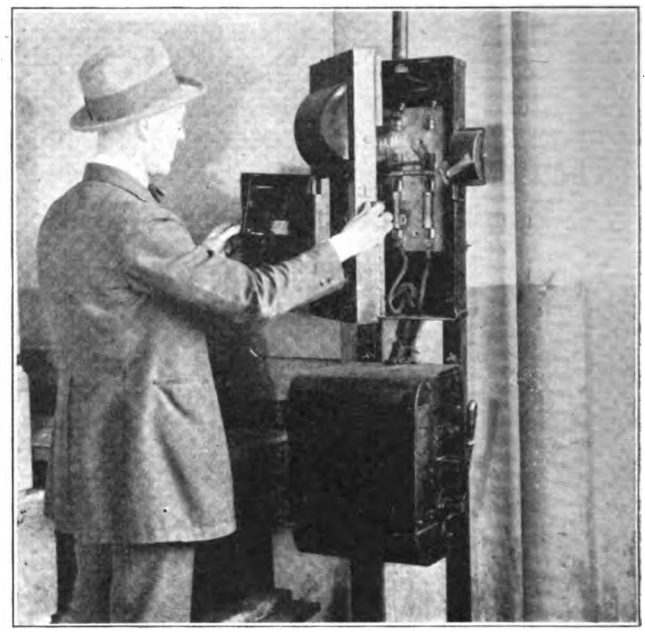
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A Safety Switch with Arc Quencher

IN this new WK-55 Safety Switch, made by the Westinghouse Electric & Mfg. Co., an arc quencher has been developed of simple design, that is claimed to extinguish the arc quickly and efficiently when the circuit is opened. This arc quencher consists of metal laminations, separated by layers of insulation and air space. According to the manufacturer's description, as the blade traverses the quencher, the arc is broken into a series



of sparks that are cooled by the metal plates and by the air currents between them. As the blade passes through the quencher, the arc is dissipated and cooled to such an extent that the current drops to zero and the circuit is interrupted without danger or damage.

The arc quencher of the WK-55 switch is said to be capable of breaking circuits carrying from 50% more current in the larger sizes to 300% more in the smaller sizes, than the rated amperes of the switch, even at 500 volts.

NOW that a gradual rehabilitation of industrial and agricultural life in Europe seems assured, how will this affect the United States?

It is evident that much of the money we have loaned to European countries is being applied to increase the output of productive enterprises. This is probably a partial cause of our increase of imports and our falling off in exports in January and February. To send goods and to supply real services to the United States is the ultimate way by which Europe must discharge her debts to this country.

Another effect of increased activity in Europe will be stronger competition in world trade. At the same time, greater production in Europe will naturally be accompanied by increased buying power among the many. This is shown in the case of the French automobile industry, which last year increased its output 37 per cent. over that of 1924, and increased its exports 27 per cent. —and, yet, France purchased three times as many cars from us in the first seven months of 1925 as during the same period of the previous year.—*La Salle Extension University.*

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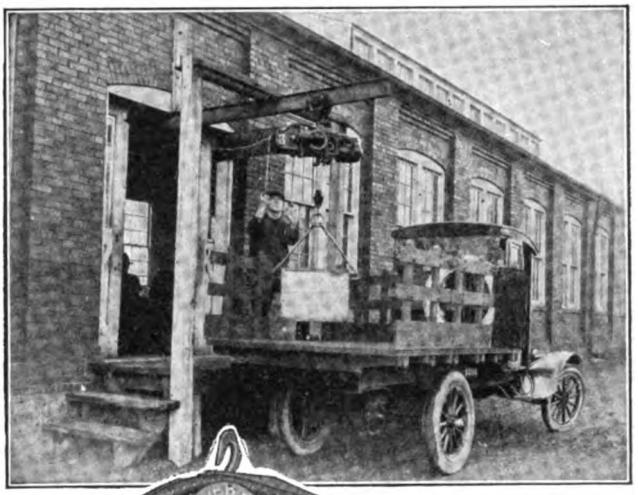
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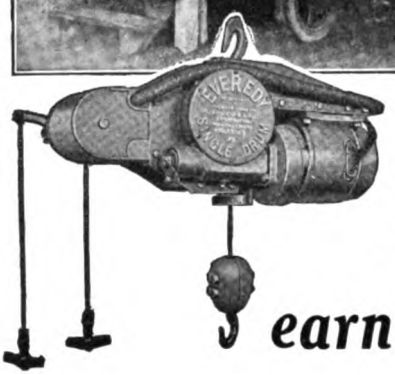
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Trucks earn nothing while they wait to be loaded

The way to get the most out of your equipment outside of the plant is the same way that you get the most out of the machines inside—keep the wheels turning.

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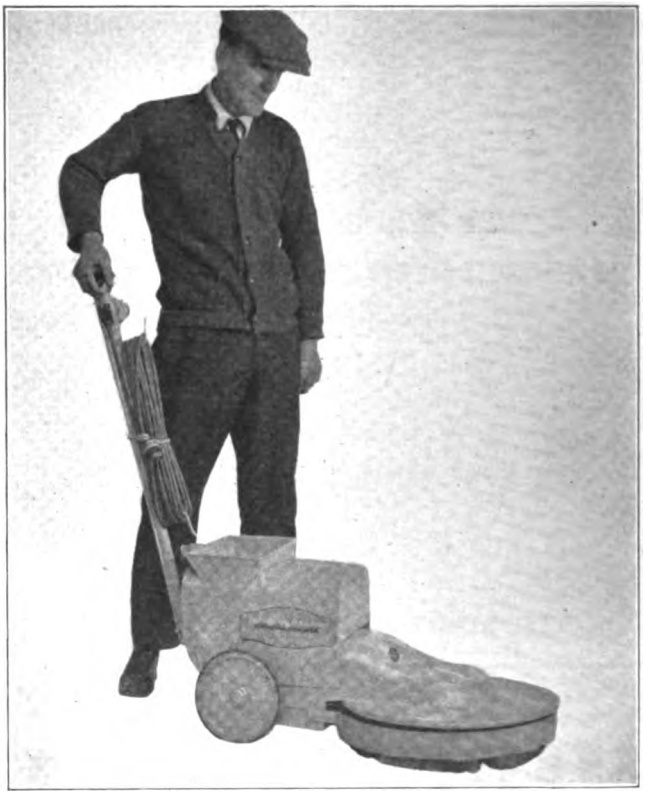
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THE floor scrubbing machine shown here is one of the recent models put out by the Finnell System, Inc., of Hannibal, Mo., and was designed to meet the needs of large floor area scrubbing and yet be readily handled from one building to another. It provides a means for scrubbing factory or offices floors, as well as for waxing and polishing the latter; being provided



with removable brushes and polishing discs, so that either operation can be performed by changing from discs to brushes or vice versa. Equipped with a ½-hp. motor, it is rated as being capable of scrubbing an area of from 1,000 to 1,500 square feet per hour.

STANDARDS for bolts and nuts was the subject of a special meeting April 16 at the Third International Standardization Conference held in the Engineering Societies Building, New York, under the auspices of the American Engineering Standards Committee.

At this meeting a step was made towards the adoption of an international standard for bolts and nuts.

Soon after the war the Germans adopted national standards for bolt and nut diameters and corresponding wrench openings. This was followed by similar action in Austria, Holland, Sweden and Switzerland, which followed the German work in the principal dimensions, with the result that nuts, wrenches and bolt-heads are interchangeable in all these countries. In the United States, a large amount of work has been accomplished in the last three years by a Sectional Committee on Bolt, Nut and Rivet Proportions, which contains more than fifty members representing about thirty national organizations, as the subject is a far-reaching one, affecting nearly every industry.

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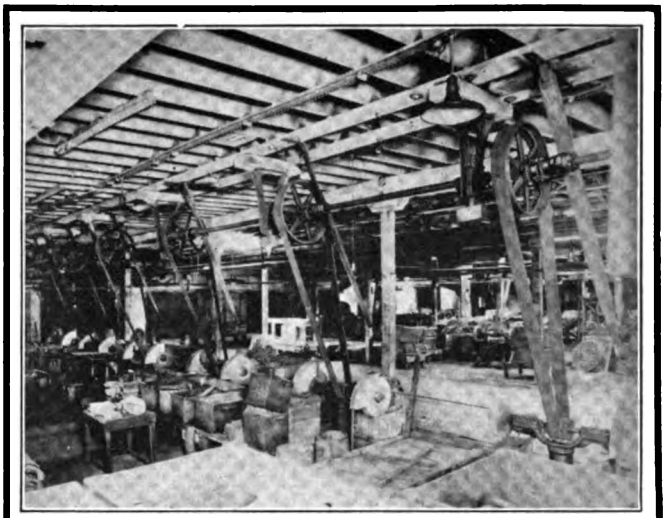
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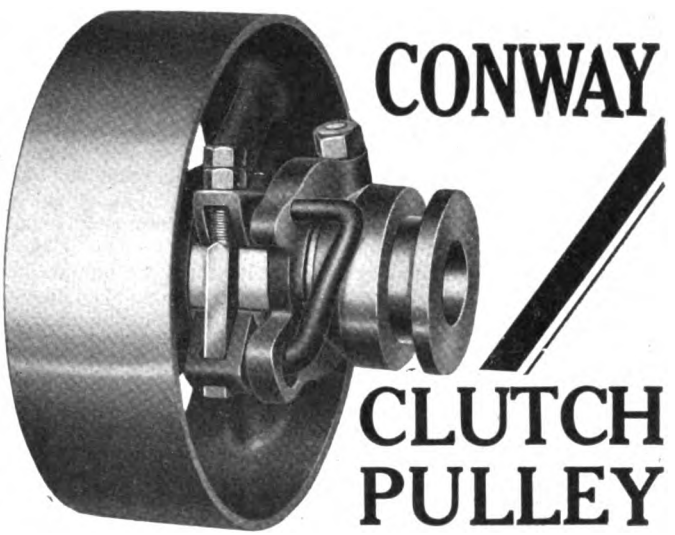
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Statement of the Ownership, Management, Circulation, etc., Required by the Act of Congress of August 24, 1912.

of INDUSTRY ILLUSTRATED, published monthly, at New York, N. Y., for April 1, 1926.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared John H. Van Deventer, who, having been duly sworn according to law, deposes and says that he is the Editor of the INDUSTRY ILLUSTRATED, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher, The Engineering Magazine Co., 120 West 32nd Street, New York, N. Y.

Editor: John H. Van Deventer, 120 West 32nd Street, New York, N. Y.

Managing Editor: None

Business Manager: Harvey Conover, 120 West 32nd Street, New York, N. Y.

2. That the owner is: The Engineering Magazine Co., 120 West 32nd Street, New York, N. Y.; John R. Dunlap, 120 West 32nd Street, New York, N. Y.; J. R. Dunlap, Jr., 120 West 32nd Street, New York, N. Y.; John H. Van Deventer, 120 West 32nd Street, New York, N. Y.; Harvey Conover, 120 West 32nd Street, New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

JOHN H. VAN DEVENTER, Editor.

Sworn to and subscribed before me this 17th day of March, 1926.

JEROME B. McEVILY.

(My commission expires March 30, 1927.)

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READERS' GUIDE
to Profitable Equipment
Practical Helps for Mill and Factory Managers

Booklets Describing Temperature Control are offered by Taylor Instrument Companies. See page 95.

Heating, Ventilating and Mechanical Draft Equipment that have 45 years of experience behind them. See page 99. American Blower Co.

Bulletins That Solve Ventilating, exhausting, blast heating, and other draft problems. See page 103. New York Blower Company.

Anti-Friction Bearings, that permit higher speed at the lowest friction loss. See page 43, The New Departure Mfg. Co.

Fifty Years of Conveyor Service, the record of the Logan Company. Details on page 1.

A Bulletin Showing a Clutch which is adaptable and standardized for many various machines. See page 111. Conway Clutch Co.

Bulletins on Jennings Heating Pumps, containing valuable information on heating system installations, are offered by the Nash Engineering Co. on page 16.

Information on a Perpetual Inventory System that keeps a check on thousands of parts and assemblies, is described on page 86. The McCaskey Register Company.

Mechanical Rubber Goods that are absolutely guaranteed. See page 71. United States Rubber Co.

Over Forty Years Experience in Materials Handling Systems, is available to industrial executives through The Lamson Co. See page 45.

Illustrated Catalog on Positive Feed Lubricator used on all types of machinery. See page 96. Malcolm H. Smith Co., Inc.

Illustrated Folders on the Hallowell Pressed Steel Bench Leg should interest every industrial executive. See page 65. Standard Pressed Steel Co.

Catalog No. 200 shows the solution to the handling problem by means of overhead traveling cranes. See page 47. Whiting Corp.

A Drill Chuck with exceptional strength and power is made by The Jacobs Mfg. Co. For information see page 53.

Bulletin No. 1201 contains information on standardized shop furniture manufactured by the New Britain Machine Co. Page 7.

"Formula 269" is the name of a new cleaner for every industrial purpose, particularly windows. See page 98. The Gerson-Stewart Corp.

Catalog No. 10 Describes the Dial Thermometer, easily readable at a distance of 20 feet. The Motometer Co. Page 8.

A Catalog of Information on Blue Printing can be obtained from the C. F. Pease Co. Page 51.

Catalog No. 24 describes an improved oven for cores. See page 61. Young Brothers Company.

Eliminates a Large Percentage of Cable Renewals. This is the claim for the Reelite made by the Appleton Electric Co. Page 113.

A Factor in Preventing Shut Downs, Depreciations, and Power Losses in Machinery. See page 5. Timken Roller Bearing Co.

Information on Stopping the Losses Resulting from Human and Mechanical Errors in the measurement of material is offered by The Toledo Scale Co. See page 117.

A 25% Lower Insurance Rate with the Fyer-Wall Doors. Described by Richards-Wilcox Mfg. Co. on pages 34-35.

An Electric Lift Truck for Unusually Heavy Loads. See page 57. The Yale and Towne Mfg. Co.

Catalog L-66 gives information on variable speed control. For a copy see page 83. Reeves Pulley Co.

Heavy Duty Unbreakable Chisel Steel can be obtained from Ludlam Steel Co. Page 101.

Information on Lighting Fixtures, adjustable for any operation, is given in the catalog offered by the American Fixture Co. See page 119.

A Book that answers Questions on belt care and operation can be obtained from Chas. A. Schieren Co. Pages 15-66.

A Free Trial Offer and booklet describing savings in materials handling on page 90. Barrett-Cravens Co.

A New Parker Vise called Big Bear with greater power and extra weight. See page 70. The Chas. Parker Co.

Descriptive Circulars Illustrating Steel Fabricated Buildings for every industrial requirement can be obtained from the Martin Steel Products Co. See page 109.

Descriptive Bulletins on Industrial Paints can be had by writing to the Nitrose Company. See page 108.

An Economical Means of Cleaning Parts is shown on page 100. Oakley Chemical Co.

List No. 58 gives full details of the most complete line of pipe threading equipment and is offered by The Oster Mfg. Co. See page 93.

A Catalog Describing Aerial Transportation Systems can be obtained from the Euclid Crane & Hoist Co. See page 79.

Catalog No. 21 Describes some Valuable Suggestions for Steel Lockers, Bins, Racks and Shelving. See page 84. Durand Steel Locker Co.

A Booklet describing Counters for rate setting and production work. See page 2. The Veeder Mfg. Co.

Catalog 43 Issued by the Medart Company affords a simple method of concentrating transmission machinery purchases. See page 56.

A Booklet is Offered describing an exceptionally efficient Dump Bucket by The Roura Iron Works on page 97.

The "Merrick Catalog" shows how bulk materials can be weighed while conveyor handled. The Merrick-Scale Co., page 119.

Catalog No. 30 on Small Tools can be obtained from Brown & Sharpe Mfg. Co. See page 105.

Hundreds of Executives Now Realize the Economy of the "tractor-trailer method." See page 36. Mercury Manufacturing Co.

Descriptive Booklet No. X, describing Ball Bearing Motors can be obtained from The Valley Electric Co. Page 52.

A Complete Line of Power Transmission Appliances. See page 101. T. B. Wood's Sons Company.

A Steam Trap on a 90 Day Trial also catalog. Offered by the Armstrong Machine Wks. See page 116.

Illustrations Describing the Economical Handling of Materials are shown on page 12. The Jeffrey Manufacturing Co.

A Ten Day Trial of Electric Drills is offered by the Independent Pneumatic Tool Co. on page 50.

A Tier-Lift Truck with more than a hundred uses is described by the Lakewood Engineering Co. See page 55.

Information on the New Type Roller Waste Can on page 60. The Witt Cornice Co.

The Solution to Your Paint Problem. See page 77. American Asphalt Paint Co.

The Proper Handling and Storage of Lubricating Oils. See page 14. S. F. Bowser & Co., Inc.

A New Catalog on sanitary ice cooled drinking fountain. See page 79. Century Brass Works.

Handling Units that have increased production 15 per cent. are shown on Back Cover by the Shepard Electric Crane and Hoist Co.

A Catalog on Flexible Shaftings for tool room, machine shop, pattern shop and foundry. See page 87. N. A. Strand & Co.

A Ball Bearing Portable Blower for cleaning machinery on page 79. Electric Blower Co.

Illustrated Catalog Describing a Compact, Sturdy, Steam Engine for many industrial purposes is offerded by the Troy Engine & Machine Co. See page 89.

An Average Power Saving of 15 per cent. is shown on page 6 by Hyatt Roller Bearing Co.

Bulletins on Low Cost Charging Equipment for electric trucks, etc. See page 62. The Hertner Electric Co.

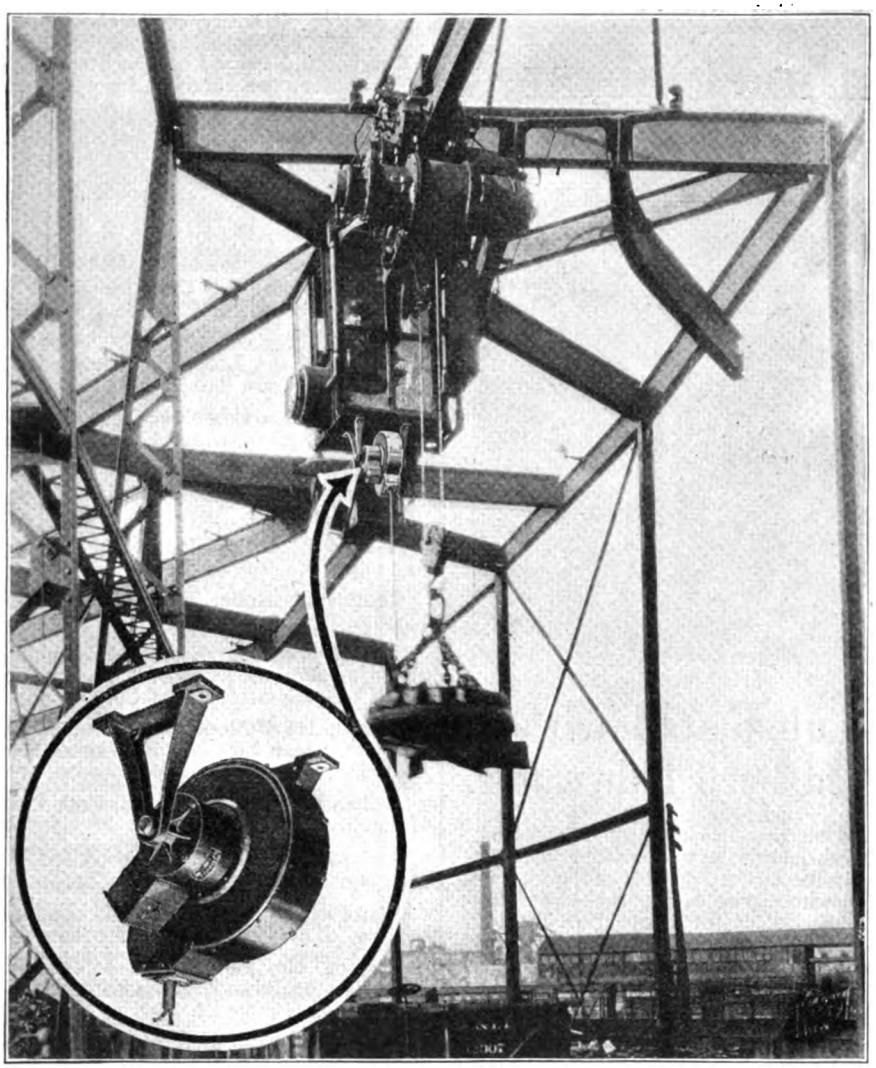
Bulletins on Various Pneumatic Conveying and Dust Collecting Systems are offered by The Dust Recovering and Conveying Co. See page 37.

Very Interesting Bulletins on Boiler Room Economies are offered by the Wickes Boiler Co. See page 88.

Bulletin No. CE719 Describes a Steel Belt Lacing that is quickly joined. See page 82. The Bristol Co.

Illustrated Catalogs on Casters for industrial trucks and also on Roller Bearing will prove very profitable and are

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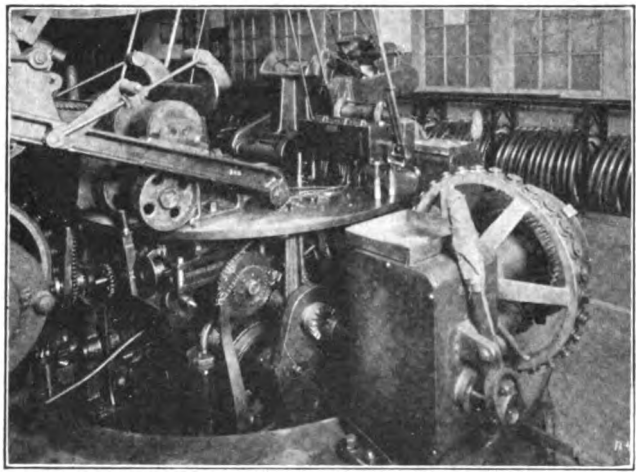
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McCord Radiator Mfg. Co.

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McCord Lubricators

being distributed by the Bond Foundry and Machine Company. Page 10.

Catalog and Price Lists on Steam Unions that prevent loss of steam, can be obtained from the E. M. Dart Mfg. Company. See page 108.

Bulletin Describing the Portable Bench Saws and Jointers, electrically driven, is offered by Heston & Anderson. Page 107.

150 Practical Ideas is shown in the new 1926 catalog, describing materials handling methods. Lewis-Shepard Company. See page 41.

Industrial Railway Cars for Every Purpose also portable track, switches and turntables are sold by the Easton Car and Construction Co. See page 103.

Details of the Ettco Keyless Drill Chuck can be seen on page 70. Eastern Tube and Tool Company, Inc.

A 62-Page Catalog Describing the Various Types of Scales, that indicate weights, while material is on the move, is offered by The American Kron Scale Co. See page 75.

Sample Blades are Offered by Victor Saw Works. See page 76.

A 10-inch Drill with more than a dozen unusual features. See page 94. Buffalo Forge Company.

Catalog on Boiler Feed Water Regulators. See page 82. Chaplin-Fulton Co.

Catalog "E" very interestingly describes an adjustable speed grinder that saves its cost in one year. See page 91. The U. S. Electrical Tool Co.

Descriptive Bulletins on Exhaust Fans that give a supply of fresh, clean air to work rooms are offered by the Diehl Mfg. Co., page 83.

A Steam Trap on 30 Days' Free Trial offered by the Sarco Company, Inc. Page 106.

A Free Trial Offer on One Gallon of Skybryte. For details see page 64. The Skybryte Co.

Write for Prices on carefully machine heat treated machine screws. The Ferry Cap & Set Screw Co. See page 55.

Catalog No. 23 contains information on valve reseating machines, useful in any power plant and factory. The Leavitt Machine Co., page 72.

Information on Electric Hoists for All Industrial Departments. Roeper Crane & Hoist Works, Inc. See page 83.

Catalog on a complete line of steam specialties is offered by Davis Engineering Corp. See page 109.

The New Principle Recently Added to the Howell Motor. See page 85. Howell Electric Motors Co.

A Booklet on Quality Leather Packings for all industrial purposes can be obtained from the Chas. A. Schieren Company. Pages 15-66.

Pyott Red Face Pulleys are illustrated and described on page 88. Pyott Foundry Co.

A Hack Saw of High Tungsten Steel is described by the Simonds Saw and Steel Co., on page 78.

The Latest System in Watchclocks. Literature describing this is offered on page 105 by the Detex Watchclock Corp.

Equipment that Minimizes the Handling of Products. The Powell Pressed Steel Co. Page 76.

A Colored Pencil with the lead as thin as ordinary writing pencils. See page 87. American Lead Pencil Co.

A Vise with more than half century of experience behind it. See page 54. Prentiss Vise Co.

Factory Certified Wire Rope for use as crane cable. See page 11. Williamsport Wire Rope Co.

Long Wearing Brushes for every industrial purpose are described on page 49. The Osborn Mfg. Co.

Electric Tractor Truck or Crane that costs only $5.00 per day to operate. See page 87. The Baker-Raulang Co.

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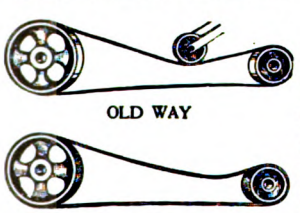
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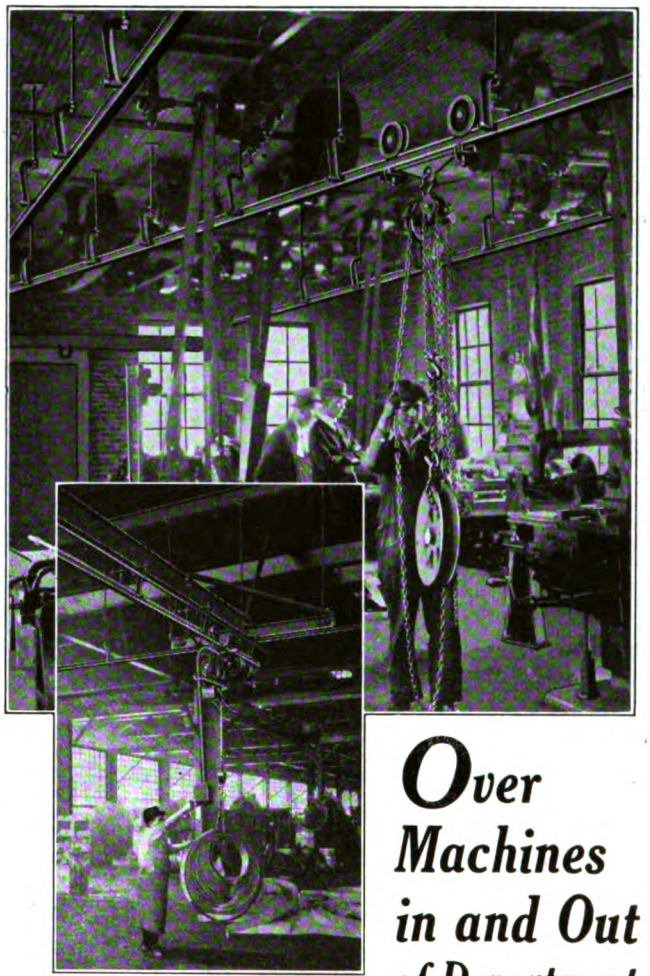
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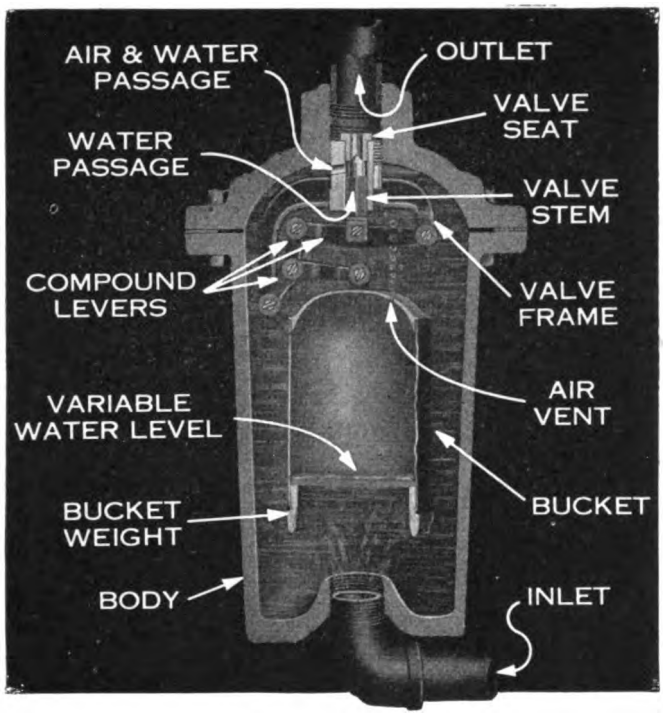
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furniture of this kind, see Hughes Steel Equipment Co., page 101.

A Motor with an Abundance of Reserve Starting Power. For details see page 111. The Master Electric Co.

An Illustrated Catalog on Leather Belting built for speed. See page 13. I. B. Williams & Sons.

Coatings that Cut Down Upkeep on Roofs, Floors and Walls. Choice of samples offered by L. Sonneborn Sons, Inc. See page 63.

High Speed Drills for high speed production. See page 92. The Cleveland Twist Drill Co.

An Illustrated Booklet, "More Light" on the use of factory paint is offered by the U. S. Gutta Percha Paint Co. See page 9.

"15 Points of Exide-Ironclad" is the title of a booklet on Storage Battery Information. See page 121. The Electric Storage Battery Co., Philadelphia.

A New Car Spotter. Information and prices. See page 122. H. W. Caldwell & Son Co., Link Belt Company, Owners.

Literature that Explains the Advantages of Pulleys and Pressed Steel Hangers is offered by the American Pulley Co. See page 102.

Steel Boxes and Platforms that save labor costs and valuable storage space. For complete facts see page 3. Truscon Steel Co.

Tap Drill Chart Cards useful for designers and builders of machinery are being issued by Wisconsin Electric Co. See page 67.

A Booklet Describing Steel Bound Hand Trucks. See page 97. Fairbanks Co.

Complete Information on the Overhead Equipment necessary to put a plant on an efficient basis to handle material. See page 109. Reading Chain and Block Corp.

A Paint Made Expressly for Galvanized Iron and also paints for every industrial purpose, see Inside Back Cover. Goheen Corp. of N. J.

20 to 40% Saved on Cleaning Costs. See page 119. Invincible Vacuum Cleaner Manufacturing Co.

Lubrication as a Means to Reduce Production Costs is explained in a book entitled "Lubricators for Industrial Machinery." For a copy see page 114. McCord Radiator and Manufacturing Co.

Special Discounts on Industrial Brooms are offered by the Joseph Lay Company. See page 103.

An Oilless Bearing is described on page 59 by the Arguto Oilless Bearing Co.

Electric Fuses that stay in service longer. See pages 73-74. Chicago Fuse Mfg. Co.

An Illustrated Booklet describing a lubricator that has a wide range of industrial applications is offered on page 96 by the Malcolm H. Smith Co., Inc.

The New Bonney Catalog showing the complete line of Chrome-Vanadium Wrenches can be obtained from the Bonney Forge & Tool Works. See Inside Front Cover.

Fabricated Sheet Metal Parts. An engineering service offer by The Breese Bros. Co. See page 105.

Belt Lacers that result in greater transmission efficiency. See pages 80-81. Clipper Belt Lacer Co.

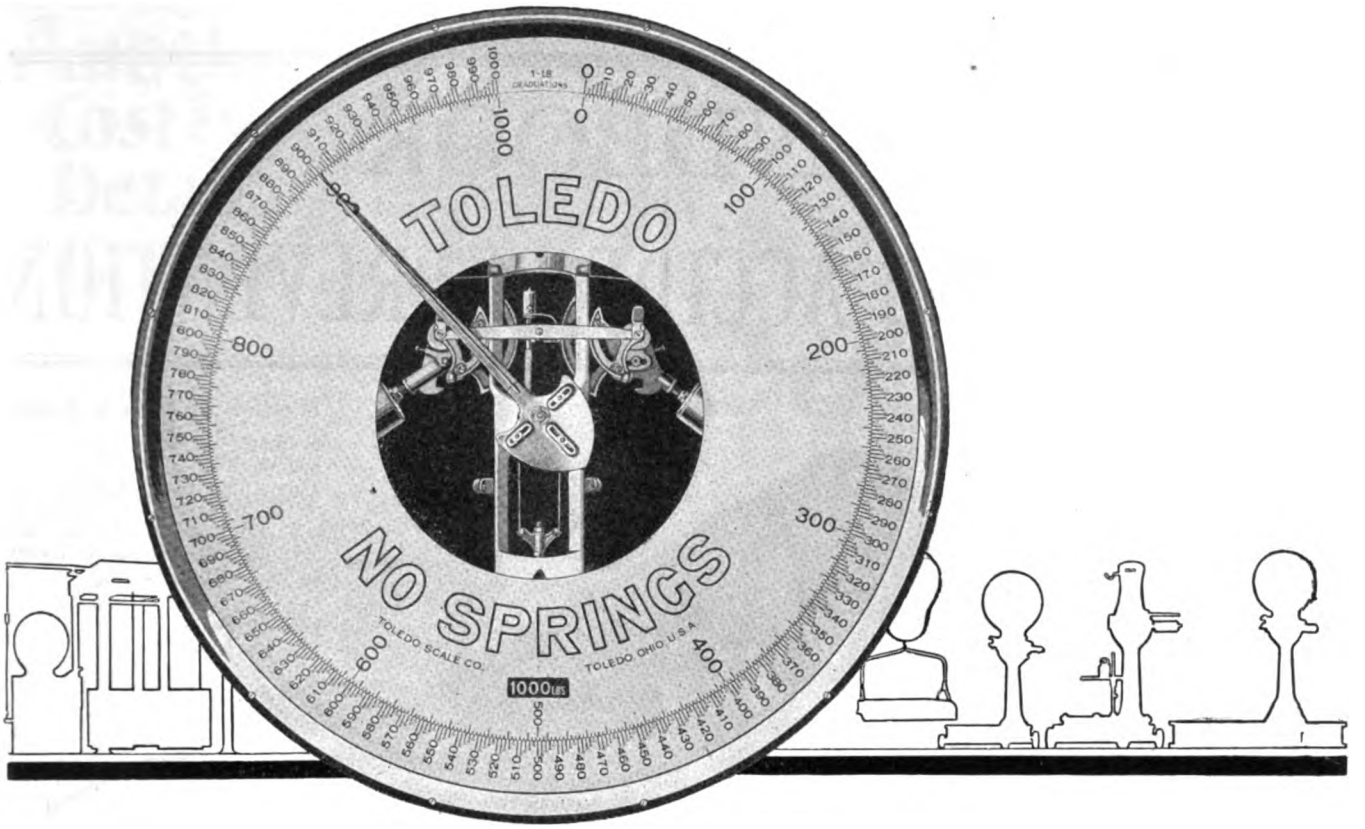
A Single Phase Motor with a great deal of reserve power is shown on pages 68-69 by the General Electric Co.

Literature Describing a Power Baler that saves waste storage space and is fire-proof is offered by Davenport Mfg. Co. See page 107.

Catalog Describing 275 Styles and sizes of oilers for all types of machinery. Gits Bros. Mfg. Co., page 115.

A Trial Application of a pulley covering that saves belts, power and bearings. See page 115. Ben Halstead Company.

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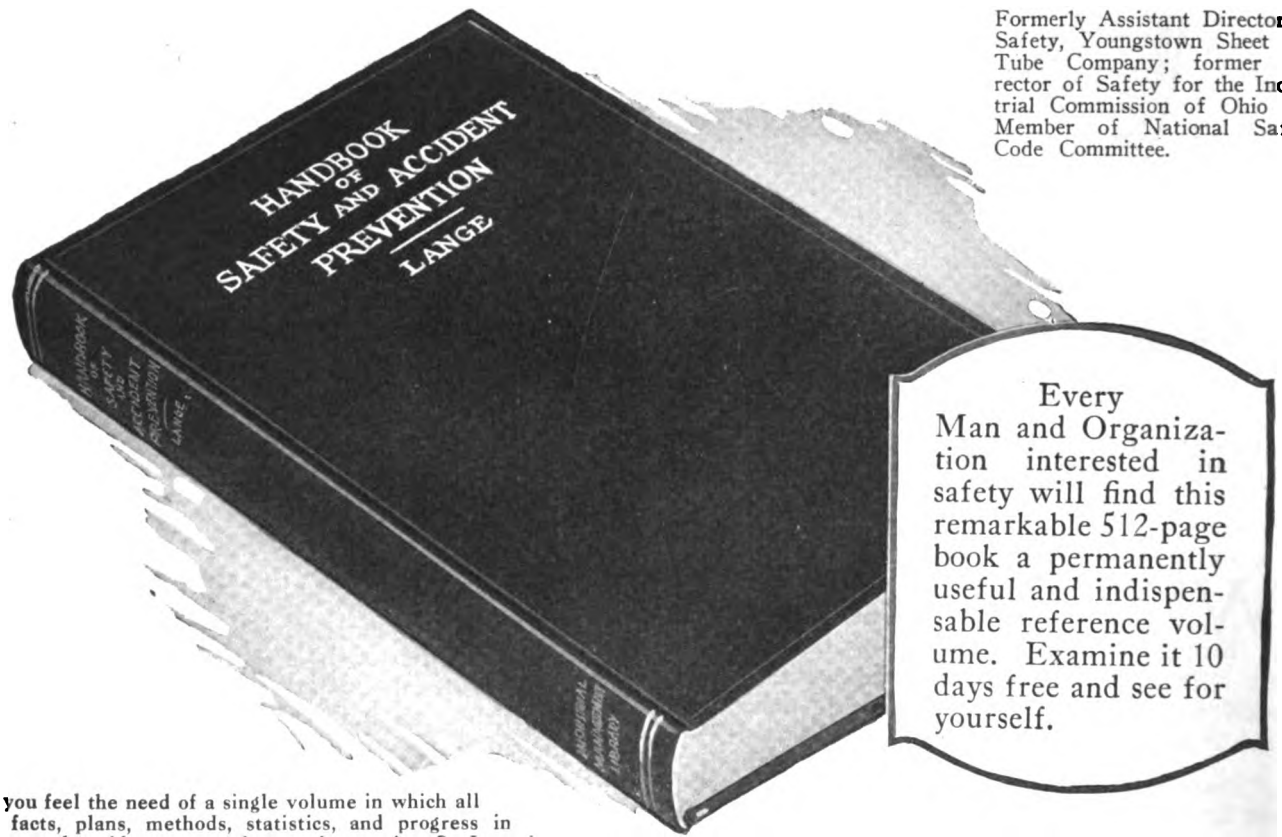
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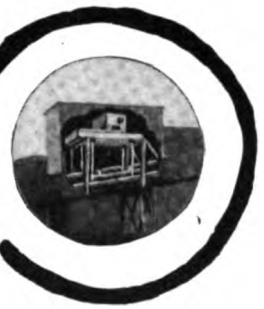
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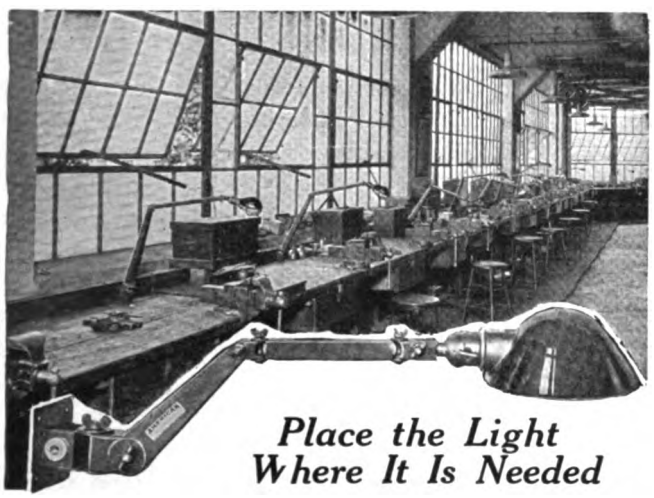
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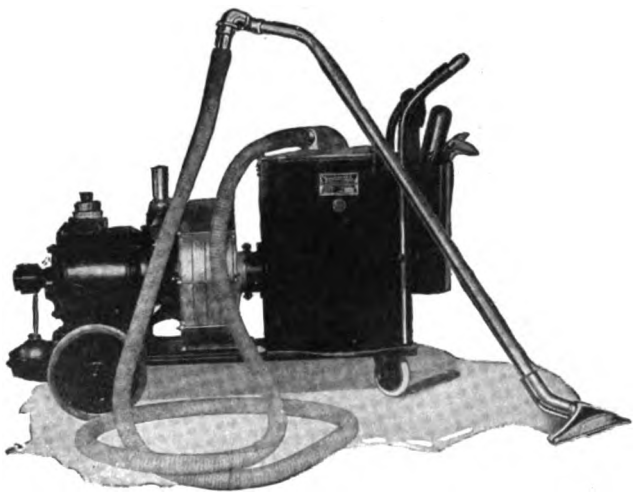
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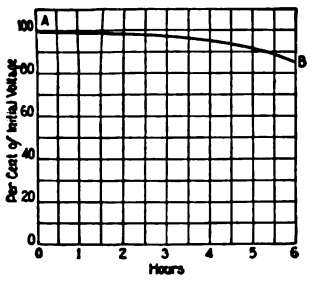
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An industrial truck is only as *dependable* as its *storage battery*



One of the biggest factors in the efficiency and economy of a handling system is the dependability of its batteries. Below you will read about a particularly dependable battery.

One reason so many prominent manufacturers choose Exide-Ironclad Batteries is that they keep on the job day in and day out—they are dependable



Speed up your "electrics" with Exide-Ironclad Batteries. This chart shows that they maintain a high voltage throughout the entire day's operation.

WHEN your electric industrial trucks and tractors are equipped with Exide-Ironclad Batteries, those machines stay on the job week after week and month after month without losing a day out of service. They do this because an Exide-Ironclad hardly ever needs repair. It is built rugged—just as rugged as our thirty-eight years' experience in battery-making has taught us how to make it.

There are many other reasons why Exide-Ironclads are the battery choice of leading companies all over the country. An Exide-Ironclad is not stopped by steep grades or extra-heavy loads. When more power than usual is needed, this battery delivers current faster than usual, and the truck breezes ahead.

The speed and pep of an Exide-Ironclad hold up strongly all day long, for the voltage of this battery keeps high right up to the end of discharge. Hence your trucks can cover more ground and handle more goods in a day's time. On charge the Exide-Ironclad is most efficient, for it takes current in quickly, easily, and with little waste. The life of this battery is long and its first cost reasonable.

It will pay you to know all about this unusual battery that has cut handling costs in so many factories. Send for a free copy of our booklet, "15 Points of the Exide-Ironclad Battery."

Exide
IRONCLAD
BATTERIES

A few of the many companies that use Exide-Ironclads

Remington Arms Co., Bridgeport, Conn.
B. F. Goodrich Co., Akron, O.
U. S. Playing Card Co., Cincinnati, O.
Cadillac Motor Co., Detroit, Mich.
Cleveland Automatic Machine Co., Cleveland, Ohio
Fisher Body Co., Detroit, Mich.
The National Cash Register Co., Dayton, O.
Dodge Bros., Inc., Detroit, Mich.
American Motor Body Co., Philadelphia, Pa.
Crane Company, Chicago, Ill.
J. G. Brill Company, Philadelphia, Pa.
Eagle-Picher Lead Co., Joplin, Mo.
Delco-Light Co., Dayton, Ohio
Buick Motor Co., Detroit, Mich.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

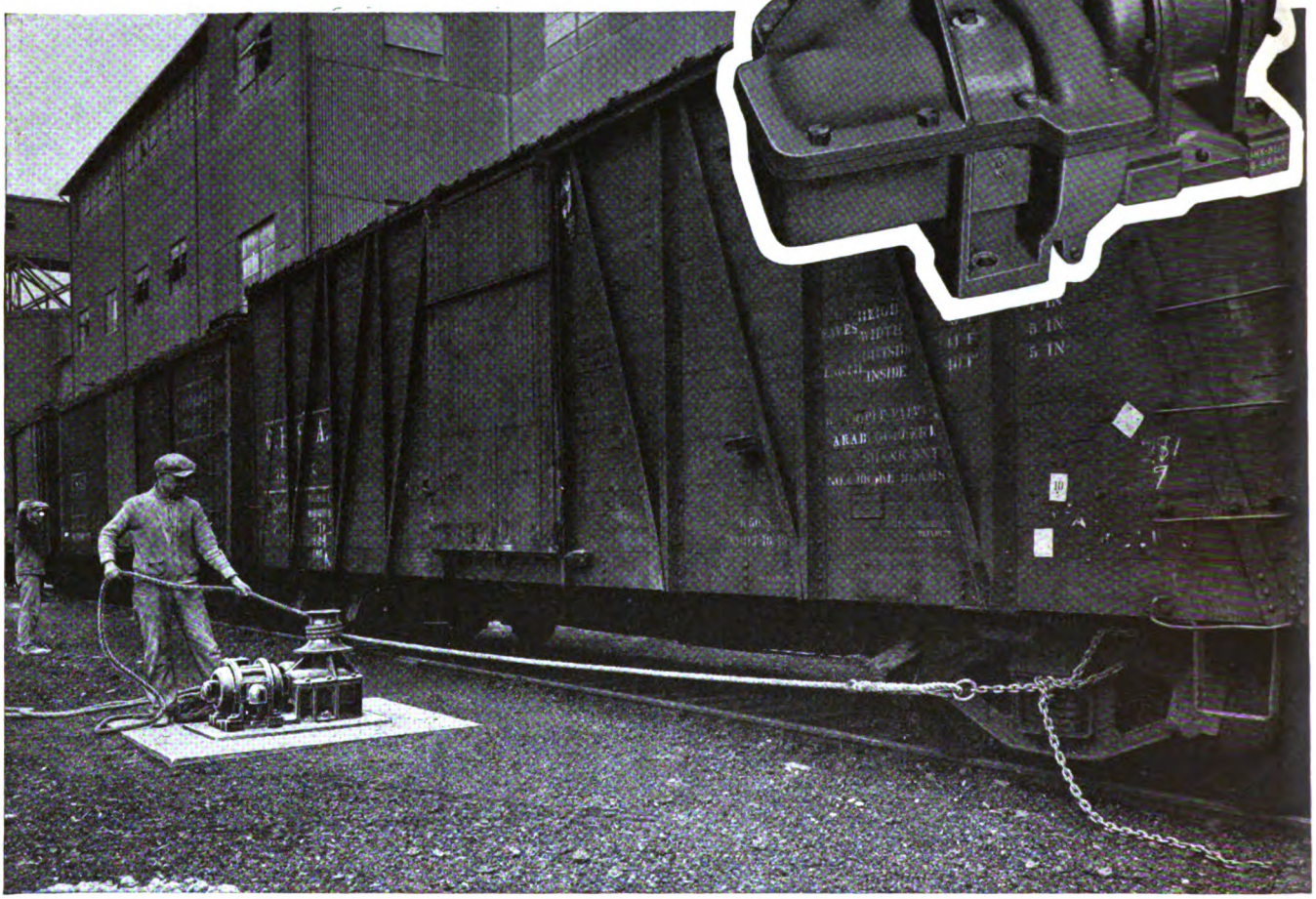
Exide Batteries of Canada, Limited, 153 Dufferin Street, Toronto

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The Best Way to "Spot" Cars!



The New Caldwell Car Spotter



Caldwell Vertical-Capstan Electric Car Spotter at work at plant of Darling & Company, manufacturers of high grade fertilizer

LET this rugged, self-contained winch spot your cars and do odd "pulling" jobs around the plant. Pulls in any direction.

The Caldwell Vertical-Capstan Electric Car Spotter is always ready—no need to wait for the switch engine! Takes no time at all, to spot a car.

A unique design, with few working parts; therefore, a *low price to you.* It doesn't pay to use pinch bars, or other hand methods. Send for full particulars on this quicker, cheaper way. Return the coupon.

Builders of car pullers for 35 years.

H. W. CALDWELL & SON CO.
LINK-BELT COMPANY, OWNER
New York, 2676 Woolworth Bldg. **Chicago, 1700 S. Western Ave.** Dallas Texas, 810 Main St.

IND. ILL. C-42

H. W. CALDWELL & SON CO.
1700 S. Western Ave.
CHICAGO, ILL.

Send us (without obligation) price and full particulars about your new car spotter.

Name_____
Firm_____
Address_____
City_____ State_____

CALDWELL CAR SPOTTER

For products not advertised in this issue write Industry Illustrated

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GOHEEN

PAINT ENGINEERS

PAINT CHART

A Standard Paint for Each Specific Purpose

Every Paint is an engineering product—a result of many years of test and experiment in laboratory and service. Each paint has been designed for use in a specific, well defined field of service, and has been perfected to give the best service in the use to which it is put. This chart will help you decide which Goheen Paint will serve you best.

Galvanum FOR GALVANIZED IRON TRADE MARK	For Galvanized Iron under any conditions of service, Galvanum Paint is the only paint which can be applied directly to galvanized iron without acid wash, weathering or priming coat. It is a standard of comparison. Lasts seven to fifteen years, prevents all rusting and corrosion.
Carbonizing Coating TRADE MARK **For Iron and Steel**	For Iron and Steel, inhibitive as well as protective, this paint absolutely prevents corrosion of the metal.
Highway Red TRADE MARK A CHEMICALLY COMBINED RED LEAD PAINT **For Iron and Steel**	A chemically combined Red Lead Paint, with preservative qualities not possessed by straight Lead and Oil.
Thermokote A GOHEEN PRODUCT A PAINT FOR ALL HOT SURFACES AND STACKS **For Hot Surfaces**	A heat-resisting paint for Smoke Stacks, Boilers, and all hot surfaces, manufactured especially to stand up under high heats, and to give positive results under varying temperatures.
MILL WHITE **Interior White**	For Wood, Steel, Concrete, Brick and Plaster, designed specifically to stand up under severe conditions, and can therefore be used as a standard paint for use throughout office and factory.
Concrewaltum Paint (TRADE MARK) **For Concrete Surfaces**	For Concrete, Stucco and Masonry surfaces, dampproofs and beautifies the surface, and is made both as an Interior and Exterior Wall Paint, as well as a Floor Enamel.
Old Honesty TRADE MARK **For Wood**	A chemically combined ready mixed paint for interior and exterior wood surfaces, compounded to resist the action of Sulphur Fumes, Acids, Gases and Moisture. It is an ideal paint for Industrial requirements.

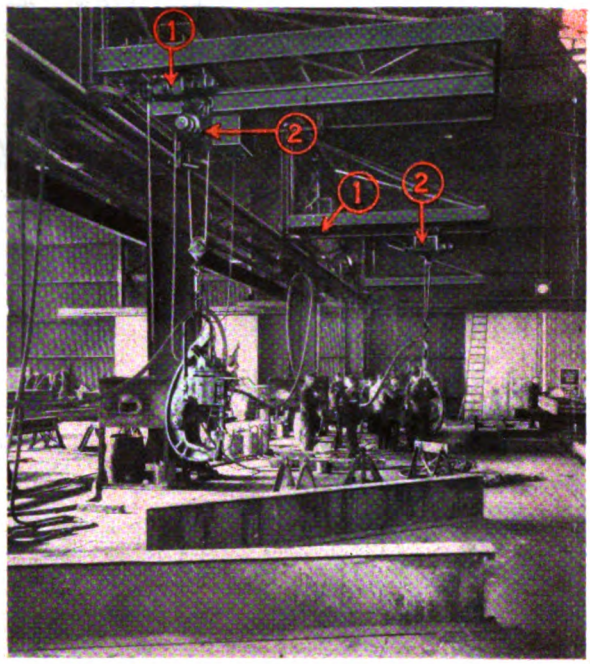
GOHEEN CORPORATION of N. J.

Paint Engineers Since 1888 **Newark, N. J.**

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EILERT PRINTING COMPANY, INC.

Production is increased 15%



The Mississippi Valley Structural Steel Co., St. Louis, Mo., uses Shepard Electric Hoists and Shepard Back Geared Motors on traveling wall gantry cranes. The hoists are 75% speedier than chain blocks. On riveting jobs production has been increased 15%.



1

SHEPARD BACK GEARED ELECTRIC MOTOR

This unit, in reality a speed reducer with motor attached, is installed on each crane and propels it along the runway.

The Shepard Back Geared Motor has numerous applications, and is used in many plants to electrify old hand racked cranes, converting them into very efficient electrically operated apparatus.

Units to modernize a plant

A most useful service that the Shepard organization renders is in supplying a plant with electric lifting and load-moving equipment that meets precisely the conditions of that plant.

This is possible because Shepard equipment comprises a very extensive line of electric hoists, cranes and allied machines. Each has the Shepard Balanced Drive, Enclosed Unit Construction, and Automatic Oil Bath Lubrication.

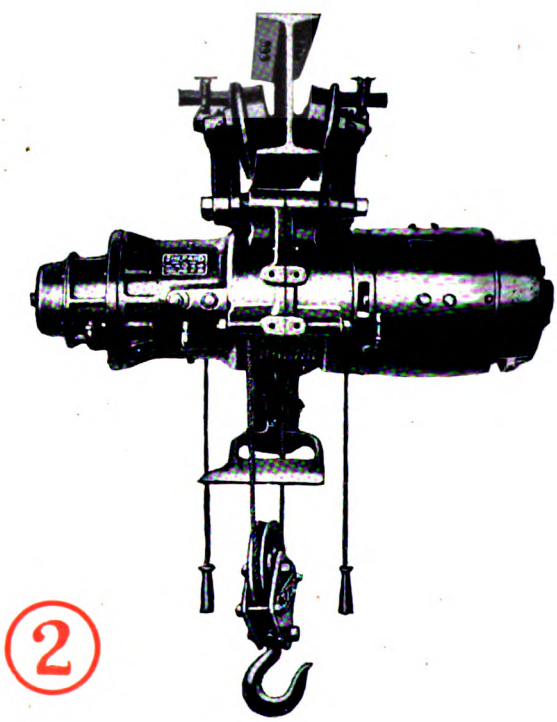
Shepard Engineers have helped in laying out efficient rehandling systems not alone in new plants, but in old plants, which now enjoy the most modern and efficient handling methods.

Write for Floor Operated Hoist and Back Geared Motor Catalogs, and any data you desire on electric cranes and hoists.

SHEPARD ELECTRIC CRANE & HOIST CO.
352 Schuyler Ave., Montour Falls, N. Y.

Branches in Principal Cities
Largest Manufacturer of Electric Hoists in America

SHEPARD
ELECTRIC CRANES & HOISTS



2

SHEPARD FLOOR OPERATED EDECTRIC HOIST

This machine is one of the many different floor operated electric hoists made by Shepard. A hoist of this type, fitted with push button control operates on the I-Beam of the Mississippi Valley Crane and handles the riveting machines.

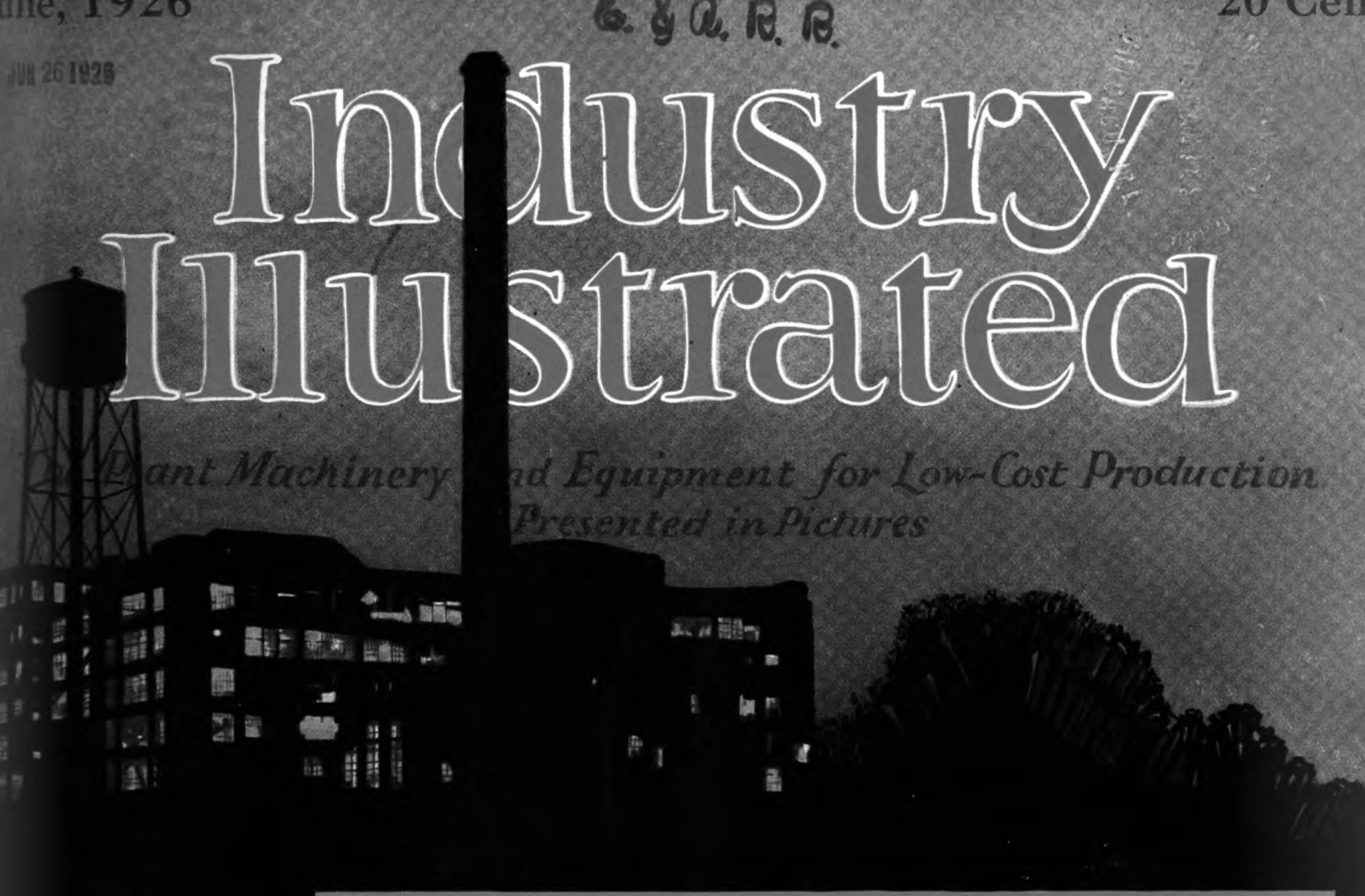
Shepard Electric Hoists are made in types and capacities to suit conditions in any type of plant.

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C. & A. R. R.
JUN 26 1926

Industry Illustrated

Plant Machinery and Equipment for Low-Cost Production Presented in Pictures



"Tips on Tooling"

is the title of a series of articles describing pictorially the most modern methods for obtaining high speed production from machine tools. The first article of the series—on bar work—appears in this issue.

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Publishing Offices
Industry Illustrated

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A GOOD MECHANIC

USES GOOD TOOLS

February 15, 1926.

Bonney Forge & Tool Works,
Allentown, Pa.
Dear Sirs:

I thought I would drop you people a line in regards to the best wrench I have ever used. I have been using tools of all kinds ever since I was nine years old and I am now twenty-eight. My past trade has been a mechanic on all kinds of steam and gas engines, on highway and construction work, but now I own my own garage. Well, to make a long story short, I always look for the best tools I can buy. I mostly used ——— wrenches. One day I happened to get a hold of two of your old wrenches. One is a No. 1028 S and the other a No. 1731 A. I did not think much of them at first; I thought they would spread or break. Well I will tell you now those two wrenches are worth more to me now than all my other tools put together. When all wrenches fail to move rusted or set nuts I get my Bonneys and they always do the trick. I only wish that space would permit me to write more of how your wrenches have gotten into tight places with no cussing or broken and skinned knuckles—and that is a lot in garage work. My only hope is to have every wrench in my shop a Bonney, both tappet and general service wrenches, before long. I hope and trust this line or so will help a little for your business as you have helped me.

Most truly yours,
James J. Britt, Prop.,
Service Garage,
Mechanicsville, N.Y.





Set No. 25
Contains six *"CV" Engineer's type 15 degree angle wrenches with 12 different openings from ⅜" to 1". Price, east of Mississippi $6.85 without Leatherette Roll. $7.85 with Roll. Canadian and Western prices slightly higher.

Mr. Britt, whose letter is quoted above, is one of thousands of real mechanics who prefer Bonney Wrenches

Chrome-Vanadium
registered
August 11th, 1925

You can secure from your jobber. Write for detailed information.

Bonney Forge & Tool Works
Dept. B. Allentown, Pa.

Makers of Special Service Wrenches of Chrome Vanadium, Carbon Steel Drop Forged Wrenches, Stillson Wrenches, Vises and Drop Forgings and the Bonney Rim Tool.

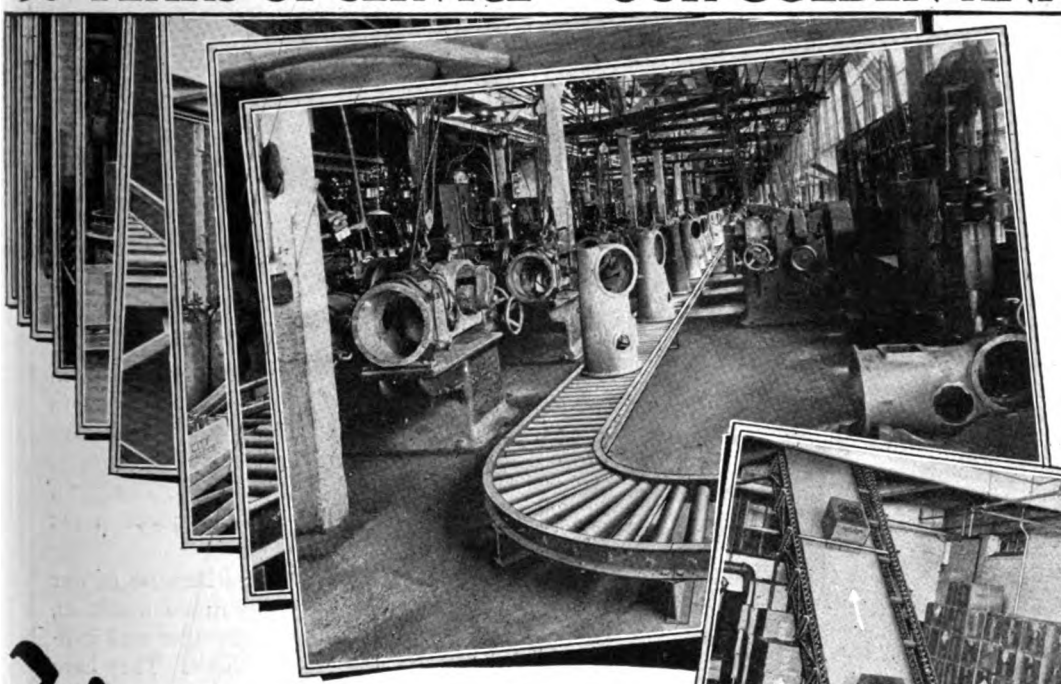
BONNEY Chrome-"CV"-Vanadium WRENCHES

(Patents Pending)

*CV is a Bonney trademark registered in the U. S. Patent Office.

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50 YEARS OF SERVICE ~ OUR GOLDEN ANNIVERSARY

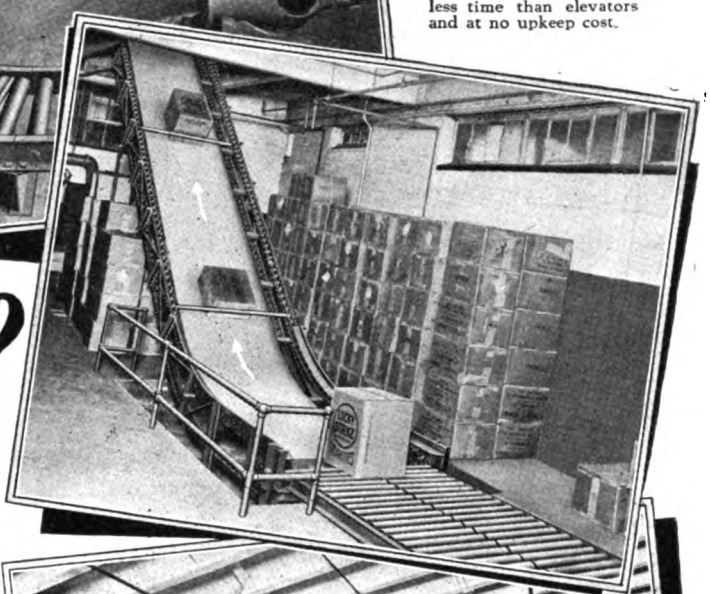


Three Illustrations of Logan Economies

Top: Tractor castings handled between machining operations at Ford plant.

Middle: Cartonsof Lucky Strikes sent quickly from basement storage to shipping platform via Logan Gravity Rollers and Pusher Bar Elevator.

Bottom: The American Tobacco Co. uses an open Logan Spiral Chute to lower fibre cartons of tobacco from third floor to shipping rooms in much less time than elevators and at no upkeep cost.





What Conveyors?

IT IS no longer necessary to "sell" the manufacturer on the idea of time, labor and money-saving equipment; without it he would find it difficult if not impossible to meet present-day competition. The question, therefore, is not, *Will it be conveyors?* but, *What conveyors will it be?*

You can buy cheaper conveyors than Logan Conveyors. But after all, the initial price paid for material-handling equipment is relatively unimportant compared with the kind of service you get from it after installation. Correct application, steady, carefree operation year after year, a minimum of maintenance expense and the certainty that your production schedule will not be hampered by costly and irritating breakdowns—these are factors of prime importance.

Logan Conveyors have rendered just such uninterrupted service over a long period of years, in a wide variety of industries. Our Engineering Department is equipped to give you prompt and constructive cooperation. Use the coupon for convenience.

Logan Co. Incorporated 1888

Louisville, Kentucky Offices in Principal Cities.

LOGAN CO., Incorporated
Louisville, Ky.

Date.....

We are interested in conveyors. Without obligating us please have your representative call.

Name.....

Address.....

City.....

Logan Conveyors

LOUISVILLE

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VALUE



When buying cutters, consider carefully the value which you get for your money. A cutter's value depends entirely upon its ability to do work well.

Brown & Sharpe Cutters and Hobs stand up on the most exacting jobs. Their long life and highly efficient design make their value, to the man who buys them, more and more apparent every day.



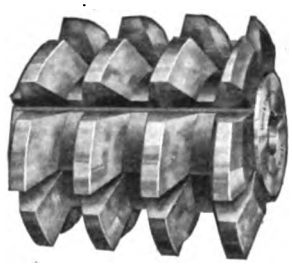
Catalog No. 30 lists the complete line of Brown & Sharpe Cutters and Small Tools. Ask your dealer for a copy or write to us direct.

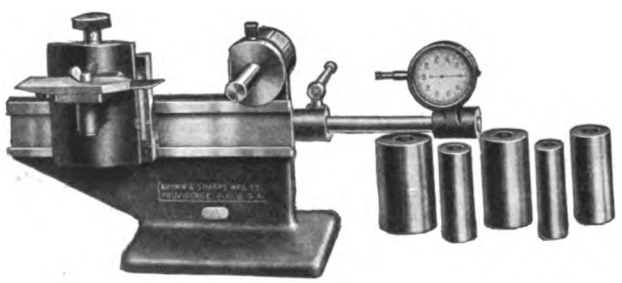
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BROWN & SHARPE MFG. CO.

Providence, R. I., U. S. A.







This Brown & Sharpe Cutter Testing Fixture is used conveniently when sharpening gear or other formed cutters or hobs. All sizes of cutters up to 10" in diameter can be accommodated.

BROWN & SHARPE

"Standard of the Mechanical World"



The Publisher's Column

ACCORDING to recent figures, published in the daily press, the wages of laborers in British coal mines range from $1.60 to $2.09 a day. The scale in American mines averages $6.80 a day. As a matter of fact, the American worker, in all industries, is without question the highest paid in all the world.

As a nation, too, we are envied because of our outstandingly prosperous condition; so much so, that the old world is sending committees and individuals over here, to study our methods. They have begun to realize that Uncle Sam did not reach this enviable state through war profiteering; that there is some other reason—some secret formula accountable for our prosperous industrial structure, with its well-paid workers and consequent high living standards.

There is no secret about all this. The formula is open to anyone, anywhere. It is a formula that has been preached in the pages of INDUSTRY ILLUSTRATED since its inception: *the intelligent application of modern machinery and scientific methods.* It applies to the large plant and to the small one, and it is today accomplishing seeming miracles in practically all of our industries.

That is the formula that accounts for America's prosperity. And it is the formula which dominates both the editorial and the advertising pages of every issue of this magazine.

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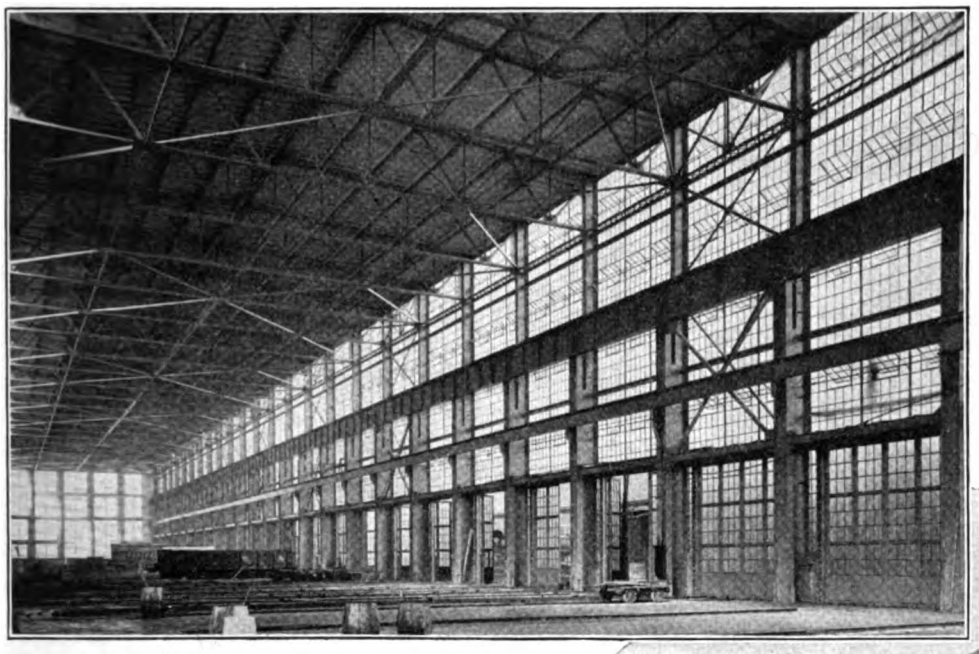
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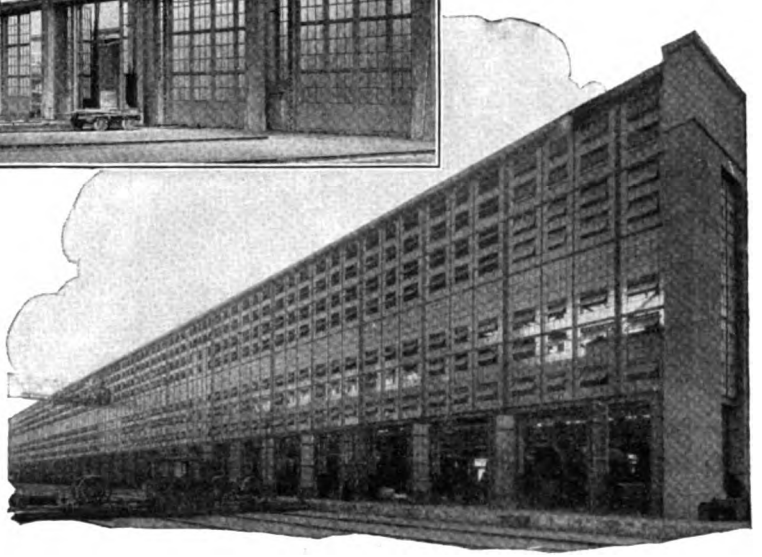
Vol. 9, No. 6. Subscription price $2.00 per year; single copies 20 cents.

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A. T. & Sante Fe Shops, Albuquerque, N. M., E. A. Harrison, Archt. Lower: Sante Fe Shops, San Bernardino, Calif., E. A. Harrison, Archt. Complete installations of Truscon Steel Windows and Steel Doors.

Approved by Leading Industries

In many buildings of the country's leading industries Truscon Steel Windows and Mechanical Operators provide full daylighting and instant, efficient control of natural ventilation, so necessary to preserve proper working conditions. Fireproofness and permanence are added advantages. The repeated choice of Truscon Steel Windows by leading industrial organizations is the best evidence of their efficiency and economy.

Truscon's staff of skilled engineers with wide experience in daylighting and ventilating gladly cooperate with you in securing the most efficient and economical results. The Truscon line includes all types of steel windows, mechanical operators and steel doors.

Catalogs free on request

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Foreign Trade Division, New York.
The Truscon Laboratories, Detroit, Mich.
Trussed Concrete Steel Co. of Canada, Ltd., Walkerville, Ont.

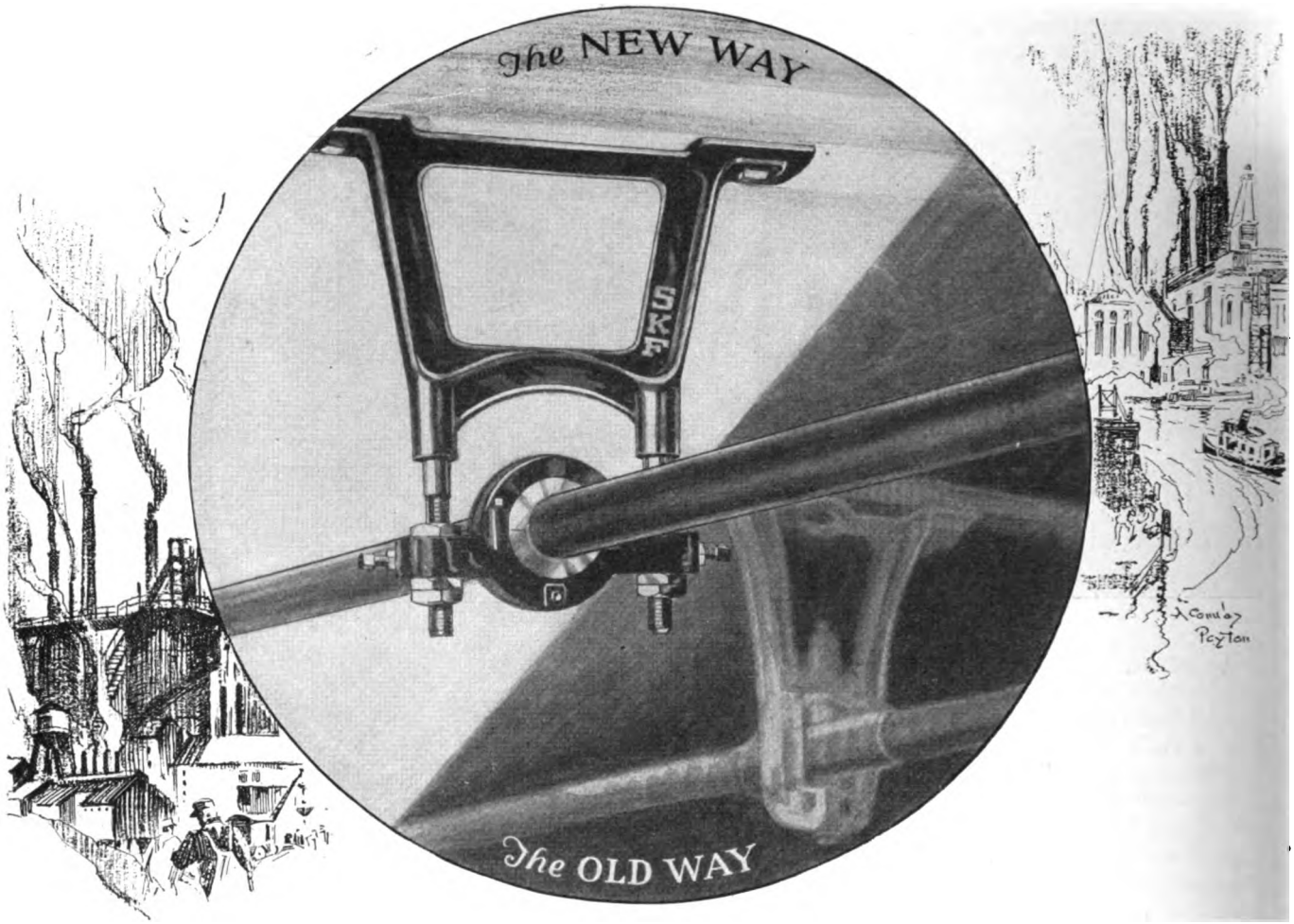
TRUSCON NATIONAL ERECTION SERVICE
Assures Accuracy Speed & Economy

*TRUSCON STANDARD STEEL WINDOWS AND MECHANICAL OPERATORS

***A complete line of Steel Buildings, Steel Windows, Metal Lath, Steel Joists, Steel Poles, Concrete Reinforcing for Buildings and Roads, Pressed Steel Specialties, Waterproofing & Technical Paints. Truscon maintains Engineering and Warehouse Organizations thruout the Country**

Ad. No. 1—269

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Cutting 53.04 H. P. *off the power load**

TO prevent shaft bearings running hot and whining for oil, power costs running high and out of all proportion to the amount of power actually used by old plain bearings, which constantly demand attention and repairs — install Skayef Self-Aligning Ball Bearing Hangers.

A Southern cotton mill*, not only reduced labor and lubricant costs, but cut 53.04 H.P. off the power load as soon as Skayef equipment was installed.

Skayef engineers will show you how Skayef line shaft equipment will reduce your power and maintenance costs, speed up production, eliminate expensive delays and pay for itself in less than two years.

** A certified survey of this installation sent on request.*

The SKAYEF BALL BEARING COMPANY, 165 Broadway, New York

1568

BALL BEARING

SKAYEF HANGERS

POST HANGERS, PILLOW BLOCKS AND TRANSMISSION APPLIANCES

SKF Puts the Right Bearing in the Right Place

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Hercules Power Goes to Work on Timken Bearings

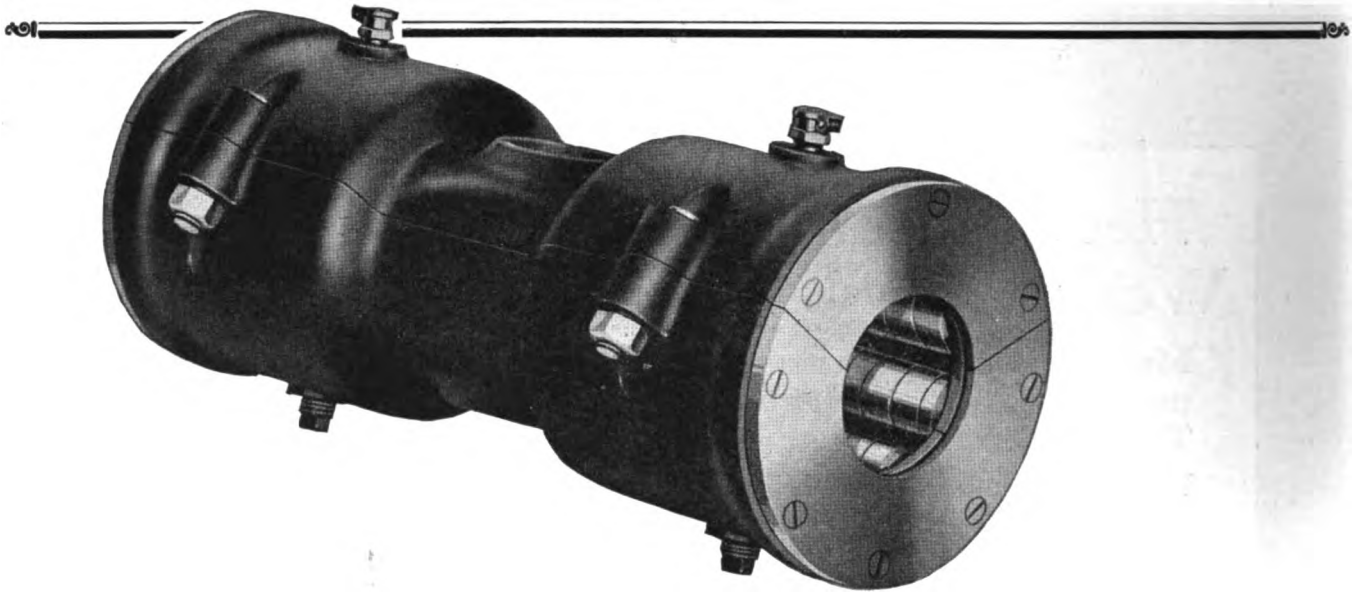
More of the power generated by Hercules units comes out in *pay work*. Timken Tapered Roller Bearings help to make it possible. Timkens kill excess friction. Extreme Timken load capacity carries heaviest thrust and shock. Timken positive roll alignment—*exclusive*—is a match for speed. Timken-made steel means bearings fit to outlast the unit itself. Buy or build Timken-equipped. It improves the product and the output.

THE TIMKEN ROLLER BEARING CO., CANTON, OHIO

TIMKEN
Tapered
ROLLER BEARINGS

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Older than the century —and still going strong



Hyatt Line Shaft Roller Bearings are built to endure. Many have already served thirty years—and aren't old timers yet.

Hyatt bearings are rugged, and don't wear. They are flexible. The helically-wound rollers absorb loads, vibration and irregularities in shaft surfaces. Their full line contact prevents overloading, reduces friction and saves 15% of your power bill.

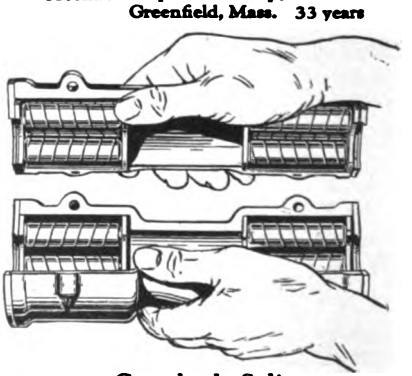
Lubrication is required only three or four times a year—cutting oil and labor costs. One installation paid for itself in eight months and is now earning 174% annual dividends.

Bearings and boxes are split, for quick installation, without disturbing shaft fittings. They are quickly adjusted to any hanger. The new *narrow center* Hyatt bearing extends Hyatt service and economies to narrow transmission lines.

Send for Hyatt Line Shaft Bulletins 130 and 134, or ask your local mill supply dealer for details.

These companies have used Hyatt Line Shaft Roller Bearings, in quantities of 200 to 30,000, for twenty years and more:

Colburn Mach. Tool Co. Franklin, Pa.	20 years
Ford Motor Car Co., Detroit	20 years
Harley-Davidson Mf'g. Co. Milwaukee	20 years
United Shoe Mach. Co. Beverly, Mass.	20 years
Wallace Barnes Co. Bristol, Conn.	20 years
Whitin Machine Co. New London, Conn.	24 years
Davis Sewing Machine Co. Dayton, Ohio	25 years
Roanoke Mills Roanoke Rapids, N. C.	30 years
Greenfield Tap & Die Corp. Greenfield, Mass.	33 years



Completely Split for Easy Installation

HYATT ROLLER BEARING COMPANY

Newark, New Jersey

Pacific Coast Address: San Francisco, Cal.

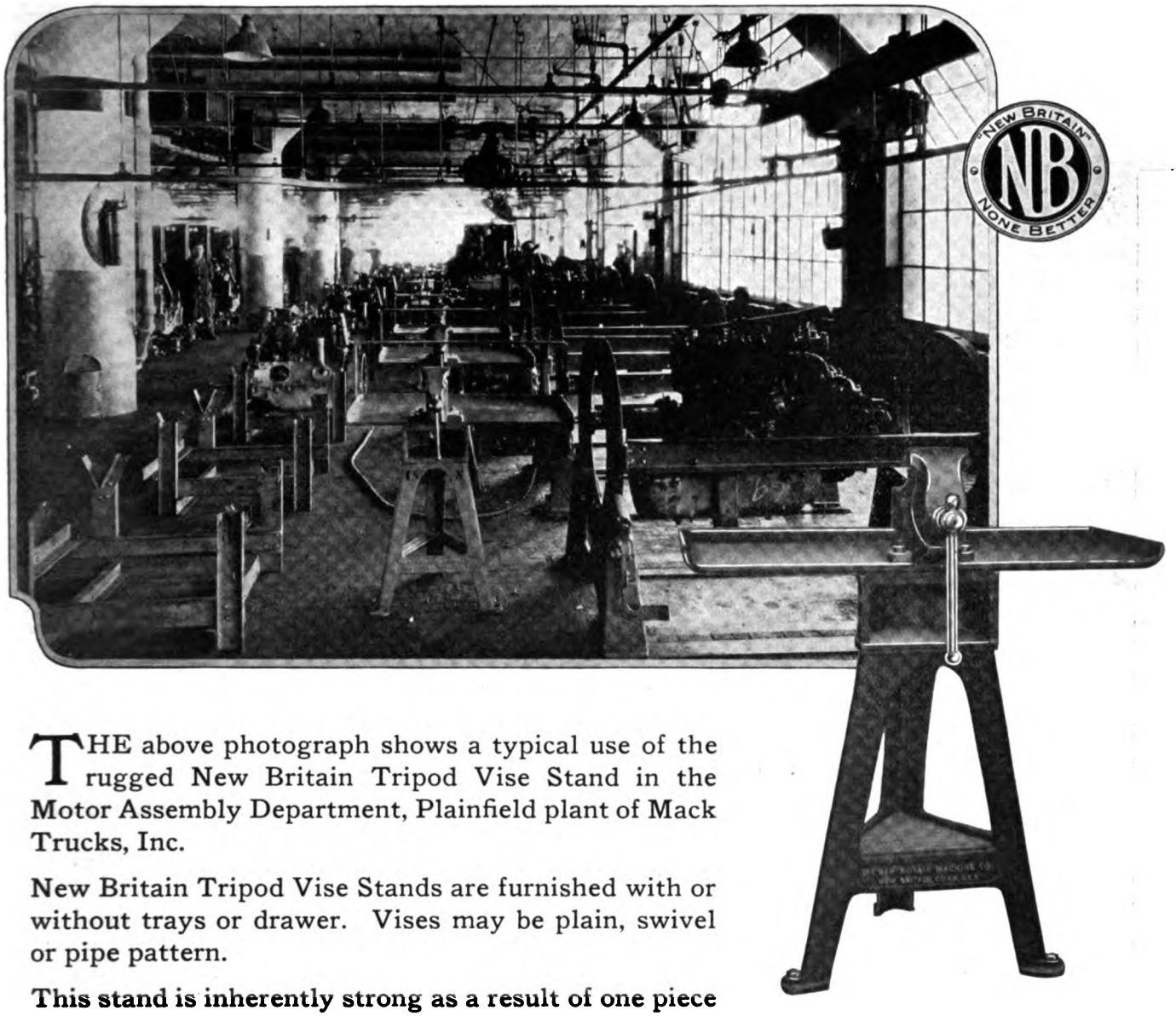
HYATT

ROLLER BEARINGS

Nearly two million Hyatt Line Shaft Roller Bearings are now in use.

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THE above photograph shows a typical use of the rugged New Britain Tripod Vise Stand in the Motor Assembly Department, Plainfield plant of Mack Trucks, Inc.

New Britain Tripod Vise Stands are furnished with or without trays or drawer. Vises may be plain, swivel or pipe pattern.

This stand is inherently strong as a result of one piece construction and rigid on any floor because of three point base bearing.

In your plant there are undoubtedly places where this New Britain Tripod Vise Stand will work out as efficiently as in the Mack Truck Plant.

Special combinations to meet your particular needs can be readily arranged. Quotations promptly furnished.

Size of vise	5	inches
Size of tray	20 x 40	"
Height of stand	34½	"
Weight—as illustrated	375	lbs.

The New Britain Machine Co.

New Britain **Connecticut**

Manufacturers of

NEW BRITAIN SHOP FURNITURE

New Britain Machine Co.
New Britain, Conn.

☐ Send Bulletin on Tripod Vise Stand

☐ Send complete information on full line New Britain Shop Furniture

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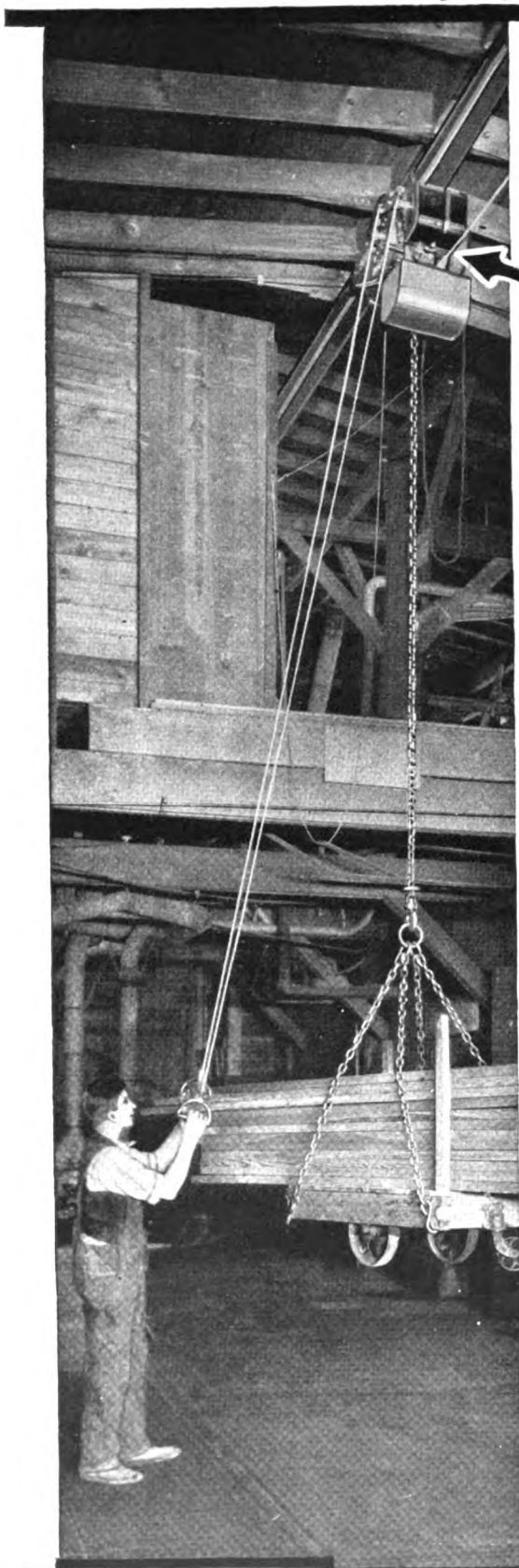
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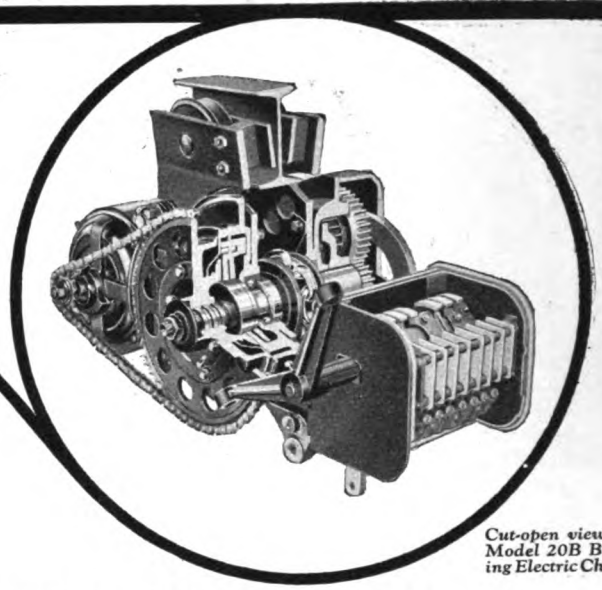
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I.I.626

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TRADE YALE MARK





Cut-open view of Yale Model 20B Ball Bearing Electric Chain Hoist

A Yale Model 20B Electric Hoist solves many handling problems

There's no need for a costly elevator installation on this job. A Yale Model 20B Ball Bearing Electric Chain Hoist and a length of standard I-Beam serve admirably to handle the bulky loads and transport them with promptness and safety—and at a considerable saving in money with a minimum plant investment.

Yale Model 20B Hoists are compact, flexible and the most efficient electric hoisting and handling units made.

Their compactness, due to the use of chain and the centralized ball bearing load sheave, and their strength and safety in the welded steel load chain, all-steel suspension and rugged construction are well known to hoist users everywhere. Every working part of the Yale Electric Hoist is readily accessible for inspection, yet at all times completely protected and easily lubricated.

As a result, Yale Hoists give exceptional service at far less than the average cost per ton or per year.

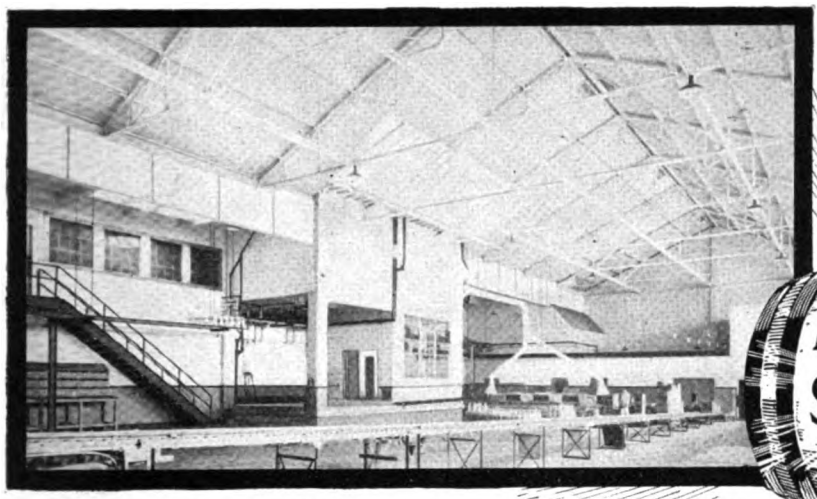
The Yale & Towne Manufacturing Co.
Stamford, Conn., U. S. A.

YALE MARKED IS YALE MADE

YALE Hoisting and Conveying Systems

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Clean, lustrous, lasting white paint



Thousands of industrial plants find the superior qualities of Barreled Sunlight an actual economy in interior painting.



at the lowest cost per sq. ft. of surface covered

A CHECK-UP among hundreds of industrial plants has shown that Barreled Sunlight does the finest possible job of interior painting—and does it *at an actual saving*.

The labor cost of application is less because Barreled Sunlight, containing no varnish, flows on freely with brush or spray—and covers remarkably.

Repainting costs are far lower, too. Once on the ceilings and walls, this paint is good for years of service. Its smooth surface *washes like tile*—and frequent washings will not wear it away.

Made by the exclusive Rice Process, Barreled Sunlight is guaranteed to remain white longer than any gloss paint or enamel, domestic or foreign, applied under the same conditions—also not to flake or scale if properly applied.

Plant lighting is always improved with Barreled Sunlight. Its lustrous surface reflects just the right quantity and *quality* of working light—free from glare.

Barreled Sunlight is sold in 55- and 30-gallon churn-equipped steel drums, and in cans from ½ pint to 5 gallons. Where more than one coat is required, use Barreled Sunlight Undercoat first.

Use the coupon to obtain illustrated booklet and panel painted with Barreled Sunlight.



Washable!

Ceilings and walls painted with Barreled Sunlight are easy to keep clean. Washing removes the dirt but not the paint!

U. S. GUTTA PERCHA PAINT CO.

Factory and Main Offices

5 Dudley Street, Providence, R.I.
New York—350 Madison Ave.
Chicago—659 Washington Blvd.
San Francisco—156 Eddy Street

Distributors in all principal cities

Barreled Sunlight

Reg. U.S. Pat. Off.

U. S. GUTTA PERCHA PAINT CO.
5 Dudley Street, Providence, R.I.

Please send us your booklet "More Light," and a panel painted with Barreled Sunlight.

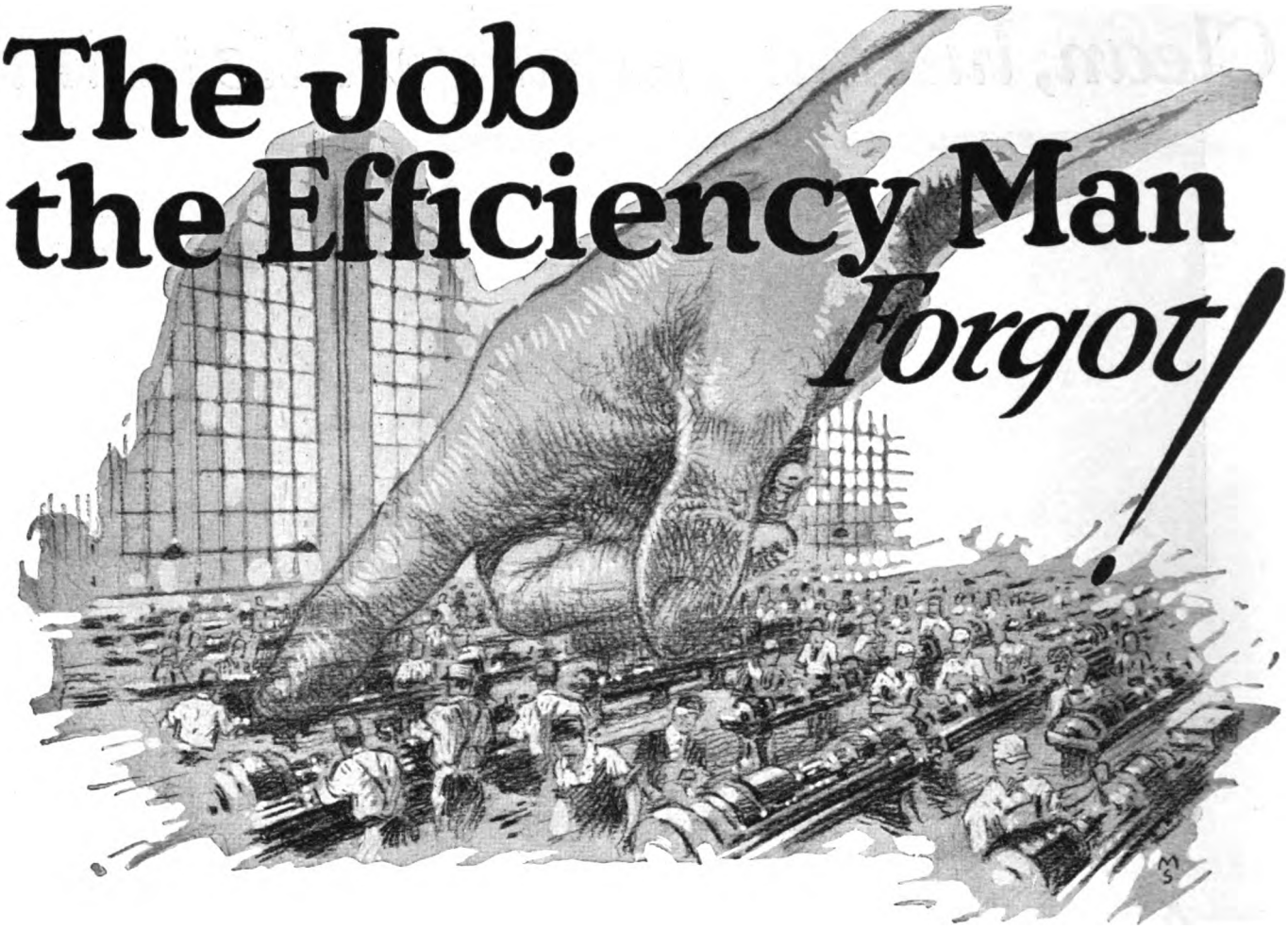
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The Job the Efficiency Man Forgot!



IN ROUTINE of manufacture there are many processes that have become "cob-webbed by custom." Factory ways of doing things often become so standardized by long practice that their cost is regarded as a fixed part of overhead, and possible short-cuts are overlooked.

Each year the Domestic Electric Company searches out such processes—developing new appliance motors to replace costly hand-power with fractional horsepower; improving present motor applications, increasing production capacity, cutting production costs.

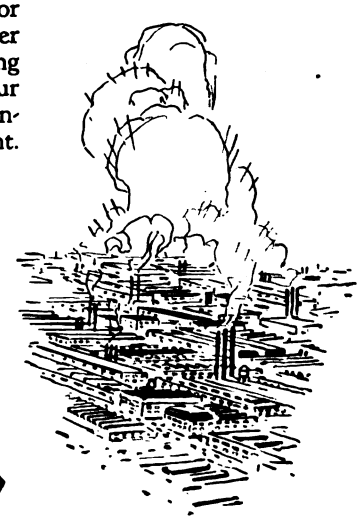
In 12 years devoted exclusively to the development of special motors, Domestic Electric has harnessed fractional horsepower for the service of appliance manufacturers in many fields—on drills, grinders, routers, saws, pipe cutters, sprayers, and other types of industrial machinery, as well as household and commercial appliances.

There is no duplicate of this experience—nor can its advantages be matched elsewhere in this field. Not only does Domestic Electric's highly individualized service assure the most efficient application of motor to job, but Domestic Electric methods bring these results at surprisingly low cost.



Always our engineers are available to help in solving any motor problem for manufacturers who use power in their own production or on commercial, domestic or industrial appliances.

There may be in your business some job or jobs that Domestic motors could handle better and more cheaply than they are now being handled. If so, write us briefly, stating your problem. It will receive the immediate attention of our research engineering department.



DOMESTIC ELECTRIC COMPANY, CLEVELAND, OHIO

Manufacturers of fractional horsepower motors exclusively 70

Domestic Electric Motors

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1780—Wire Scratch Brush. Straight back brush with extra long wires for general use. The wire used in Osborn ScratchBrushes is the first quality tempered steel, drawn especially for scratch brush use.

Long Life— Efficient Service with Osborn Wire Brushes

Painters, above all other workers, demand long wearing service and permanence of cutting qualities in wire scratch brushes.

The fact that Osborn Wire Brushes are well and favorably known among the painting trade is evidence of their better-wearing qualities.

In Osborn Wire Scratch Brushes, the wire is scientifically treated to assure permanent cutting quality—each brush is shaped to make the particular job for which it is intended easier and quicker.

Osborn's standard—A Better-Wearing Brush for Every Use—is fully demonstrated in its line of wire scratch brushes.



28—Bridled Casting Brush. This brush contains more wire than the ordinary casting brush. Heavy sheet iron bridles minimize vibration and reduce breakage of end wires. Will give 2 to 3 times the length of service.

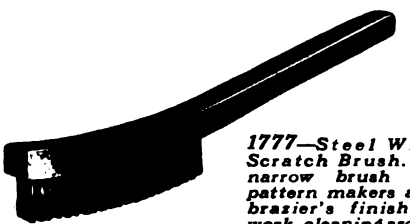


1779—Wire Scratch Brush. Made with curved back. For removing paint, varnish and rust.

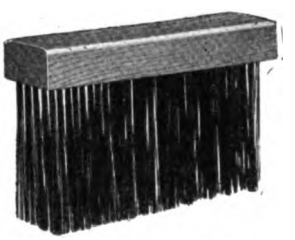
THE OSBORN MANUFACTURING COMPANY
INCORPORATED
5401 Hamilton Avenue Cleveland, Ohio



1781—Wire Scratch Brush. Standard Shoe Handle Brush for household, auto or factory use.



1777—Steel Wire Scratch Brush. A narrow brush for pattern makers and brazier's finishing work, cleaning architectural iron work, figured brass and small castings.



7—Plain Wire Casting Brush. Made of special tempered flat steel wire —very strong and durable. Made in several sizes.

OSBORN

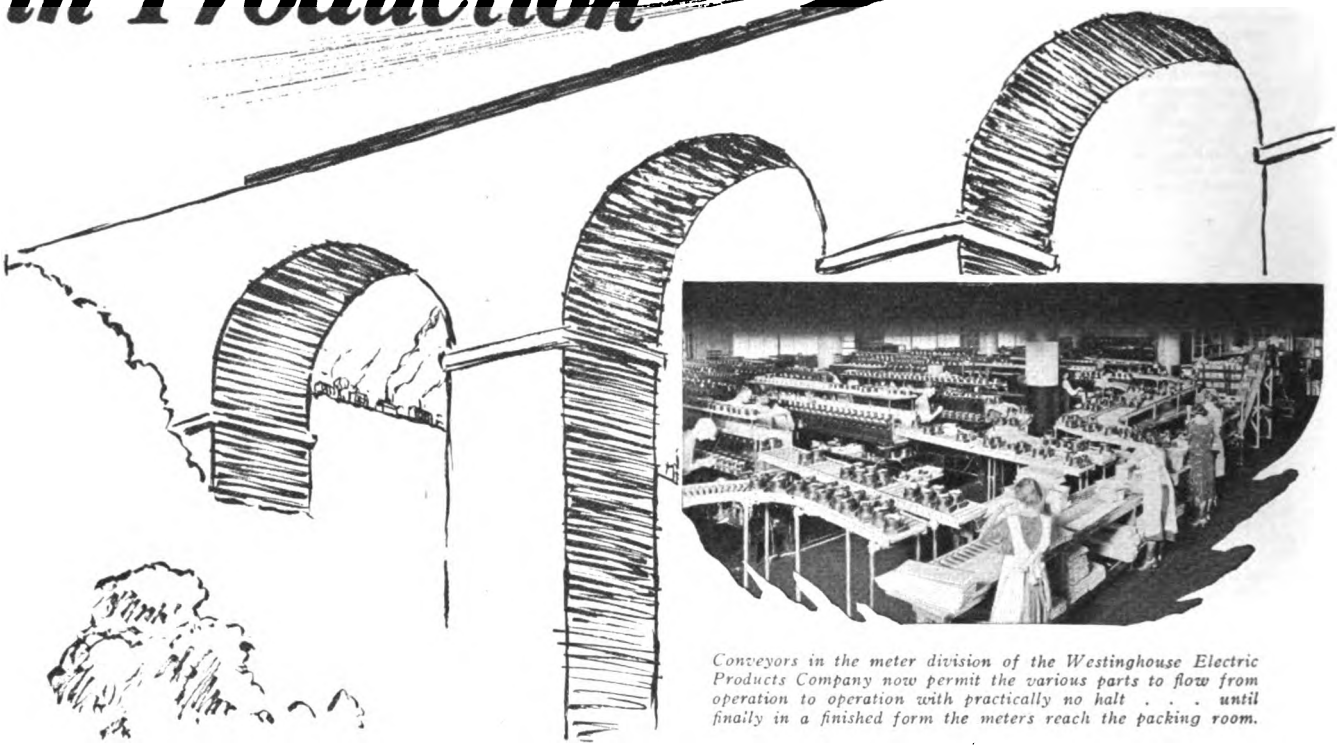
Osborn Brushes

A BETTER WEARING BRUSH FOR EVERY USE

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Bridging the Gaps in Production



Conveyors in the meter division of the Westinghouse Electric Products Company now permit the various parts to flow from operation to operation with practically no halt . . . until finally in a finished form the meters reach the packing room.

Lamson Cuts Manufacturing Costs in America's Greatest Factories!

MODERN manufacturers have come to know that the largest cost savings of to-day come from efficient handling and transportation rather than from the mere making. The successful industrial executive has learned that insofar as possible work in his plant must flow by, while highly-paid workmen remain in place on their jobs.

Because these facts have become the basic principles of modern manufacturing, America's industrial leaders have sought out Lamson . . . conveyor engineers, designers and makers who for nearly half a century have been successfully eliminating waste in factory operation, in materials handling and in factory routing.

The savings and economies effected by Lamson designed conveying equipment have resulted in Lamson engineers being invited to have a part in the designing and manufacture of conveying equipment in plants which are representative and international in scope. Lamson equipment has made possible huge savings in the General Electric Plant, Robbins & Myers, Westinghouse Electric Products Company, Quality Biscuit Company, National Cash Register Company, Atwater-Kent Mfg. Company, Stromberg Mfg. Company, Russell Miller Milling Company, and hundreds of others of equal size and with equal success.

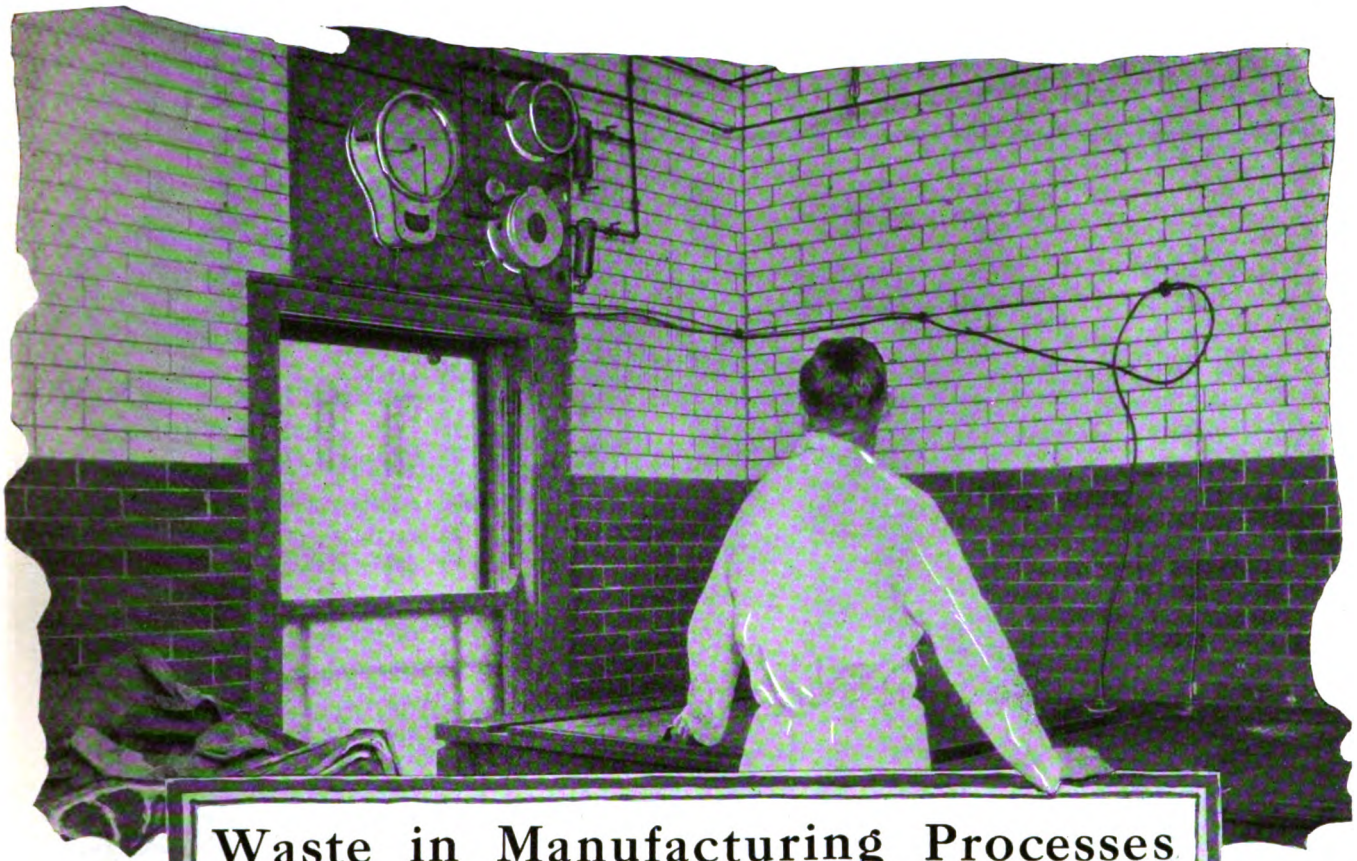
Regardless of your problem—even though it be but the proper placing of a length of gravity or maybe a whole series of conveyors which will link an entire industrial establishment and re-route the manufacturing movements of an entire factory—you will find Lamson equipment and engineers qualified and willing to co-operate with you in solving your materials handling problem.

THE LAMSON COMPANY
SYRACUSE, NEW YORK

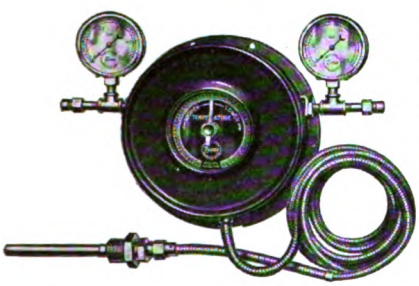
LAMSON·CONVEYORS

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Waste in Manufacturing Processes Eliminated with *Tycos* Temperature Control



Tycos Automatic Temperature Controls for all Industries

One of the results of accurate temperature control has been the elimination of spoilage of products and its wastes. Thousands of plants in every industry now safeguard their products with *Tycos* Pressure and Temperature Control Instruments.

For instance: at the Chicago Sausage Company where meat products are prepared, *Tycos* Instruments are used to insure proper temperature control. These instruments are used in connection with the boiling vats where approximately 100 hams are cooked at one time. The *Tycos* Instruments have entirely eliminated dependence on the human element and have reduced to a minimum all possible losses.

In like manner you will find *Tycos* Instruments controlling temperature in the baking of enamel, the roasting of coffee, the distilling of asphalt, the cooking of varnish, the sterilizing of jars, the heating of metals, the drying of lumber, or one of the hundreds of other uses—*Tycos* Instruments can be depended upon at all times to indicate, record or control the process.

We have issued a series of bulletins covering every phase of temperature control. Tell us what your temperature difficulty is and we will send a bulletin covering your particular problems. No obligations.

Taylor Instrument Companies

ROCHESTER, NEW YORK

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Tycos Building
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Manufacturing Distributors
in Great Britain
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Tycos Temperature Instruments

INDICATING · RECORDING · CONTROLLING

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ROCKWOOD *Instant* PULLEY SERVICE



if

You Required a Different Size Rockwood Paper Pulley Every Working Day

it would take you more than seven years to buy each one of the 2194 sizes in Service Stocks from Coast to Coast

FORTY years ago Rockwood gave to industry a new pulley —a pulley of paper, unequalled to this day. And now Rockwood gives a service worthy of the pulley —coast to coast service which places 2194 different Rockwood Paper Pulley sizes almost at the very doors of users and dealers throughout the nation.

Pulley replacements formerly meant delay and high prices. Now —with Rockwood *Instant* Service —they are a matter of hours or minutes only—and prices are lower. Now—you or your dealer may get from our local service stock near you, any one of the 2194 different sizes of Rockwood Paper Pulleys—1½ to 14 inch diameters.

No more uncertainty—no more waiting for the factory to make the pulley. The Rockwood Paper Pulley of the right size is always waiting nearby—wrapped ready for *instant* delivery. Only Rockwood gives you this service. Only Rockwood *could* give it. And only Rockwood produces such a pulley —a pulley that grips so hard and slips so little that it has become standard factory equipment on 90 percent of all belted electric motors. *Rockwood has solved your pulley problem!*

Order from the nearest Rockwood Paper Pulley Service Stock, giving diameter of the pulley wanted, width of belt to be used, size of shaft and dimensions of keyway in shaft.

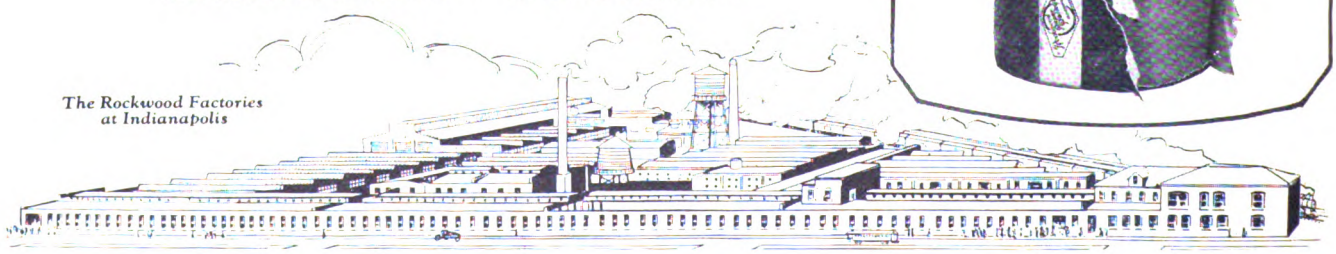
THE ROCKWOOD MFG. CO. - INDIANAPOLIS, U. S. A.

SERVICE STOCKS
from Coast to Coast
Rockwood Paper Pulley Stores, Inc.

ATLANTA, GA.—All Sizes 1½ to 12 in. dia.
Fulton Supply Co., 70 Nelson St.
BALTIMORE, MD.—All Sizes 1½ to 10 in. dia.
Carey Machinery & Sup. Co., 119 E. Lombard St.
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Matthews Electric Supply Co.
BOSTON, MASS.—All Sizes 1½ to 14 in. dia.
Olmsted-Flint Corp., Cambridge.
BUFFALO, N. Y.—All Sizes 1½ to 10 in. dia.
Root, Neal & Co., 178-180 Main St.
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Spaulding Electric Co., 1344 Michigan Ave.
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Rockwood Paper Pulley Stores, 1801 English.
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Webb Belting Co., 1501 West Twelfth St.
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LOUISVILLE, KY.—All Sizes 1½ to 8 in. dia.
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Julius Andrae & Sons Co., Broadway and Mich.
NEW YORK CITY—All Sizes 1½ to 14 in. dia.
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A. W. White, 424 West Reno St.
OMAHA, NEB.—All Sizes 1½ to 8 in. dia.
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Ready to Deliver!





The Rockwood Factories at Indianapolis

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another example of the national fetish for *cleanliness*

Cleanliness is a national habit. We feel better and *work* better for being clean. These days, even the small boys wash behind their ears.

All Schieren Belting is *scoured*—cut from a strip of the hide along the backbone it is literally washed behind the ears. We, too, are of the herd whose god is cleanliness.

Years ago we found that a scoured leather was more pliable. Hard, grit filled belts wore themselves out quickly. They resisted every impulse to bend them around pulleys.

We scour our belts to minimize the resistance of sharp turns and bends. Schieren Belts are soft and pliable, and they work better because they are clean.

DUXBAK BELTING TRADE MARK

Chas. A. Schieren Company ESTABLISHED 1868

Tanners

Belt Manufacturers

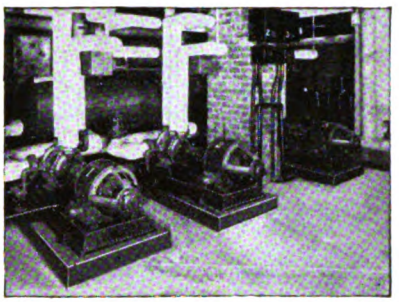
Main Office and Factory

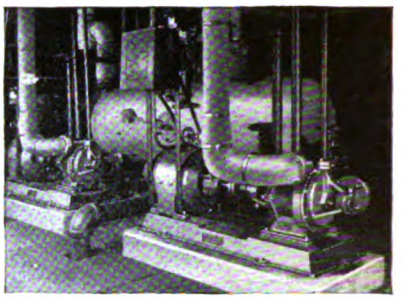
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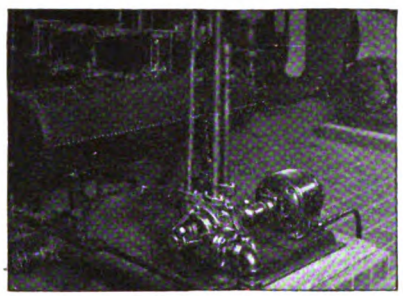
Branches and Distributors in All Principal Cities

Chas. A. Schieren Co., 31 Ferry St., New York
Gentlemen: Please send me your book that answers questions on belt care and operation.
Firm Name .....
Address .....
Signed by .....

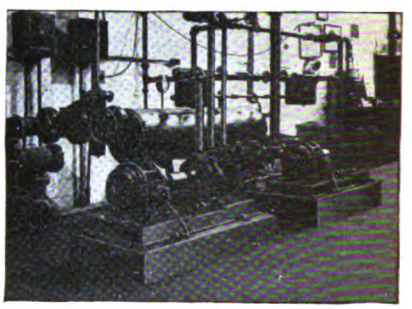
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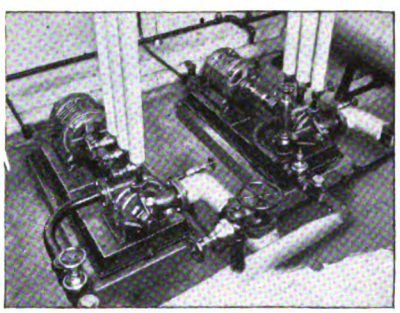




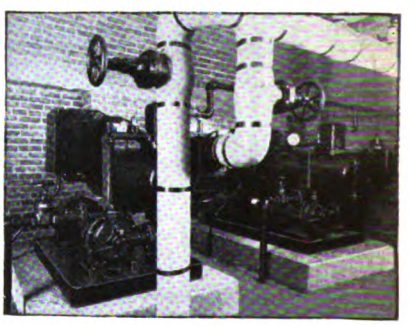
Of thousands in use all are making good



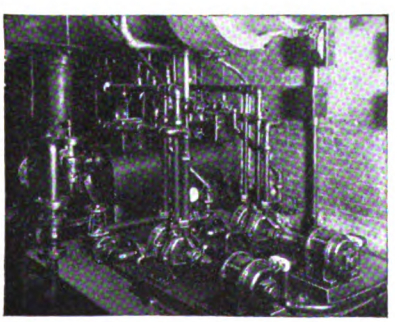
Every one of the thousands of Jennings Pumps now in use for removing condensation and air from return line vacuum steam heating systems is making good. It is giving the dependable and economical service that distinguishes superior Jennings equipment.



There is no metal-to-metal contact inside a Jennings Pump that can cause wear, resulting in decreased vacuum. High efficiency is constantly maintained. The air is withdrawn from the return line independently of the water. It is discharged without back pressure directly to the atmosphere. Result —motor power is saved, often as much as 50% of that required by other equipment of equivalent capacity.



Write for our bulletins which give complete information.

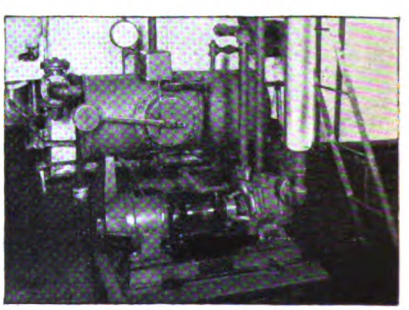


NASH ENGINEERING COMPANY

So. Norwalk **Connecticut**

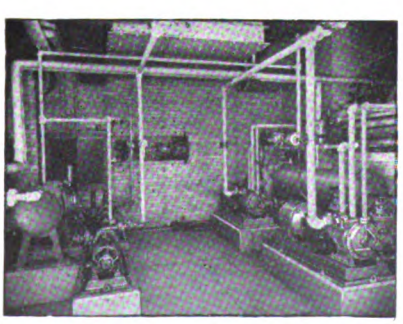
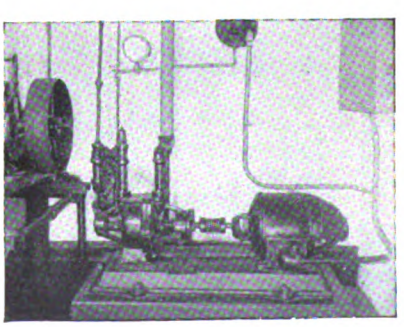
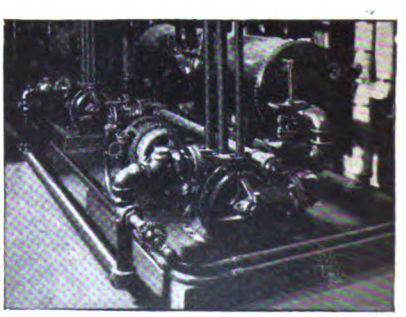
Branch Sales Offices in: Atlanta, Boston, Buffalo, Chicago, Cleveland, Dallas, Denver, Detroit, Houston, Indianapolis, Kansas City, Los Angeles, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, Portland, Richmond, St. Louis, Salt Lake City, San Francisco, Seattle, Washington.

In Canada: Montreal, Toronto and Vancouver.



Jennings Pumps

RETURN LINE AND AIR LINE VACUUM PUMPS CONDENSATION AND CIRCULATING PUMPS

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Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures

JOHN H. VAN DEVENTER, *EDITOR*

W. THOMSON LEES
Associate Editor

ADOLF SCHILDKRAUT
Art Director

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SPECIAL NOTICE

A double-page advertisement of the Chas. A. Schieren Company, of New York, appeared on pages 68 and 69 of the April number of INDUSTRY ILLUSTRATED, and featured as a background an article on "The Control of Mechanical Power Transmission" by William Staniar, Belting and Transmission Engineer of E. I. du Pont de Nemours & Company, which had previously appeared as editorial material in the September and October issues. The use of this material for advertising purposes was without Mr. Staniar's knowledge or consent, and the publishers regret that it should have caused him embarrassment.

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Tips on Tooling

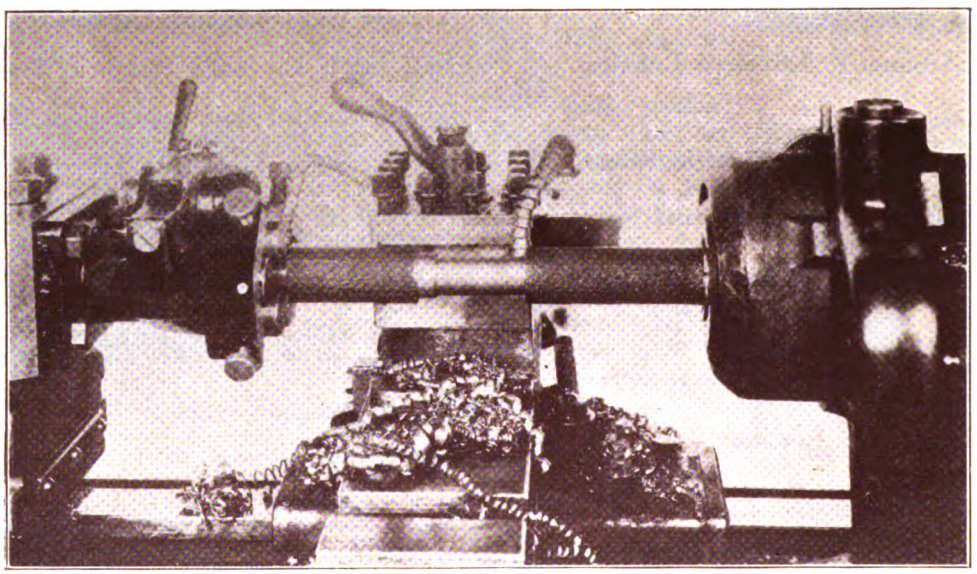
Better Methods for Bar Work

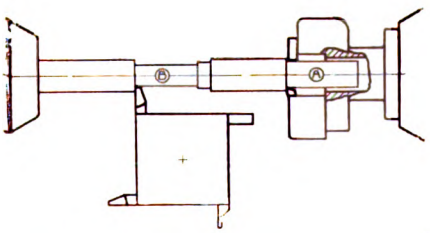
By M. E. Lange, Production Engineer, and H. P. Bailey, Assistant to the President,
The Warner & Swasey Co., Cleveland, Ohio.

MODERN tooling for machine tools not only increases the production but at the same time reduces the tooling cost. While the problems of tooling vary in each plant according to the type of work produced, the fundamental principles of "better methods" may be applied to all plants, whether the quantities produced are large or small.

One of the important machine tools in every metal working plant is the turret lathe, for producing turned parts in quantities of five or more in a lot. The three fundamental principles for increasing turret lathe production through proper tooling methods are:

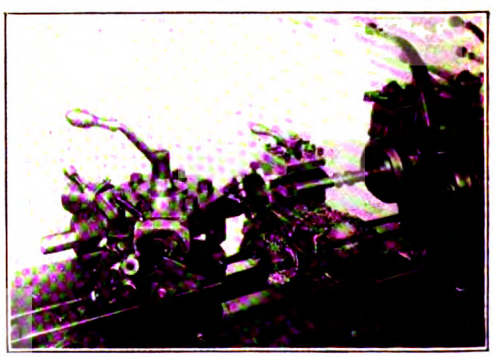
1. Combined cuts; by taking cuts from both the square turret station and from the hexagon turret station at the same time.
2. Multiple cuts; replacing single cuts from one of the tool stations with two, three or more cuts from the same tool station.
3. Rigid tooling for heavy feeds; providing exceptionally rigid tooling which will permit heavy feeds without destroying the accuracy required.

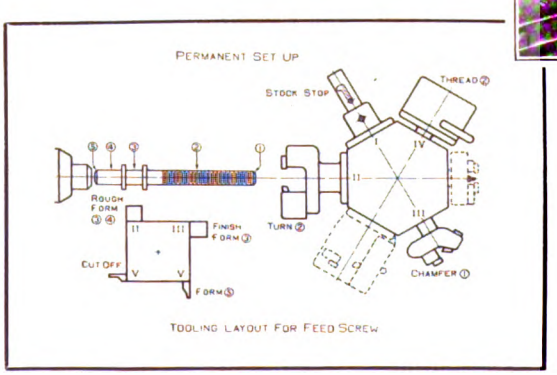




This shows an application of the principle of "combined cuts." The tool on the hexagon turret is turning Diameter A, while the tool in the square turret is turning Diameter B. This gives two tools, cutting at the same time, and reduces the time to almost one-half for a considerable part of bar work.

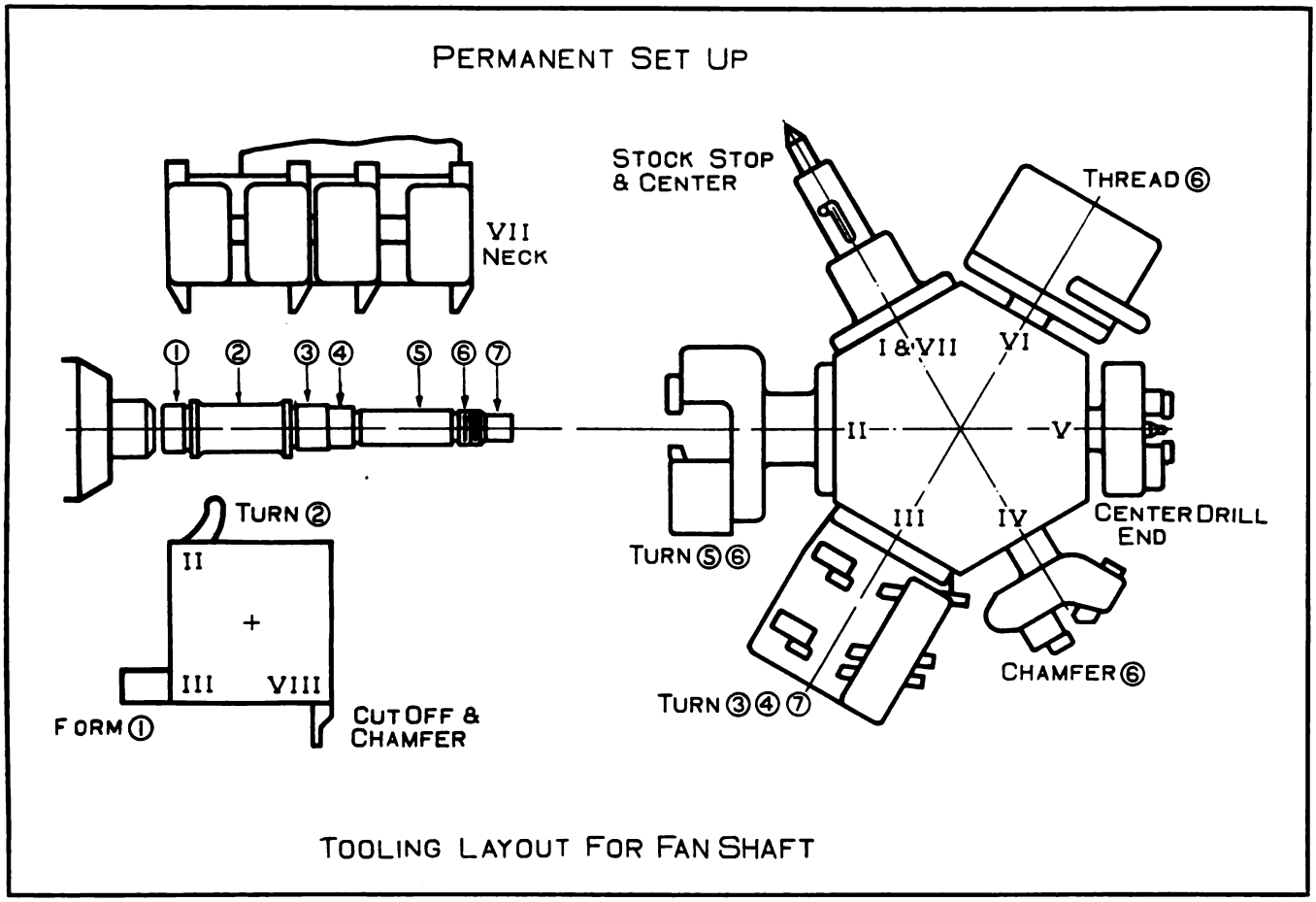
On this page are shown two examples of the principle of "combined cuts" on a turret lathe. In each case, the drawing shows the detail of operations, while the accompanying photograph shows the actual operation in process.





Another example of the important principle of "combined cuts" is here shown. A brief study of the tooling layout shows that Diameter (2) is turned with a single cutter turner on the hexagon turret while Diameters (3) and (4) are formed with forming cutters held in the square turret.

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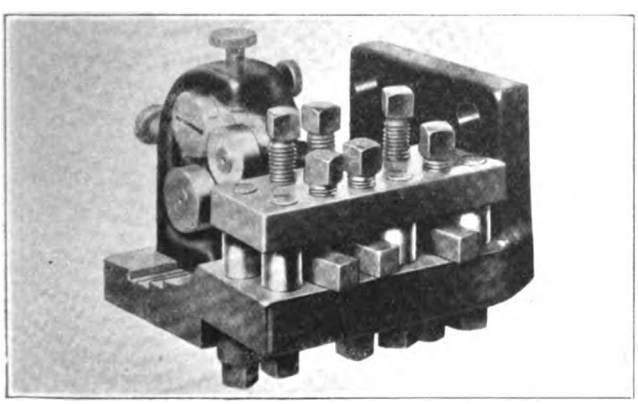
The above drawing shows the principle of "multiple cuts," as explained in the text, and as shown in operation in the photograph below.

Multiple Cuts

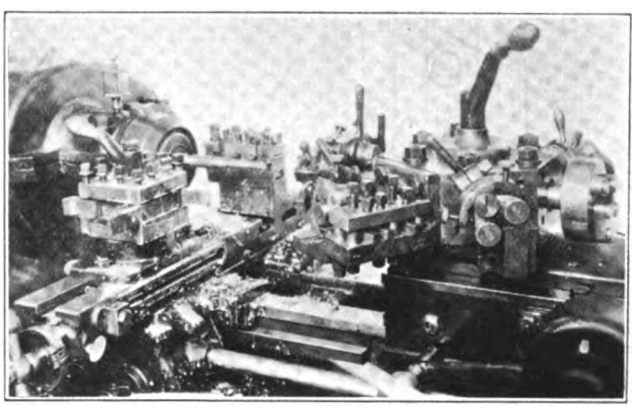
THE principle of "multiple cuts" for bar work is well shown on this page. The piece is an automobile fan shaft with several diameters and shoulder distances, and produced in quantity lots. A multiple cutter turner shown in the small illustration carries three cutters at A, B and C. The rollers at the back of the tool ride on Diameters (3) and (5) at the same time turning Diameters (3), (4) and (7).

This makes possible the taking of three cuts simultaneously, at the same time maintaining always the necessary accuracy.

Another illustration of "multiple cuts" is the necking tool at the rear of the cross slide, as shown in both the photo and layout. This takes four necking cuts at one time while the shaft is supported by the center in the hexagon turret. This tool has provision for adjustment for different jobs, and is in every way a standard, universal type of tool.

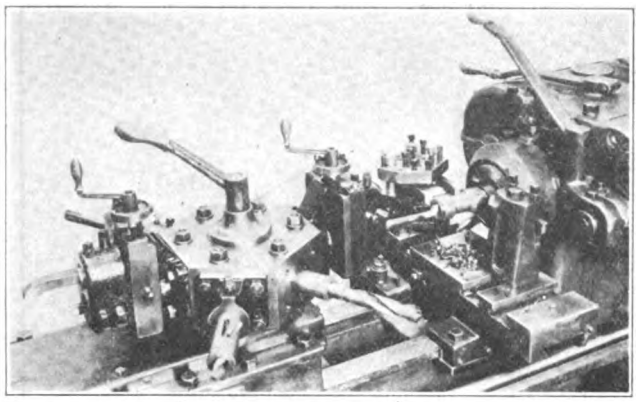


A multiple cutter turner, carrying three cutters. The rollers at the back ride on Diameters (3) and (5) at the same time turning Diameters (3), (4) and (7).

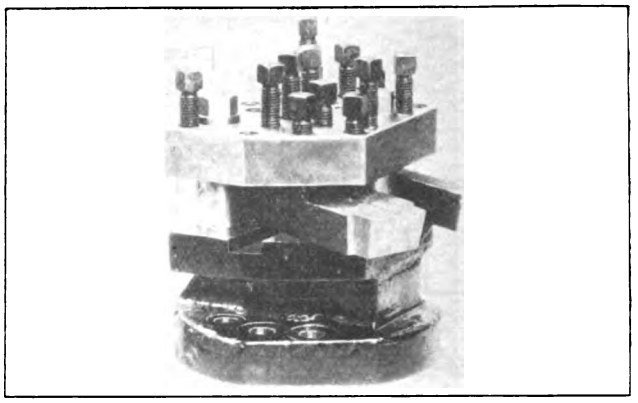


The piece being machined is an automobile fan shaft with several diameters and shoulder distances. This shows it being produced, while the other illustrations on this page show the details of operation.

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This shows the principle of "rigid tooling," to permit heavy cutting feeds on bar work.



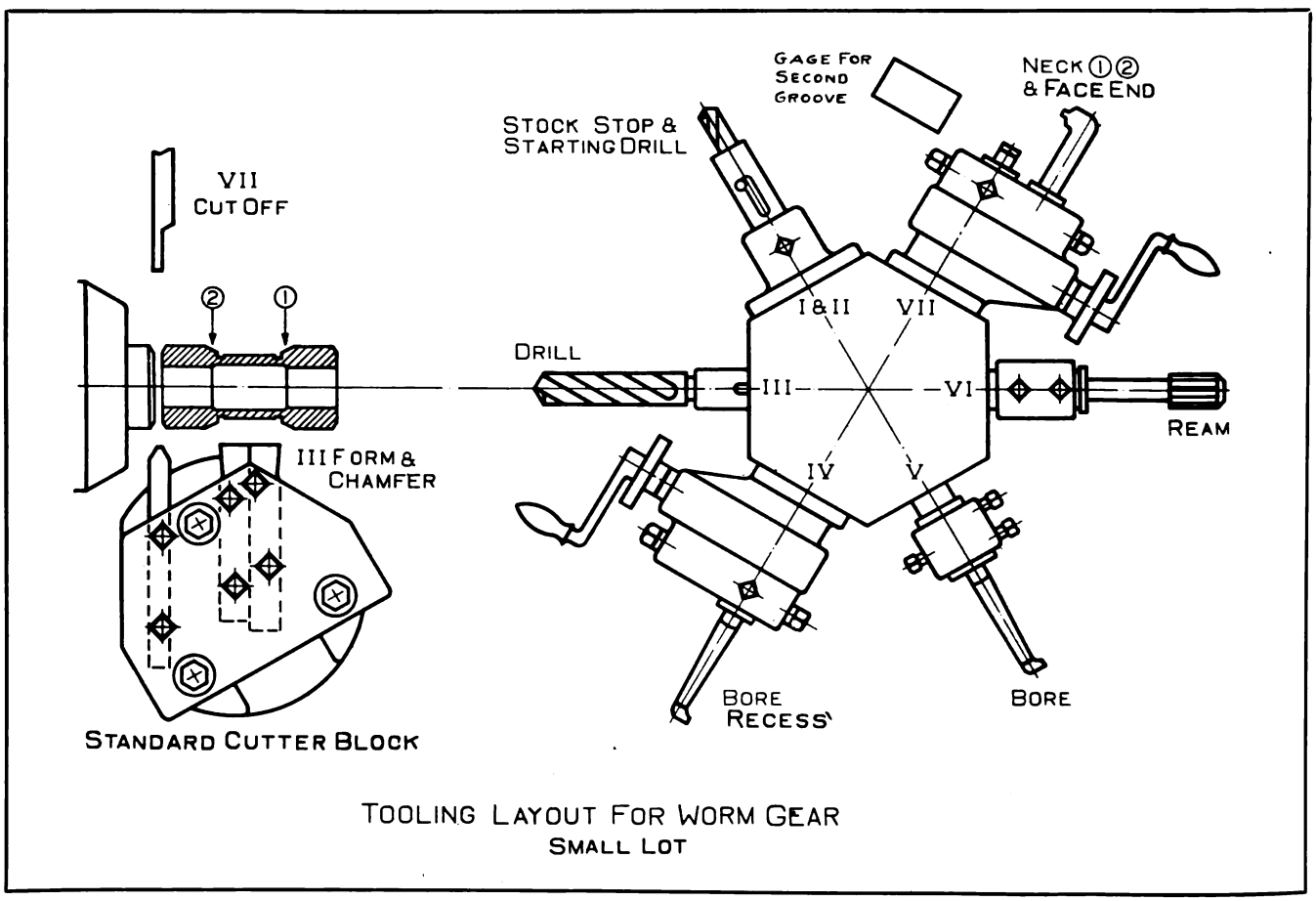
The front cross slide cutter block, used for forming and chamfering. This replaces the usual tool post.

Rigid Tooling

IN order to increase production, heavy feeds of the cutting tool are desirable. It is very necessary, however, to provide rigidity in the tools so that the required accuracy will not be destroyed. Obviously, there must be no "give" to the tool.

Illustrations on this page show how this is done in a common type of bar work. The heavy construction of the vertical slide tools in Positions IV. and VII. of the hexagon turret makes possible heavy cuts while maintaining accuracy. The micrometer dial gives quick adjustment to size and allows accurate stopping of recessing cuts.

Note the front cross slide cutter block used for forming and chamfering. This tool replaces the usual tool post and will hold simple bits or forged cutters for "multiple cutting" from the front or rear of the cross slide. This standard Universal block gives all the advantages of special multiple cutter holders at a very low cost. The tool is also designed so that it is suitable for a great variety of uses without change.



In this layout of tooling, note the heavy construction of the vertical slide tools in positions IV and VII of the hexagon turret; permitting heavy cuts without sacrifice of accuracy

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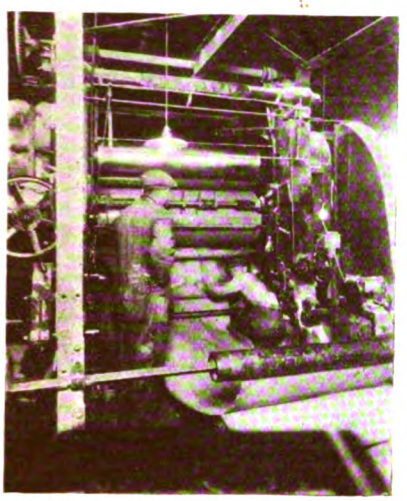


Fig. 1. A six feed mechanical force feed lubricator serving the bearings of a rubber calender. Dust, chemicals, high pressure and temperatures complicate the lubrication of rubber plant equipment.

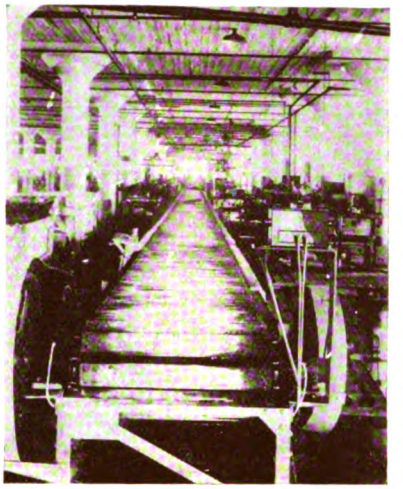


Fig. 2. The modern conveyor, where exposed to water, acid, dust, etc., requires protection of its roll bearings as well as positive lubrication. This the force feed lubricator accomplishes.

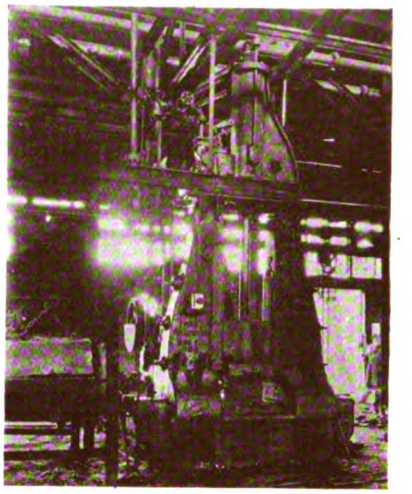


Fig. 3. Steam cylinders can also be served effectively by pressure lubrication. To withstand shocks, the lubricator on this steam hammer is mounted on a spring-floated base plate.

Pressure as an Adjunct to Effective Lubrication

By Allen F. Brewer

THE matter of lubrication today is becoming more and more a problem of developing positive means of application of oils and greases. In effect, positive lubrication may be said to be the secret of modern industrial and power plant machinery operation.

It is quite natural, in consequence, that pressure lubrication should have come to the fore in this regard. As probably the most reliable means of attaining positive lubrication of all machine wearing elements to which applied, it is certainly an insurance in favor of efficient operation, and conducive to less worry.

Pressure lubrication whether the lubricant be oil or grease is, generally, more positive than those other means of automatic lubrication which depend on hand adjustment or involve only flow of oil or grease by splashing or temperature fluctuations, etc. Systems of these latter types give but little if any pressure to the lubricant in its course through bearing clearances. They are, therefore, more or less ineffective in case oil ducts or other parts of a bearing lubricating system may be clogged with dirt or gummy matter. Forcing of oil or grease, on the other hand, under pressures ranging up to one or two thousand pounds will generally serve to effectively dislodge any such accumulations.

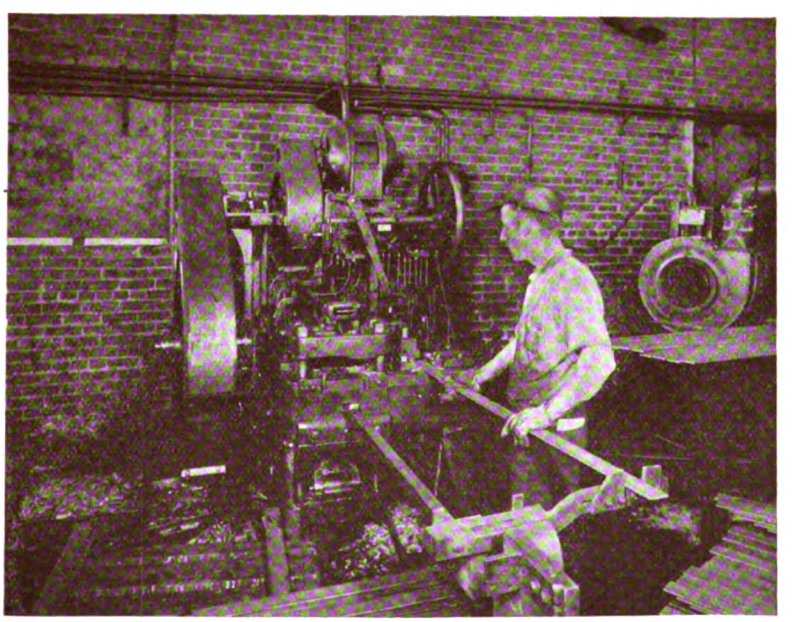


Fig. 4. In the automotive industry production has been speeded materially by improvements in pressure lubrication. As an example this force feed lubricator has practically eliminated maintenance problems on the automotive spring eye forming machine.

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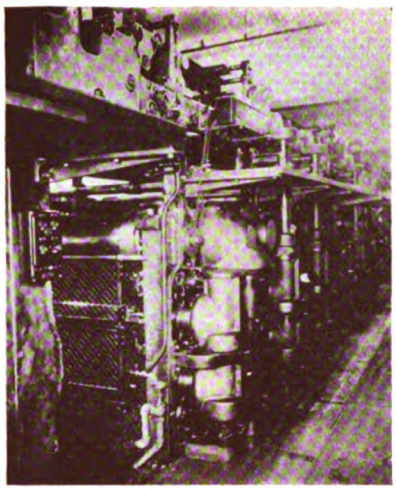


Fig. 5. A 49-feed rotary drive lubricator serving the bearings of a newspaper press. Figure the saving in work, and the elimination of possibility of ruined paper through oil-drip, etc. Note chain drive from press to lubricator.

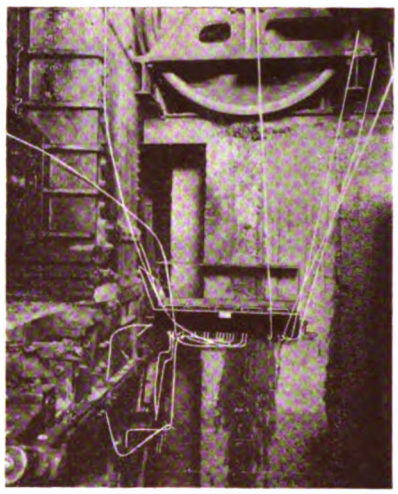


Fig. 6. Even the brick machine profits by pressure lubrication. There are 36 feeds from this particular lubricator. On massive machinery, especially where production demands are high and labor is careless, automatic pressure lubrication is a decided asset.

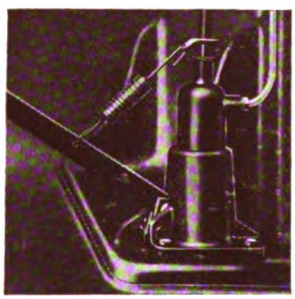


Fig. 7. The plunger pump of a centralized pressure oiling system, showing foot pedal, and intake and discharge lines.

keeping all clearance spaces and oil grooves free from foreign matter.

Oil delivered under pressure will also in many cases serve as a bearing coolant, as, for example, in the modern force feed lubricating system as applied to the steam turbine. Many industrial bearings, of course, will not be subjected to severe temperatures, nor will their clearances be as low as in the steam turbine. On the other hand, flood lubrication under pressure will, by this factor of heat removal, enable lubricating oils to function more nearly at their intended viscosity, commensurate with rotational speeds and bearing pressures involved.



Fig. 8. The oil control header of a centralized pressure oiling system, showing relation of intake to valves, oil chambers and distributing pipes.

Pressure lubrication is also embodied in the mechanical force feed lubricator, so adaptable to industrial machine bearing lubrication. Capable of delivering oil in predetermined and accurately regulated quantities to perhaps two or three dozen parts of a machine, according to the number of connections, it is a most desirable piece of equipment in the insurance of positive lubrication. By virtue of its general inability to serve as an oil recirculating device, however, the mechanical force feed lubricator will require more frequent replenishment of its oil reservoir than will a force feed circulating system. As a rule, oil in the former is used but once, unless provision is made for collecting it in suitable drip pans after it has passed through the bearings. If this is done, all used oil accumulated can be readily purified or filtered to render it suitable for re-usage. In lieu of this, it is customary to so regulate the flow in drops to the respective wearing elements, that just the right amount will be furnished to develop effective lubrication.

The average mechanical force feed lubricator is usually decidedly economical due to the fact that operation of its pumps depends upon the operation of the machine to be lubricated, direct connection being made by a lever or ratchet arm to some reciprocating element on the latter. Flow of oil, therefore, ceases automatically with the stopping of the machine. In addition, the rate of pumping is directly dependent upon the speed of the connected machine element. As a result accurate regulation of oil flow is readily attainable with very little possibility of waste.

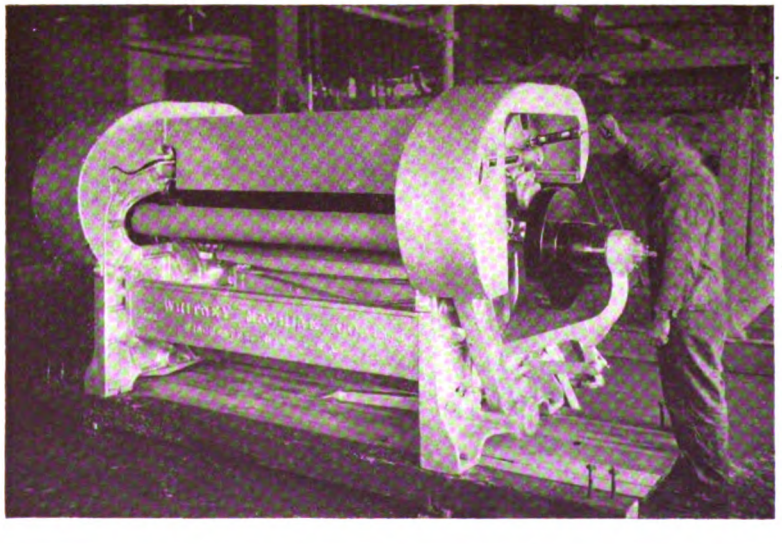


Fig. 9. In the tanning industry pressure grease lubrication is especially advantageous, as a means of counteracting the detrimental effects of dirt, water and tanning fluids on bearings.

Centralized pressure lubricating systems as adopted for the

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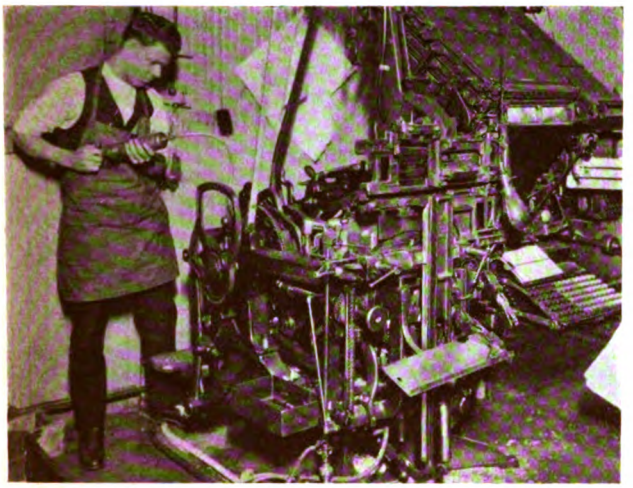


Fig. 10. The linotype machine is a multitude of intricate working elements. Its operation is almost human, but to attain results all bearings must be effectively lubricated. The pressure gun for this purpose is an asset.

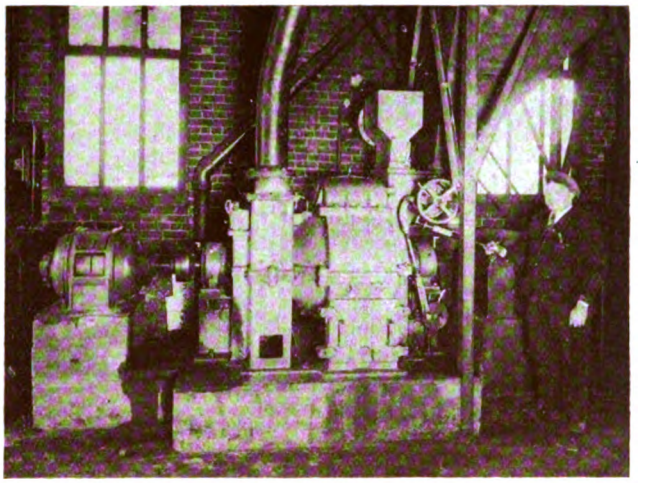


Fig. 11. In the power plant, too, must we conserve energy—both human and mechanical—for that leads to coal conservation. So this coal pulverizer has become a subject for pressure lubrication, by the simple application of proper fittings and a hand pressure gun.

lubrication of certain motor car chassis parts also require mention. They are in principle much akin to mechanical force feed lubricators being designed to function automatically and deliver oil via suitable piping leading to the various parts requiring lubrication. Such pipes come together at a central tank or reservoir which is connected with a suitable pump capable of operation by either hand or foot power, according to its location.

Such systems, in addition to their adaptability to the automobile chassis, are also suited, with perhaps certain modifications, to the oiling of industrial machinery. They are all especially fool-proof and dust-proof in their design and operation. Unlike the mechanical force feed lubricator, however, they depend upon the operator for the manipulation of their pumping or re-charging elements.

The use of pressure in the delivery of grease to machine parts requiring lubrication has also been developed to a high degree of perfection and positiveness. The so-called compression grease cup was the earliest means of bringing this about. It is still used; but higher pressures and more effective lubrication have been rendered attainable by the pressure grease gun with its accompanying fitting or lubricator. While perhaps not as economical of grease as the compression cup, it is in general more of an insurance that lubricant is being forced to all parts of bearings, etc., and that foreign matter or deteriorated grease are being expelled.

Of such equipment, the constant pressure grease lubricator used in connection with a grease gun for filling is in many cases a solution to the problem of economical pressure grease lubrication. Such a device supplies the lubricant with very little chance of waste.



Fig. 13. And back to the motor car; with a grease gun filling a lubricator, which is capable of delivering grease automatically to this king-pin bearing.

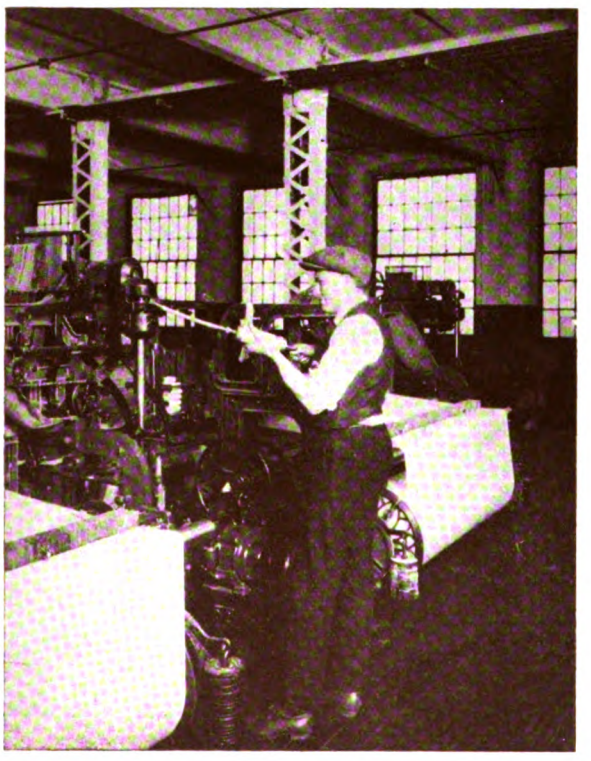


Fig. 12. The textile industry, too, is a fertile field for pressure grease lubrication, for the latter means more effective protection of costly yarns and fabrics. Note the pressure gun here serving a worsted loom.



Fig. 14. Pressure grease lubrication of hanger bearings is a practical means of overcoming many difficulties and preventing splashed or dripped lubricants.

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Fig. 1. Looks like a parade, but it is the usual sight in one of the large electric manufacturing plants where different types of trucks are assigned to hauling jobs for which they are best fitted.

The Wide Range of Modern Electric Roustabouts

They Have Sold Themselves to Every Branch of Industry

By F. C. Eibell

IN the short span of twenty-five years, electric industrial trucks and tractors have risen from the status of the unknown and untried through a maze of labor opposition, prejudice, ignorance, and the tremendous difficulty often experienced in proving the obvious, to the place where today they are accorded full consideration in the solving of American Industry's intra-plant transportation problems.

The economy of electric industrial trucks and tractors as applied to a particular job can be easily reduced to a cold dollars and cents basis. The far-reaching possibilities that such a system holds frequently causes manufacturers to take the attitude of the old "hill-billy," who, on seeing his first giraffe, insisted: "'Tain't so, they ain't no sech animal."

Always foremost among the world's large and speedy producers, American manufacturers of late years have reflected the influences of the telephone, telegraph, automobile, aeroplane,



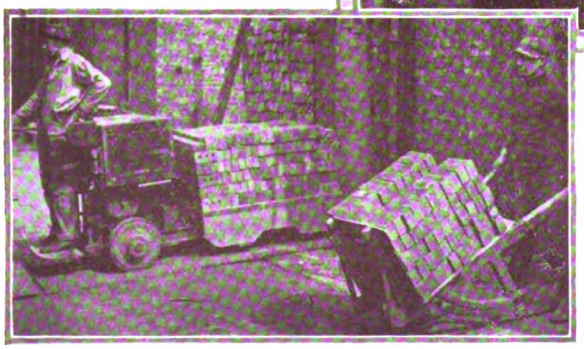


Fig. 3. Four times as many brick, hauled at four times the speed. Empty skids are placed inside the kiln and the brick loaded onto them. The track runs into the kiln, picks up a loaded skid and carries it direct to the cars for shipment.

Fig. 2. (Center) Explosives are as safely handled by this method as by any other. The Arsenal shown here gets its cartridges and other equipment with the help of storage battery trucks. A good load? Ask any of the boys who have taken their exercise at an ammunition dump.

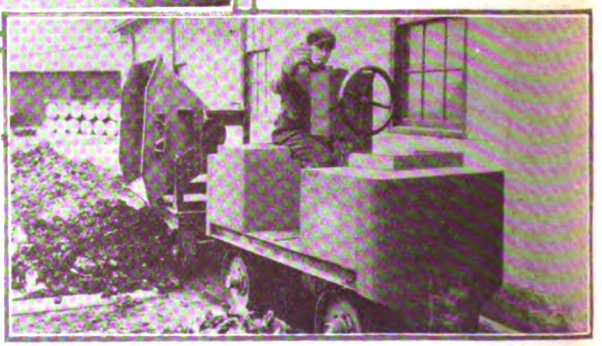


Fig. 4. Dumping the load. 27 cu. ft. is carried by each of these dump body equipped trailers. It is not unusual to see a half dozen of them, hitched to the tractor, making their way to the dump.

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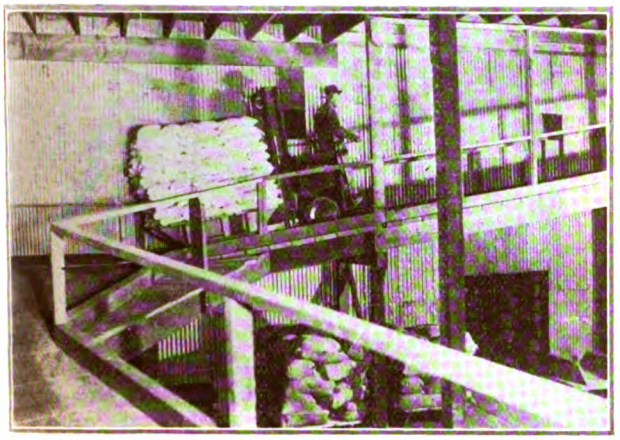


Fig. 5. A day's work for this high lift elevating platform truck consists of 20 trips up this ramp with a load of at least 3,000 pounds on each trip. At its destination the flour is double stacked.

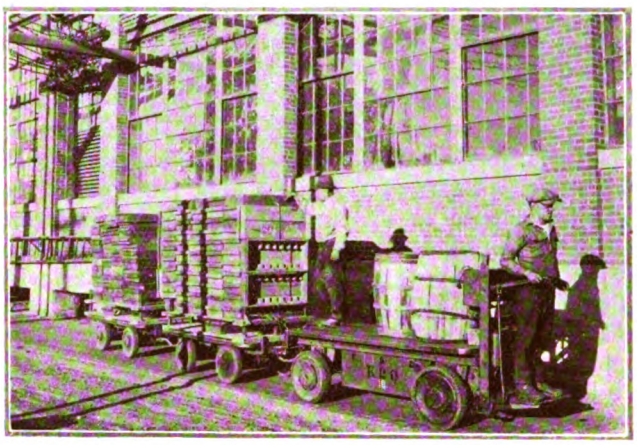


Fig. 6. Handling cores is one of the most unsatisfactory jobs around any foundry. These special type trailers have proved highly satisfactory over rough surfaces in all kinds of weather.

and radio in a mad effort for greater, and still greater production on an ever increasing efficient operating schedule. Today, generally speaking, fewer men are doing far more work than ever before, thanks to the general use of automatic machinery and well designed material handling systems. American labor is better paid than during any period in the history of our country, and working conditions as well as home life have been raised to a higher and far happier plane.

The industrial tonnage formerly handled by tens of thousands of what were termed common laborers is now handled by a relatively few thousand trucks. Compare the capacity of a stevedore, his necessary tiring on the job, and the discontent such heavy work breeds, with the storage battery industrial truck doing this same work. The truck carries a load of 6,000 pounds on each trip, quicker, easier and safer,—the stevedore moves a few hundred pounds. At the end of the morning's work a boost is given the battery, and it is ready for another strenuous shift. When evening comes there are no strained backs or aching muscles; no rupture cases to agonize the worker and add to the unproductive overhead of the manufacturer.

Economy with more speed and greater safety are the outstanding characteristics of storage battery truck and tractor systems. These intra-plant transportation systems, with their various standard and special types of trucks, have enabled thousands of companies engaged in the manufacture of practically everything with which we come in contact to better organize

Fig. 7. Below—A three-way crane truck at work in one of the large steel plants charging the magazine on the recoiling machine with coils of strip steel. Without this truck it would be necessary to use either the overhead crane or a gang of several men.

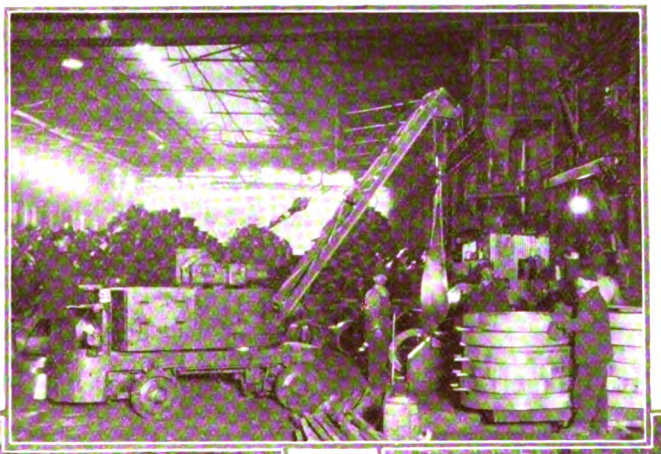




Fig. 8. This truck takes the place of "wheelers" that are now almost impossible to obtain, and does the work around brick plants quicker, better, and more economically than the gangs of laborers ever handled the job.



Fig. 9. There are any number of uses around the average plant for dump body equipment. This manufacturer hauls small parts from process to process by spotting skids equipped with dump-bodies at convenient places. The elevating platform truck moves these on its regular schedule.

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their manufacturing processes, and effect tremendous economies in the cost of handling raw, semi-finished and finished products.

Take the manufacture of brick and clay products as an example of the application of electric industrial trucks. There is, today, no equipment which is getting greater attention, for these trucks have kept hundreds of companies engaged in this industry running at maximum capacity during the past few years when "wheelers" were almost impossible to obtain. When it was evident that additional "wheelers" could not be obtained, storage battery trucks not only proved their ability to keep the plants running at full capacity, but they did the work at a great reduction in cost.

Foundries, one of the most difficult branches of production work to get to make a change in old established ways of doing things, have proved in cases too numerous to mention, the value of electric industrial trucks and tractors. Every job in the foundry from carrying the molten metal to pulling the cupola is being done by these husky little fellows quicker, better and with greater economy than under the old brute strength methods.

If paying for itself in less than a year justifies the installation of any equipment, then railroads and warehouses give ample evidence of the reasons why storage battery tractor systems should be installed.



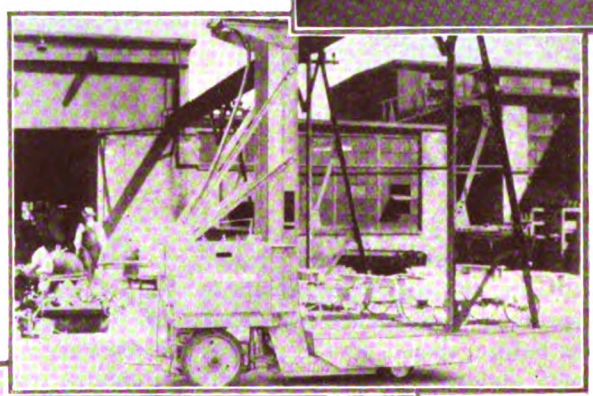


Fig. 10. The electric tractor and trailer system finds a great field of usefulness in freight stations. Visualize the number of hand truckers that would be required here.

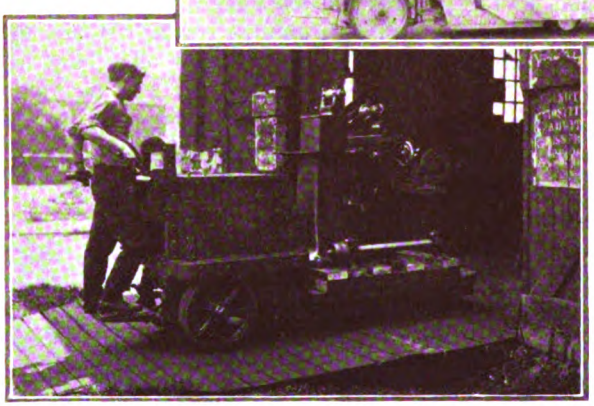


Fig. 11. One of the highest elevating platform trucks yet built. Its platform raises 9 feet. This is just an example of what can be done when conditions require it.

Fig. 12. Just an odd job for the low platform type of truck—the installation of new machinery between its regular schedule haulage trips.

Here are some pertinent facts gathered from the Chicago Warehouse and Terminal Company:

Freight is transferred through 65 miles of tunnels in the city of Chicago.

Seven electric tractors are used to move its narrow gauge freight cars to and from the elevators which bring the cars to the freight house levels.

Eight hundred cars are moved per day.

Six thousand pounds is the average total weight of a car and its load.

The cars are moved only short distances, thus they are starting and stopping almost continuously.

Although this is severe service, the tractors have stood up under it for more than four years.

The former method of doing this work was with

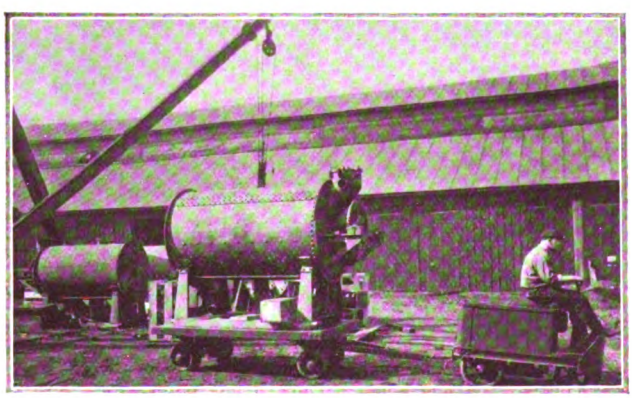


Fig. 13. Machine shops and boiler works find a tractor trailer outfit of great value for moving work in course of construction from shop to shop, especially when these shops are scattered over a wide area.



Fig. 14. The quick loading of delivery trucks is one of the many odd jobs an elevating platform truck is called upon to do. Three men are all that are required to handle this work, and the time element is reduced to a minimum.

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Fig. 15. One of the advantages of the tractor trailer method is that trailers can be fitted to the particular commodity to be handled. In this case we have the side dump for small castings.

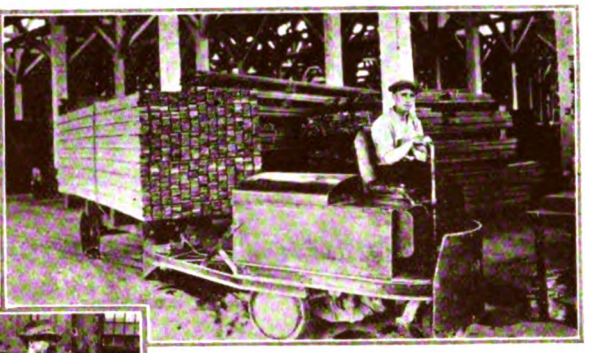


Fig. 16. The small electric tractor is used extensively at lumber mills. A variety of special and automatic conveying devices are available to increase the efficiency of the operations.



Fig. 17. In the chemical plant, tanks of carbon dioxide, chlorine, oxygen, hydrogen, and similar gases, raw, semi-finished, finished and boxed and crated products are economically handled by electric trucks.

gangs of common laborers.

The seven tractors are equivalent to 28 men.

The tractors save $22,-164.09 per year over the cost of doing the work with laborers.

The cost per car moved is only $.0776 as compared with $.1680 by the old method.

But, there are other advantages to be derived from the use of electric industrial trucks and tractors which represent large annual savings to the users. Labor turnover is reduced; healthier conditions are made possible; and, many odd hauling jobs that were not originally planned for these machines are easily handled by them when they get on the job. An example of just such a condition is the use of one of these electric tractors in a large glove factory.

The tractor was purchased for just one special job, namely, the regular and prompt removal of the fleshings from the tannery. The prompt removal of the fleshings has eliminated the objectionable odor which formerly made it difficult to get women to work in the glove factory and made the labor turnover excessively high. The prevention of this trouble alone saves the user $2,500 annually.

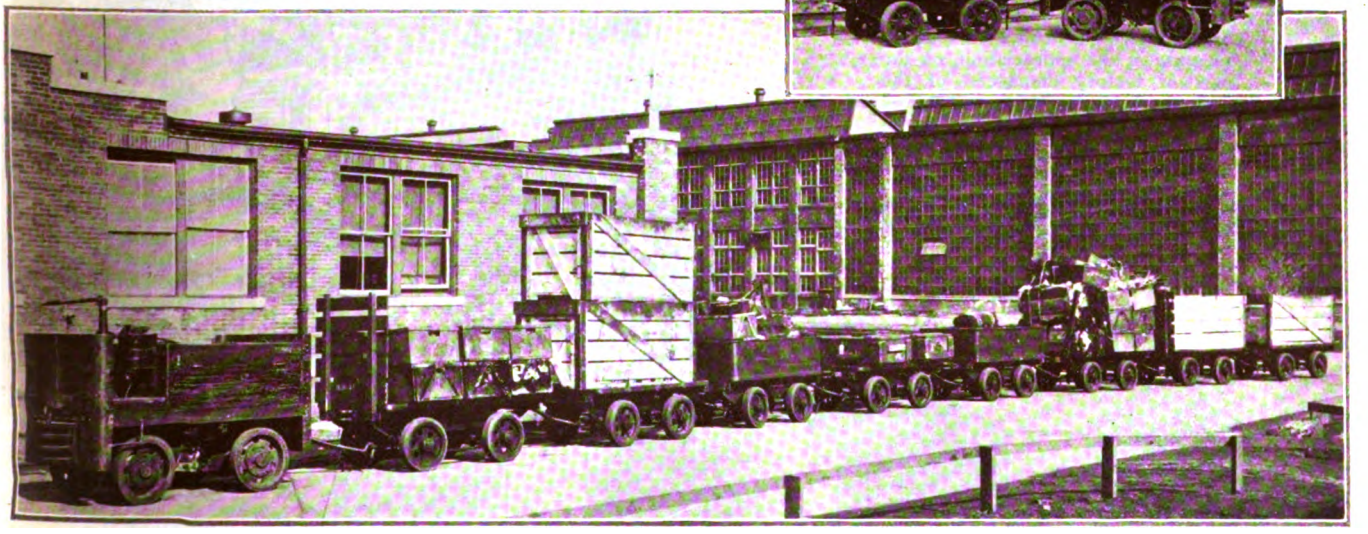
Furthermore, if the tractor were not used, two additional laborers would be needed for trucking and consequently a labor saving of $2,600 per year is made. The net saving after deducting the annual operating cost of the tractor is $3,442.70 per year.

Every industry seems to lend itself to the application of an industrial truck or tractor system, and the economies of such systems are beyond doubt.

Fig. 19. Below—Visualize the labor gang that would be needed to handle these two tractor loads. Shop boxes, crated product, raw materials, and rubbish—all part of one load. Each trailer has a different destination in the plant, and each is dropped at a scheduled time, at a scheduled spot.

Fig. 18 (Right), Tractor trailer combination, both four-wheel steer. Note all steel trailer body with I-beam supports and hinged side. This is especially constructed for heavy-duty hauling, the hinged side acts as a tail-board and heavy loads are slid into the body. The four-wheeled steer insures perfect tracking.





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Are You Collecting Your Lighting Dividends?

Scientific Illumination as a Source of Added Profit

Graphic Visualization by Frederick H. Peard

IT is not so many years ago that factory lighting was looked upon by the management as being simply a necessary evil. As a matter of fact, in all too many factories even today the lighting system still is just that: both necessary and evil. A few years ago, perhaps, there was an excuse for poor lighting. Facilities were not available, there was little real knowledge of what constituted good lighting, and efforts in that direction were classed as "welfare work" rather than as a part of production management.

Today, things are different. Not only are facilities readily available—the proper lamps, reflectors, and so on—but the immense labor of research by lighting engineers has borne fruit in determining what standards to set, and how to reach these standards of efficient lighting.

Moreover—and this has done more perhaps than anything else to convince the hard-headed factory manager—experience has shown, in instance after instance, that scientific lighting is primarily a dividend producer; the "welfare" angle being merely an additional advantage.

It is perfectly true that bad lighting is the cause of eye-strain, both in the home and in the factory. With a national record of more than one-half our workers afflicted with defective vision, there was reason enough to make it worth while to try to improve lighting conditions. But many manufacturers could not afford to look at the problem from such an altruistic viewpoint, and these were slow to take action. Had modern factory lighting had nothing to recommend it but a general improvement in the worker's eyesight, it would have had some very hard sledding.

But the pioneers who saw fit to experiment learned some rather far-reaching facts. They learned, for instance, that improved lighting brought with it a procession of other improvements, increased production, lessened spoilage, decreased accidents. And these things have put scientific lighting definitely in the province of the production man, as something he needs to know about and to make use of in making his plant produce results.

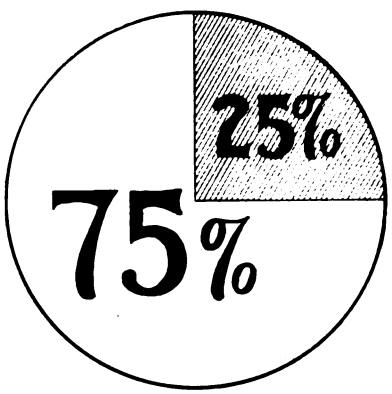


Fig. 1. One-quarter of all the industrial work done, according to reliable estimates, is performed under artificial lighting.

As showing what scientific lighting means to the profit sheet, the following quotation from a middle Western manufacturer is typical:

"As near as could be determined the average intensity of illumination with the old lighting was 1.2 foot candles.

"We took one department—25

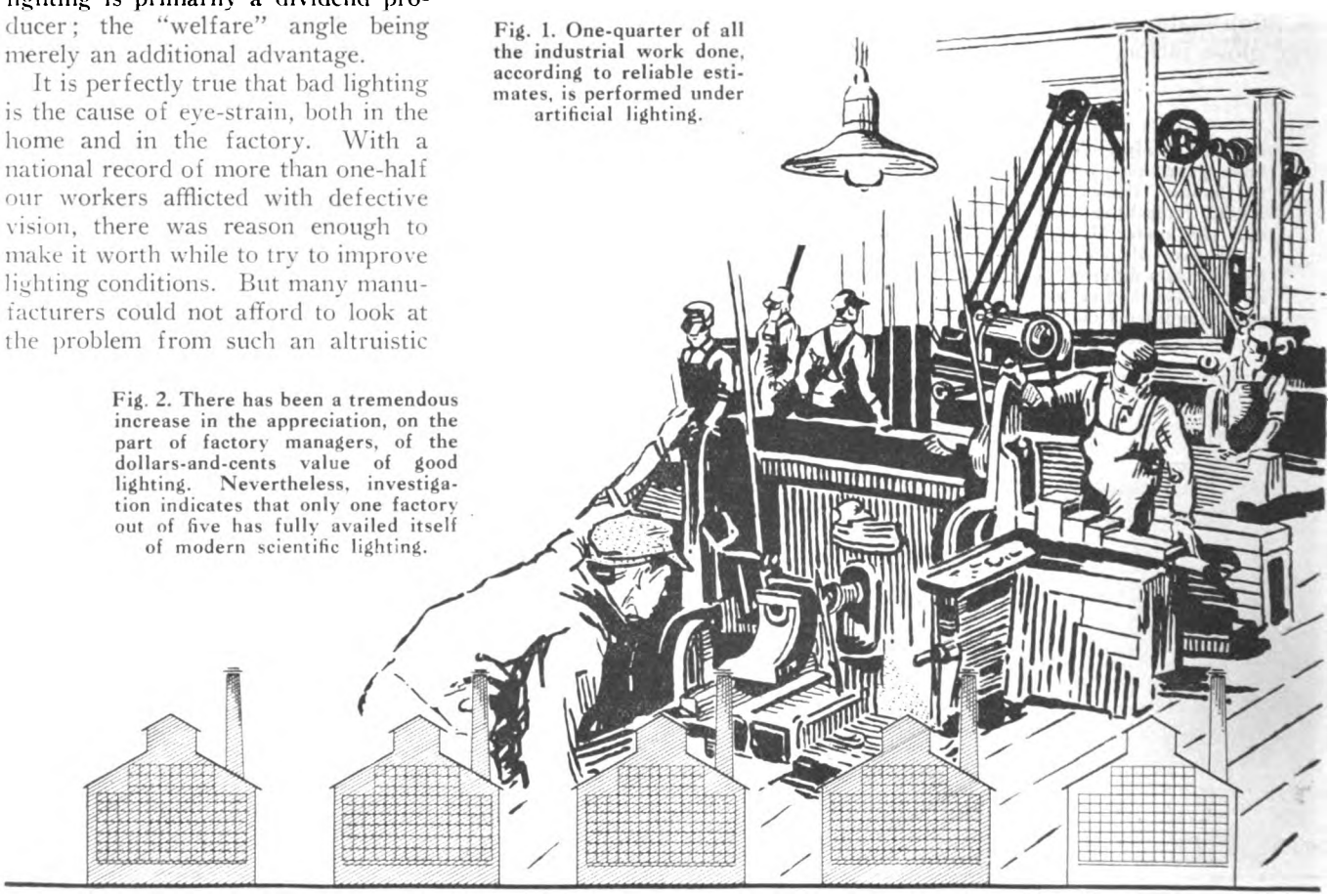


Fig. 2. There has been a tremendous increase in the appreciation, on the part of factory managers, of the dollars-and-cents value of good lighting. Nevertheless, investigation indicates that only one factory out of five has fully availed itself of modern scientific lighting.

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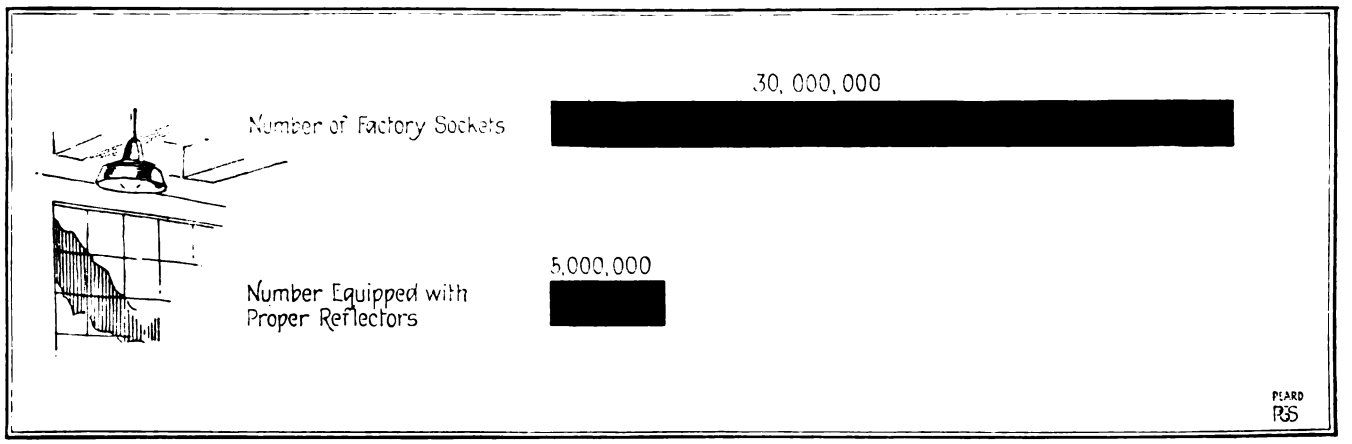


Fig. 3. Statistics collected by the National Electric Light Association show that there are some thirty million factory sockets, of which not more than five million are equipped with proper reflectors.

by 100 feet, and provided it with 35 outlets spaced on 7½ foot centers. These outlets were mounted 9½ feet from the floor, and the whole system was so arranged that any size lamp up to 200 watts could be used.

"Lamps with diffusing caps rated at 100 watts were first tried over a period of four months. The average production during that time was a little over 13% better than the old individual type of lamps. And the average intensity of light for the whole shop was about 6½ foot-candles.

"And so it went; 150-watt lamps with standard dome reflectors pulled a production of 88.4% or an increase of 17.9% over the old installation; 200-watt lamps with dome glass top reflectors showed a 96.3% production which was actually a 25.8% increase. The intensity averages for these last two tests were 9-foot candles and 14-foot candles respectively."

Twenty-five per cent. of industrial production is carried on under artificial light. And it is estimated that only one factory in every five is equipped with efficient artificial illumination. When even a fair average lighting system can be so improved as to yield a 12% production increase, one wonders what results can be obtained in the case of a plant whose present installation is not even a "fair average" one.

It must not be thought that this movement for better lighting is prompted by propaganda for the use of a greater amount of lighting current. As a matter of fact, many plants are paying higher lighting bills today than they would if the lighting system were properly planned and installed. Even where there is need for an increase in the amount of lighting current, to secure proper illumination, the increased cost proves to be only a small fraction of the increased dividends in production, lessened spoilage, and so on.

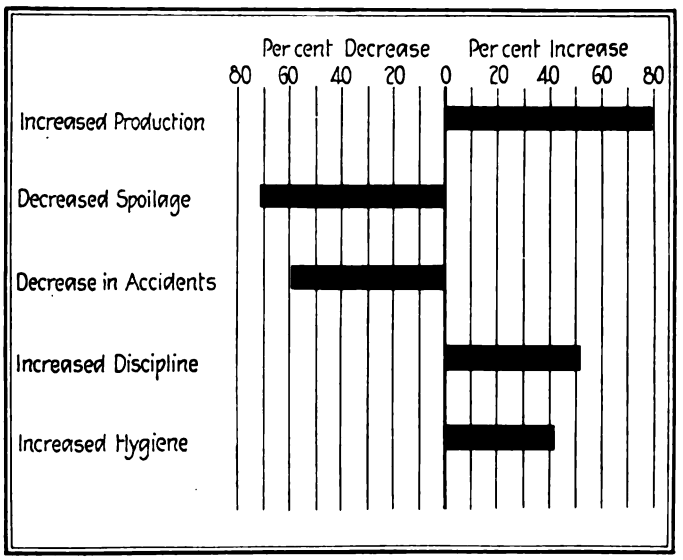
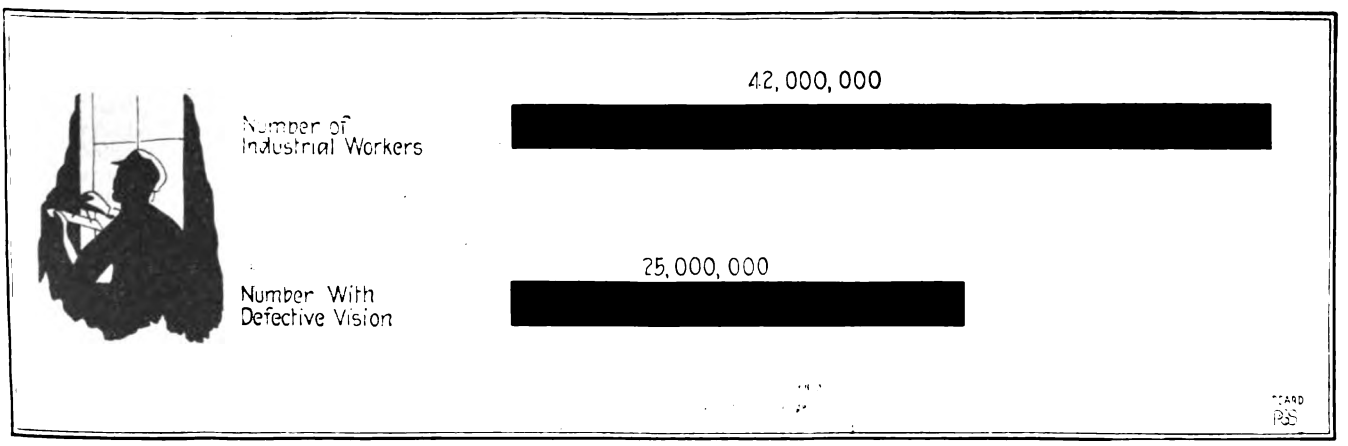


Fig. 4. The results obtained by replacing bad lighting with an up-to-date system, of course, vary. Here is a tabulation of results obtained in an exceptional case.

Fig. 5. Below—The effect of bad lighting upon eye-sight takes an added meaning when we realize the high percentage of defective vision among industrial workers.



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Fig. 1. The short girl needs a seat that can be raised, to bring her level with her work.

Seats—Right and Wrong

First Principles of Industrial Posture and Seating

By Nelle Swartz

Director, Bureau of Women in Industry, Department of Labor, State of New York



Fig. 2. The tall worker, on an ordinary chair, is forced to stoop at her work.

IF all workers were of one size, if all industrial processes required the same energy and position at work, the question of industrial seating would be simple.

In order that chairs may be adapted to all heights of workers, adjustability is an important feature. Many employers prefer to secure adjustability by using chairs of different sizes but this has not proven satisfactory since the tendency of workers is to grab the chair nearest, irrespective of size.

The seating area of a chair should be large enough to allow room for the fleshy parts of the body and in order to fit the contour of the thighs and buttocks the chair should be saddle shaped. If the chair seat does not fit the body, there is uneven distribution of pressure which results in discomfort.



Fig. 3. The back-rest relieves strain on the back muscles in holding the spine erect.

Many of the seats now in use in industry, particularly stools, are pitifully inadequate in the matter of seating area alone. In some instances it is necessary for girls to wrap their legs around the legs of the chair in order to maintain their balance.

For work which does not require leaning forward, the front of the seat should be one inch higher than the back. This downward slant maintains the proper relation of the pelvis to the spine and does much to distribute weight evenly and tends to hold the body comfortably against the back rest.

For workers who must, because of the nature of their work, lean forward, it is believed easier to maintain a straight spine upon a nearly flat seat; in such cases, the inclination toward the back should be not more than one-half inch. In any instance, the front should be slightly higher than the back. This, however, can only be done if the seats are shallow, otherwise the slight elevation in the front is likely to stop circulation in the legs and



Fig. 4. This shows why a deep chair seat is wrong; forcing the worker to sit on the edge.



Fig. 5. The inevitable backache would be prevented by a proper foot-rest and back-rest.



Fig. 6. This is how one large manufacturer has solved the problem of providing seats which save the muscles and permit of better attention to the work.

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Fig. 8. With this arrangement, it is possible to secure a "tailor-made" seating equipment with properly adjusted back, seat slope, and foot-rest.

Fig. 7. Note the foot-rest and the properly adjusted back-rest; relieving the muscles from fatigue.





Fig. 9. These chairs are designed with a view to proper support of the average worker, and are in use in a New York factory.

make them quite numb. Figs. 3 and 4 make this clear.

Furthermore, a shallow seat enables the worker to sit forward and still have the benefit of a back. If it is more than 12½ to 13½ inches from front to back, the tendency of many of the workers is to sit on the edge of the chair away from the back, which means that the weight is borne chiefly upon the posterior part of the thigh. With a shallow seat this pressure is removed and the body sways forward on the hip bones as it should.

Not only are back-rests essential to chairs but it is also essential that this rest should be adjustable so as to give support where it is most needed. Back-rests should not be so large as to interfere with the freedom of the arms. They can be from 2½ to 4 inches in width and breadth from 8 to 12 inches. The important thing is to have it properly placed at the small of the back. Such support for the lower part of the spine is essential. A worker may often tire of using a back-rest steadily, but it serves a very valuable purpose as a means for momentary relaxation.

The supporting rod which holds the back-rest should curve away from the seat not only to avoid contact with the body at any point and to allow unrestricted motion, but in order that the worker may sit well back, getting the full value of the support of the spine. When the back of the chair meets the seat across the entire width, it is a back-rest in name only. The curves must conform to the natural curves of the body for proper support. The so-called "kitchen chair" gives support too high up to be of real value and gives no support where it is most needed. Such a chair encourages slumping.

As to construction, the best type of chair for factory use has a wooden back, and wooden seat upon a metal frame. The edges must be smoothly rounded to avoid discomfort and harmful pressure.

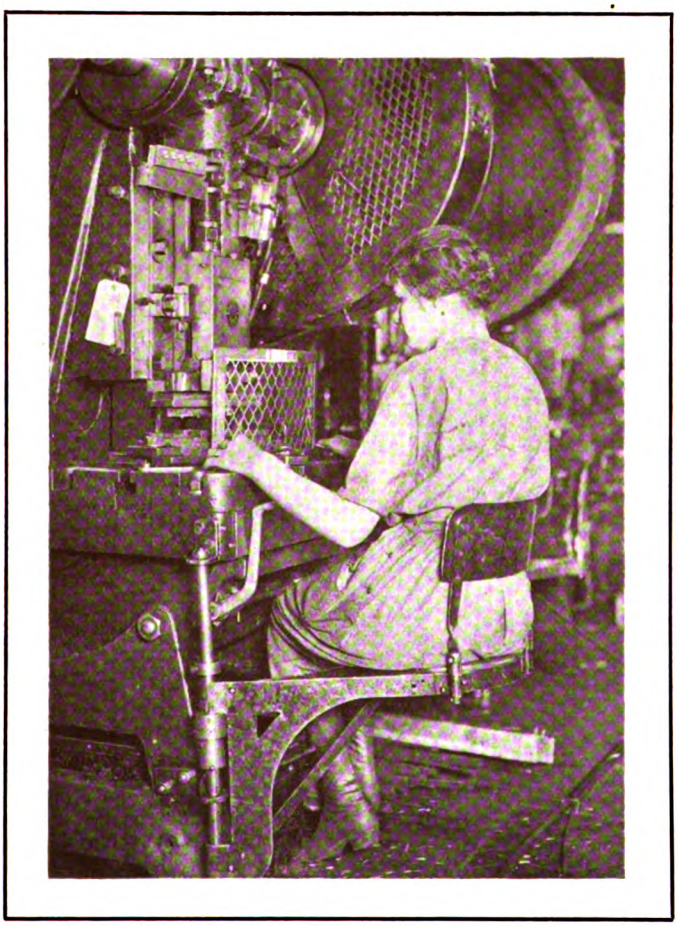


Fig. 12. Attached to the machine, this seat is adjustable for height, and incorporates several good features in spite of its simplicity.

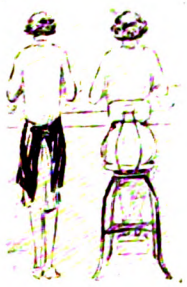


Fig. 10. The workbench at proper height for standing, and the chairs as shown, permit alternating from standing to sitting.



Fig. 11. Here is the way the "sitting-standing" idea can be adapted to standard height benches; by using a portable worktable.

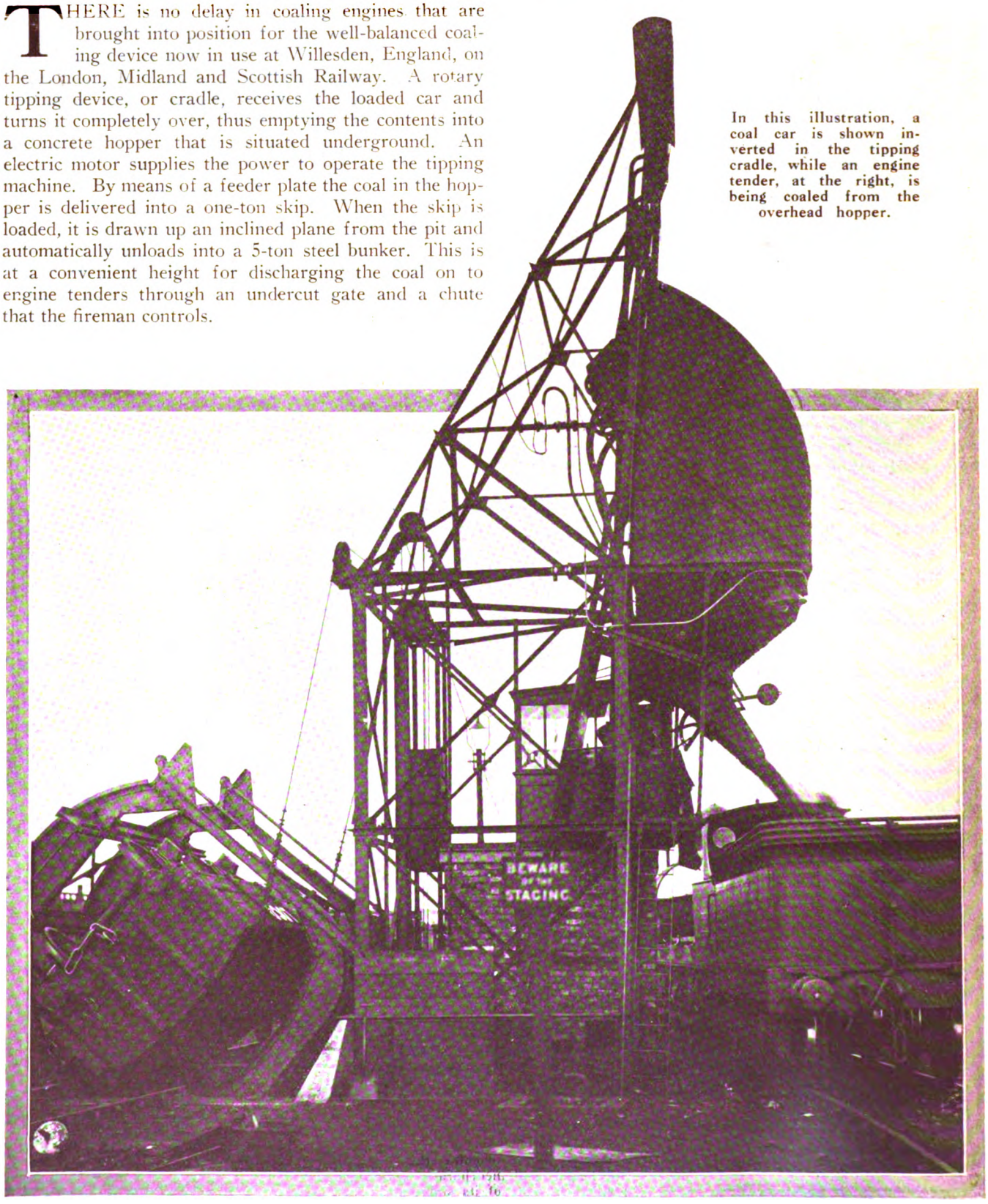
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Modern Coal Handling in England

A Car Tipper and Skip Hoist that Speeds the Coaling of Locomotive Tenders

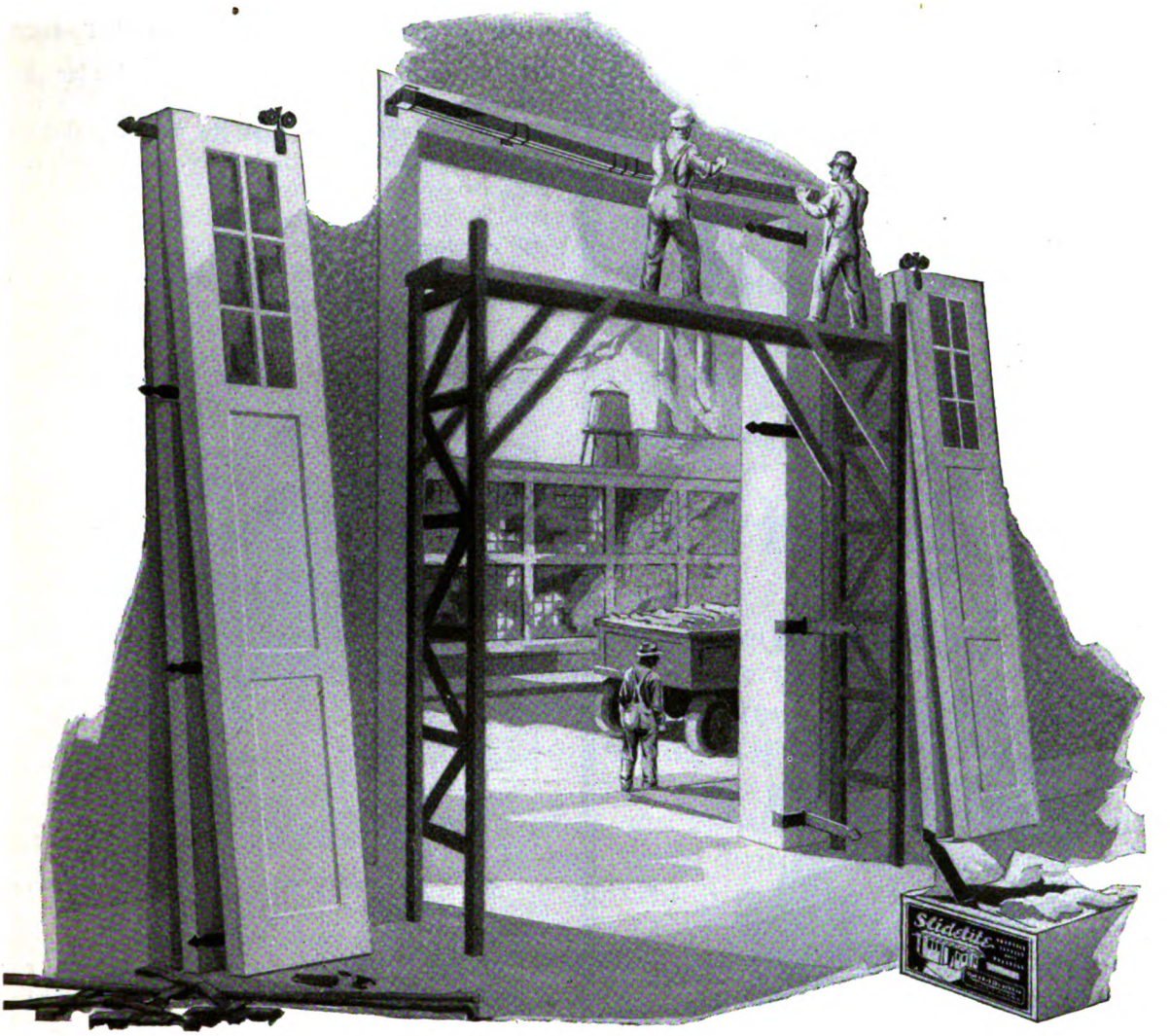
By George F. Paul

THERE is no delay in coaling engines that are brought into position for the well-balanced coaling device now in use at Willesden, England, on the London, Midland and Scottish Railway. A rotary tipping device, or cradle, receives the loaded car and turns it completely over, thus emptying the contents into a concrete hopper that is situated underground. An electric motor supplies the power to operate the tipping machine. By means of a feeder plate the coal in the hopper is delivered into a one-ton skip. When the skip is loaded, it is drawn up an inclined plane from the pit and automatically unloads into a 5-ton steel bunker. This is at a convenient height for discharging the coal on to engine tenders through an undercut gate and a chute that the fireman controls.



In this illustration, a coal car is shown inverted in the tipping cradle, while an engine tender, at the right, is being coaled from the overhead hopper.

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Doing the job over

YOU'D be surprised to know that a large percentage of our volume is in replacements.

Scarcely a day passes that one or more of our service branches are not called on to tell somebody what to do with doors that won't work.

In nearly every case, the trouble is that somebody — builder, architect, owner; generally owner—"saved money" on cheap door-hardware; and the result is that the job has to be done over. A door that's improperly equipped doesn't work; and a door that doesn't work is worse than no door at all.

"Doing the job over" is a costly operation; hardware too light for the work; or made to sell at a price; or mistakenly designed for its duty. The right thing even at a higher price would have cost less in the end.

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All's Well in the Shop

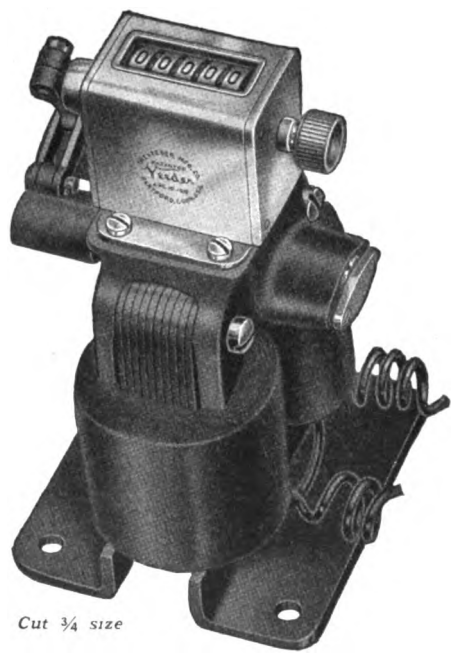
when the records read well in your office —

You can sit in your office and see—by this Counter—the work being done by the man and machine in the shop.

You know when machines are running, or idle. You get an instant production-count from remotest points to the *handiest* point for supervising.

As fast as the work comes through, the *count* comes direct to you. And that fact has its influence with your operatives. They see that the count *reads well* on this

Veeder



Cut ¾ size

The small Magnetic Counter above counts machine operations or units of output, electrically communicated. (Form "UM" Counter.)

Mechanical contacts on your machine make and break the electrical circuit which operates the counter. The electro-magnetic drive can get its current from your regular lighting circuit (direct current, 110 V.), or from storage battery.

Here is the latest and greatest aid that Counters give you in management. With the saving in personal supervision, and the gain in workmen's production.

"Form U" and larger Magnetic Counters are fully described in a special bulletin. Ask for copy—with the full-line Counter Catalogue if you haven't it.

The Veeder Mfg. Co.

31 Sargeant Street, Hartford, Conn.

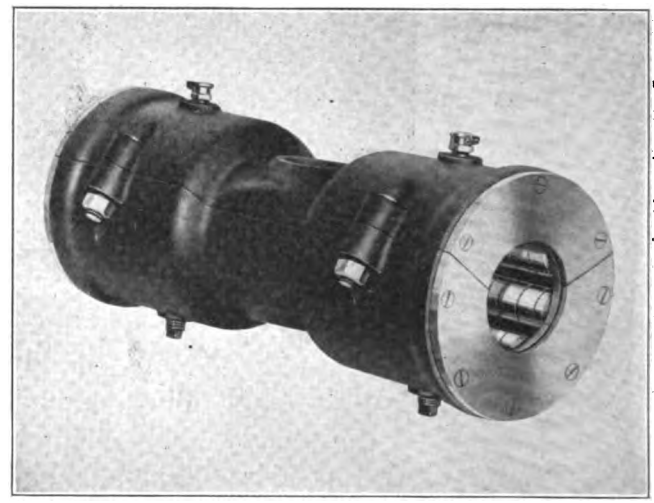
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A New Line Shaft Roller Bearing

THE new Hyatt Line Shaft Roller Bearing is announced as an exact size-for-size replacement box. It is completely split for easy installation and designed to fit any type of hanger. Although it differs in outward appearance from other Hyatts sold during the past 35 years, the distinctive helically wound rollers are still employed.

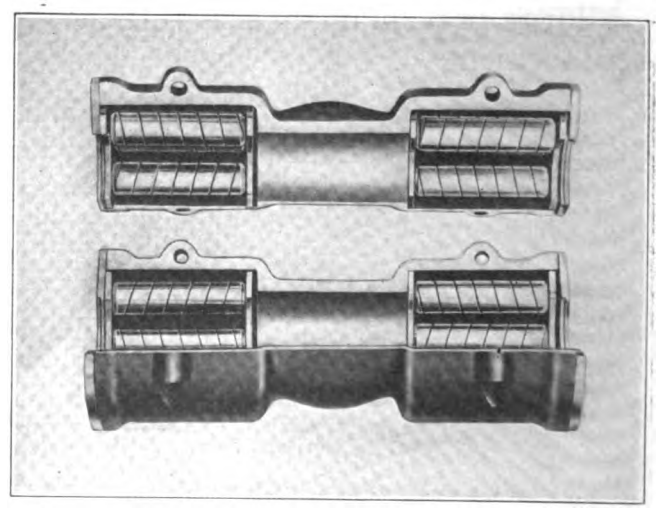
The box is dumbell in shape, with twin split roller assemblies mounted at either end. The center section, which is free from bearing surface, is narrowed down to



average plain bearing dimensions, to fit hangers with the narrowest frame openings.

The box is built in two sections, the lower part forming two thirds, and the top, one third. This brings the machined joint well above the oil level and prevents oil leakage. Tightening four bolts seals the sections around a shaft. Bosses are staggered so that the top cannot be improperly fitted. A small wrench is the only installation tool used.

The new Hyatt Line Shaft Bearing, like its predecessors, is distributed through a dealer organization,



composed of prominent mill supply houses in every industrial section of the country. Manufacture at present is confined to five sizes for which demand has been greatest: 1-7/16, 1-15/16, 2-3/16, 2-7/16, 2-15/16. For use with larger sizes of hangers requiring bearings up to 4-15/16", the old line of U. G. and B. & S. type Hyatt bearings are being continued.

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For Every Sized Plant There is Barber-Greene Eauipment that Can Cut Handling Costs



For handling around 700 tons per year this Barber-Greene "U" Portable Conveyor is an excellent machine. It can unload directly from beneath hopper-bottomed cars, it can build small stockpiles and deliver into bins. It can load trucks or wagons. It is a one man machine. And its price is $480 with electric motor [f. o. b. Aurora].



The Barber-Greene "N" Portable, alone or in series, can be used for tonnages of from about 1800 tons per year up to any amount. It can be had in various lengths to meet different needs. It can unload directly from beneath hopper-bottomed cars. Alone or in series it provides the most efficient means for getting coal from car to storage.



The Barber-Greene Coal Feeder is used in conjunction with an "N" Conveyor or a series of "N" Conveyors to deliver coal from beneath hopper-bottomed cars to storage.



The Barber-Greene flight loader—a self propelled coal loader at an exceptionally low price. If you handle 2500 tons or more per year you surely want to investigate this machine—and its price and payment plan.



For larger tonnages—or where permanence is desired—for delivery to the boiler rooms and for similar jobs there is the Barber-Greene Permanent Conveyor. It is built of standardized sections—easily changed to meet changing conditions.

Down Down Down With Coal Handling Costs

For every plant there is a Barber-Greene unit or combination of units to practically eliminate all hand labor at the three coal handling points: car unloading, storing, delivering to boilers.

These units and combinations are priced so that they do not form burdensome investments to the plant for which they are designed.

They more than replace the men needed for the job—and their portable features make them just as versatile and easily moved.

Barber-Greene units do not become obsolete as the yard grows—and they can be easily added to. The result of these things is that the cost of handling a ton of coal from car to storage to boiler is cut to the bone.

That's because the plant is not paying the high operating charges of hand labor—nor the interest on an investment too large for the tonnage handled—nor a high depreciation charge.

The few seconds time that it takes to send this coupon for complete information will be well spent.

Jot in your approximate yearly tonnage—we'll send you information on the Barber-Greene equipment that can help you to lower your coal handling costs.

Approximate yearly tonnage.....

Name.....

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City.....State.....

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Portable Belt Conveyors Self Feeding Bucket Loaders

Coal Loaders . . Automatic Ditch Diggers . . Coal Feeders

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Some Highlights on Bulk Materials Handling

By Edward J. Tournier

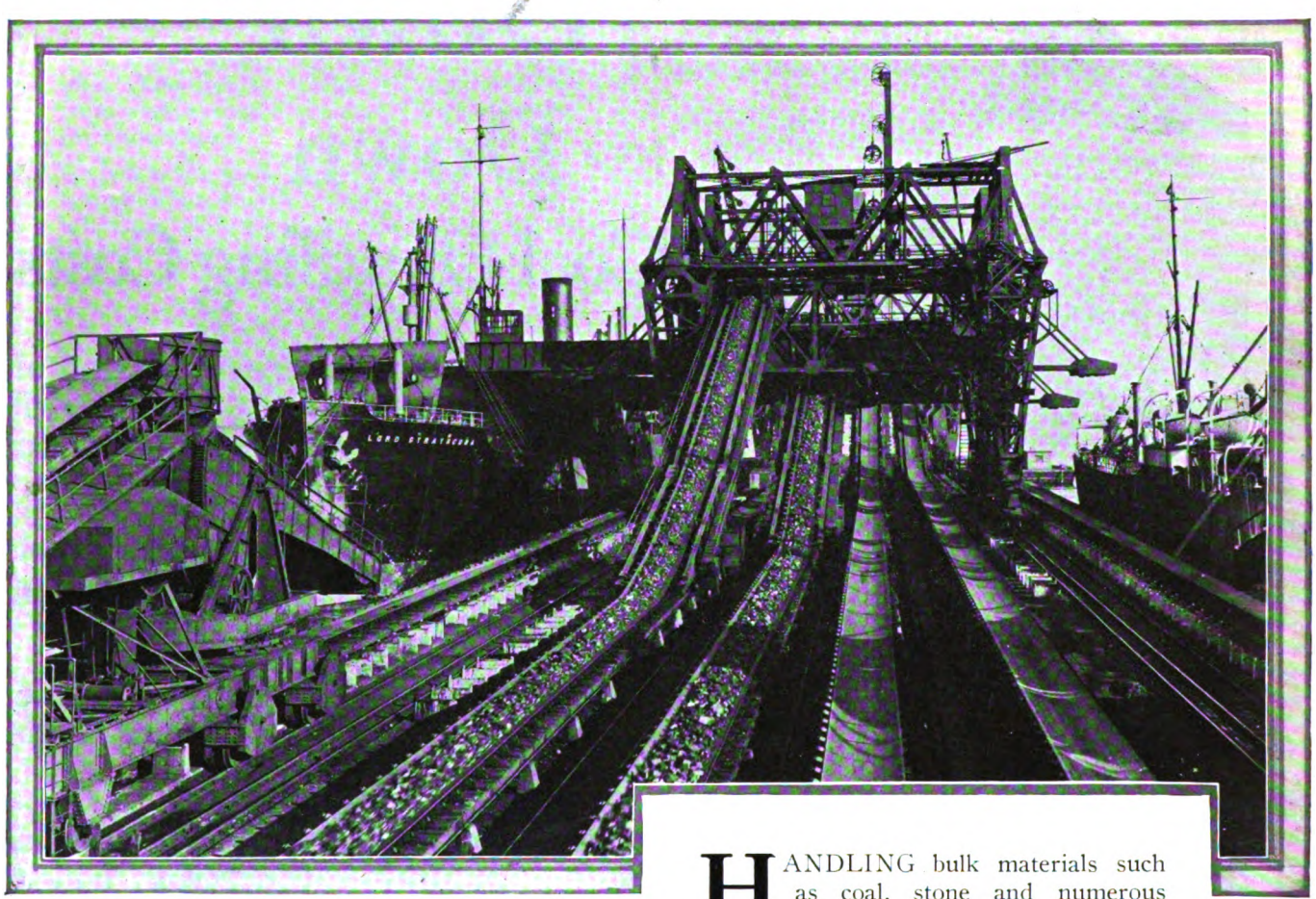


Fig. 1. Above are seen four 60″ conveyors, each of which delivers 1,800 tons per hour to one of the traveling towers spanning the dock. At the left, one of these main conveyors is loading a vessel by means of a shuttle conveyor and the device shown in Fig. 11.

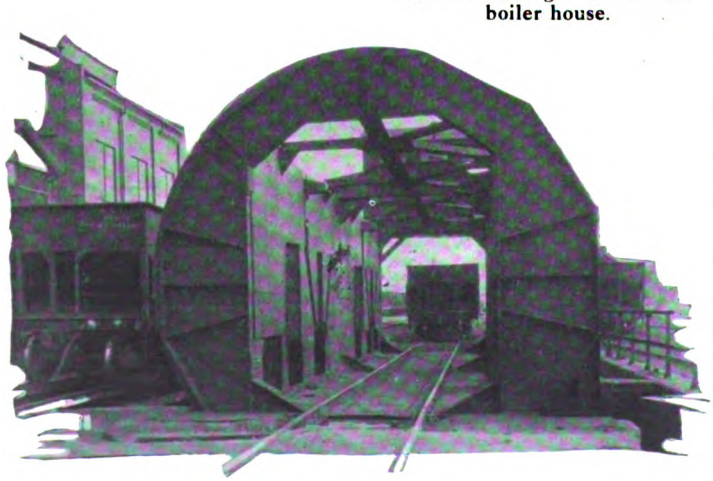


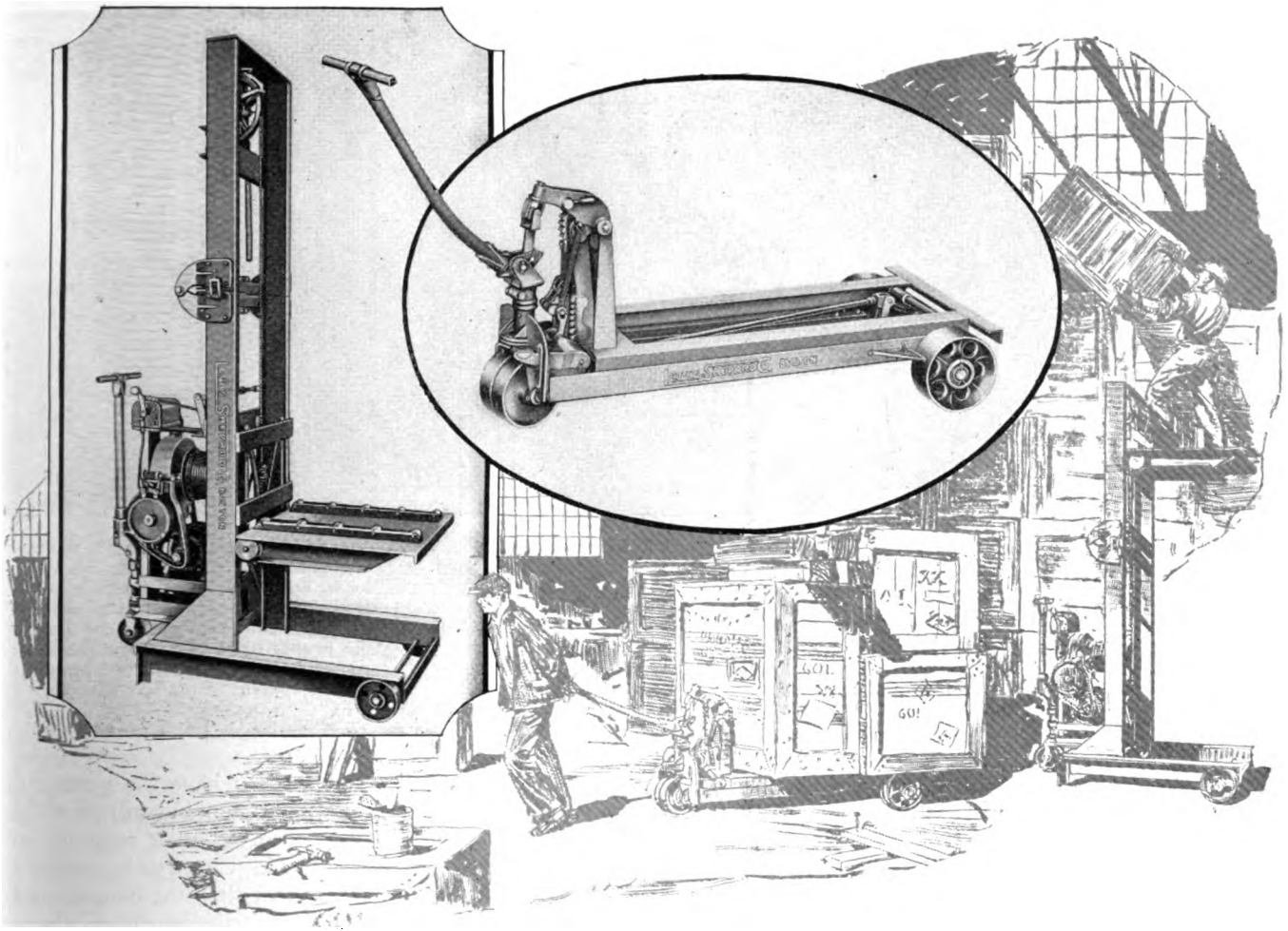
Fig. 2. Half a turn of this great steel cage spills the contents of a loaded coal car holding 100 tons, and the complete turn delivers every particle to the conveyors below for transfer to the reserve storage or to the boiler house.

HANDLING bulk materials such as coal, stone and numerous other products, is today the largest field for the use of mechanical carriers and the continued betterment of economic conditions will require further extension of such facilities.

Broadly speaking, we may say that handling bulk materials is divided into three functions: unloading, storage and loading. In the same manner loading and unloading may be classified according to the circumstances of the respective operations, whether by rail or by water. Every industrial plant, depending upon size and location, must consider at least one of the functions referred to, and some plants must give thought to all of the classifications.

The nature and destination of the materials handled determine the kind of machinery to be used, and there is a specific type of appliance suitable for every kind of bulk material. Their specifications are no longer a matter of guesswork, but can be prescribed accurately by engineers with specialized knowledge.

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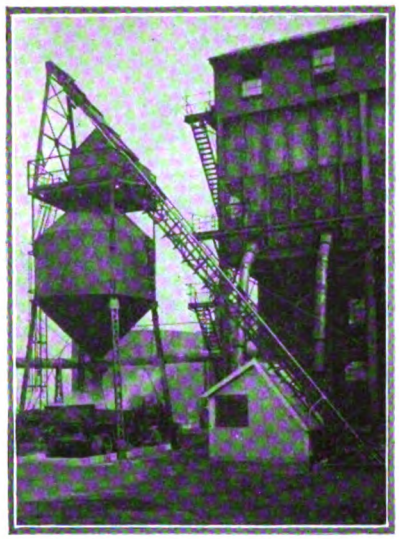


Fig. 3. The inclined part of the skip hoist runway with the storage bin and hoist house under the runway. The bin is built of steel plate and has a capacity of 40 tons. The hoisting engine has a capacity of 20 tons per hour and requires 7½ hp. for operation. This installation is especially suited to plants having small tonnages of ashes to handle.



Fig. 4. A very simple arrangement for handling stone or sand is shown in this photograph. Material discharged into the hopper in the foreground is elevated to the top of the bin and discharged through chutes.

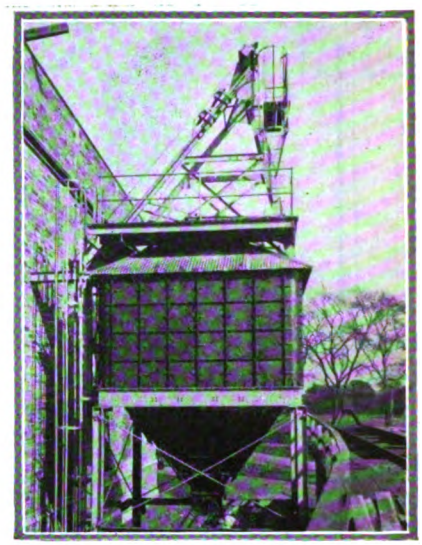


Fig. 5. This view is especially interesting in connection with an ashes skip hoist, on account of the bin construction. The supporting frame and skip guides are of structural steel and the bin proper is of cast-iron. The latter construction in standardized form is a development of the last five years.

Fig. 6. Here we have a view inside of a box car containing soda ash. The large pipe resting on the floor is the suction duct used for conveying the material to the storage bin inside of the building adjacent, shown in Fig. 9.

The principal questions in connection with mechanical handling in small power plants have to do with unloading coal and loading ashes. As the quantity of coal handled seldom exceeds fifty tons per day, and the ashes eight to fifteen tons, large investments in equipment would not be profitable. In such plants the factor which determines the kind of equipment to be used is initial cost. This must be low enough to enable the owners to make a saving before the depreciation period expires. The small industrial plant has a closer human contact than have the great corporations and public utilities. The summation of their activities in the whole country is probably not greater than the concentrated production of the super plants, but any lightening of the burdens of labor, or safeguarding of health will affect a greater number of individuals. In these small plants the executive has a fertile field for eliminating waste by the adoption of some form of mechanical handling of materials.

It is apparent that there are a number of questions of the same general character arising in both



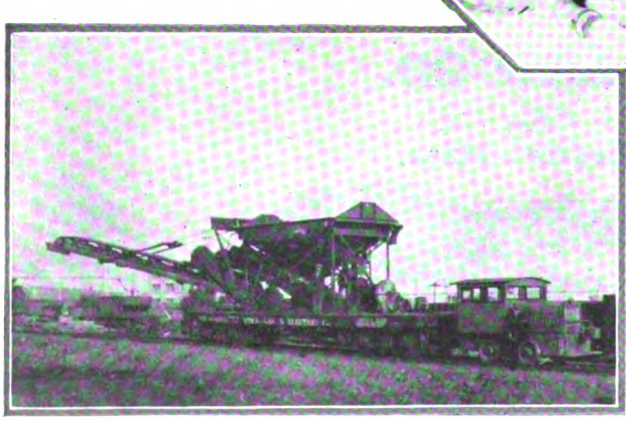


Fig. 7. This device as will be noted consists of a flat car upon which is mounted a hopper and a conveyor. The conveyor is carried on a hinged frame supported on a revolving carriage. By these means coke loaded into the hopper may be stored on the ground without breakage.

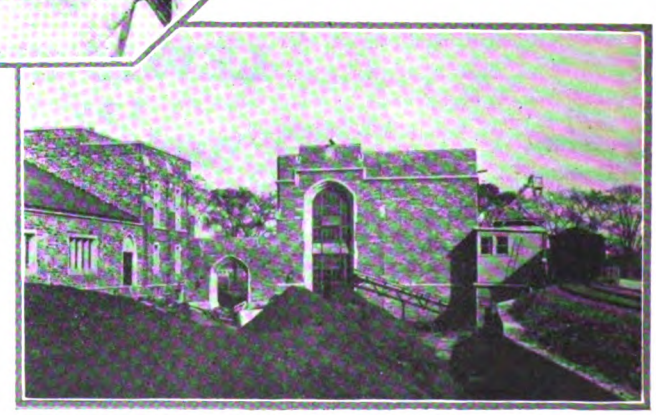


Fig. 8. For reserve storage of coal in small plants the installation shown could not be improved upon. Coal unloaded from the hopper car is fed automatically to a crusher which delivers it to the inclined conveyor shown in the background. This forms an initial pile from which the drag scraper bucket directly in front of the head of the conveyor may drag its load to any point in the yard.

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Fig. 9. This system of conveying operates much in the same manner as the well known vacuum cleaner. See Figs. 6 and 10.

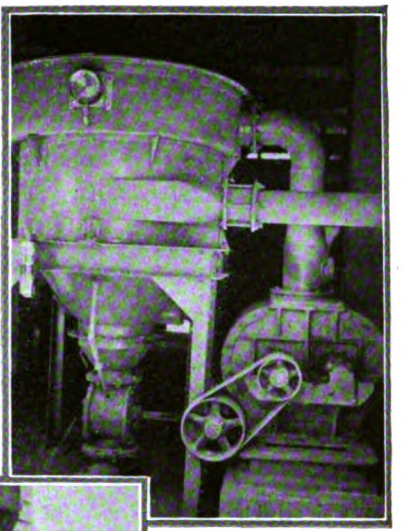


Fig. 10. This illustrates the principal elements of the suction system. At the right is a blower of the positive rotor type operated by an electric motor. At the left is a centrifugal separator in which the vacuum is created. This corresponds to the dust bag on the vacuum sweeper.

the small plant and the large plant. The functions of the machinery are in general similar, but their applications are different.

The disposal of ashes in the large plant, however, presents a more difficult problem than in the small plant, yet to some extent initial cost determines the kind of machinery to be used for this purpose.

Coke, it has been said, is as easily broken as an egg and as abrasive as emery, which makes it an especially difficult material to handle, even more so than anthracite coal. In the latter case, breakage is the one danger. In the former, if improperly handled, the coke is broken and the means of conveyance is rapidly worn out. If the coke is broken it loses value as material for gas making and foundry use. It cannot be dragged or dropped, which increases the handling difficulties.

Sand and gravel, unlike coke or anthracite coal, can be carried, transferred or dropped without fear of damage. The conveyor can be the smallest that will carry the load without considering any other factor. It can be a high speed conveyor: in fact it could be run a mile a minute, if it were possible to place the load upon it at that speed. Placing the load upon the belt therefore determines largely the size of the conveyor for this kind of material. To some extent handling stone is in much the same class. The sand preparation processes of excavating, screening and washing correspond to the quarrying and screening of stone. From these primary operations the handling process is the same for both materials.

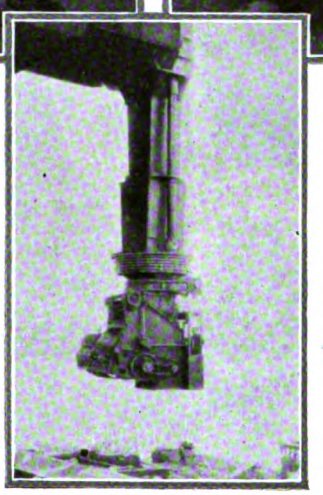


Fig. 11. The device shown here is connected (See Fig. 1) to the outer end of each shuttle and is lowered into the hold of the vessel for loading.

Dusty materials such as lime, soda, ash, etc., being injurious to health if breathed for extended periods, are matter for special study. The unloading operation especially is one which is exceedingly distasteful to workmen who attend to it. Materials are usually received in box cars because if shipped in hopper cars, the action of rain would either dissolve or cake some of these products, rendering them unfit for use. Men must go into the dust filled box car, and either with hand or power shovels, scoop the contents into some form of mechanical conveyance. The most satisfactory method is by means of pneumatic conveyors. These eliminate a great amount of dust inseparable from scooping or similar methods.

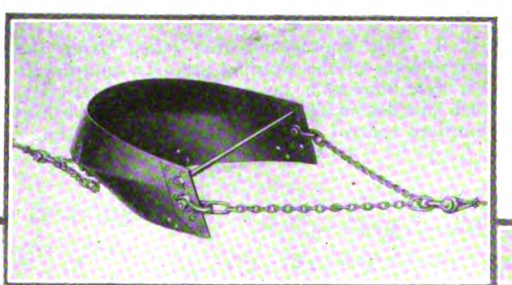


Fig. 12. The simplicity of the scraper bucket used on all drag line conveyors is shown in the illustration above.

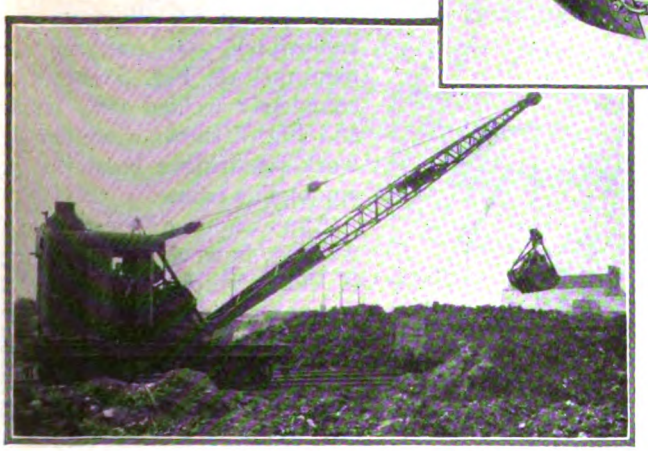


Fig. 13. The action of the grab bucket in the locomotive crane shown here tends to break the coke both in stocking out and in reclaiming. It has the advantage, however, of combining the functions of unloading, loading and self-propelling.

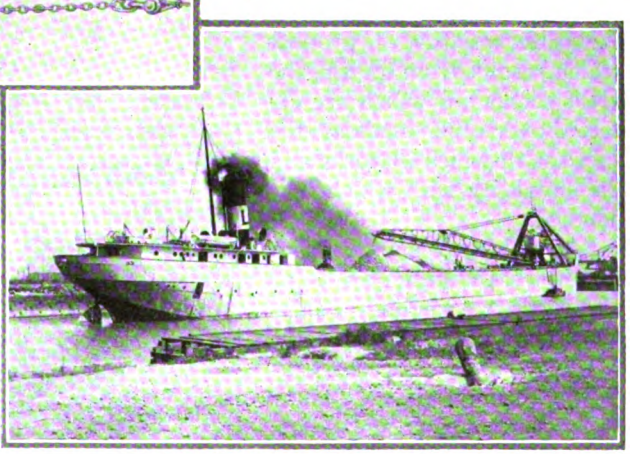


Fig. 14. The discharge of a cargo of limestone from the hold of a vessel. Two 48″ belt conveyors travel the whole length of the hull in a tunnel under the stone pile. These two conveyors discharge to an elevator, which in turn transfer the load to one 60″ belt on the unloading boom.

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Progress in Electric Arc Welding

By B. S. Havens
General Electric Company



Fig. 1. This photograph was taken using the natural light of the welding arc. An automobile rear axle housing is being welded automatically. Push buttons in front of the operator give him complete control of the operations at all times.

ELECTRIC arc welding, as a tool for modern industry, is increasing its scope daily at an amazing rate. Chief among the reasons for its wide adoption are the better quality of product which results from its use, the great economies which are effected over other methods, the speed with which it works and the simplicity with which it is handled.

A number of unique adaptations have been made of electric arc welding equipment. Fig. 2 shows a portable welding set used by the Chicago, Burlington & Quincy Railroad Company and which is specially protected against the weather. Figs. 3 and 4 show how the Prospect Boiler Works of New Brunswick, N. J., installed its equipment in an auto bus, thus allowing quick transportation of the tool to the job with suitable protection provided against the weather.

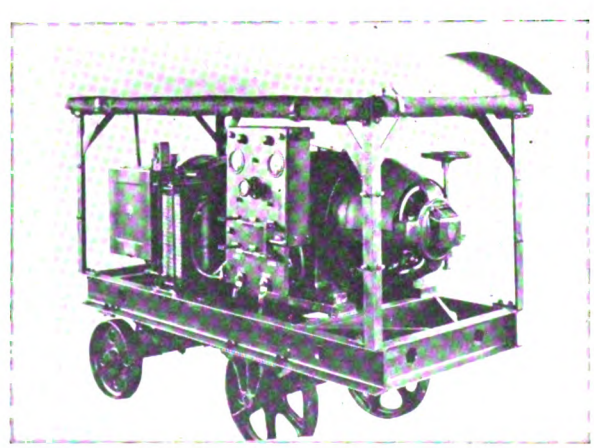


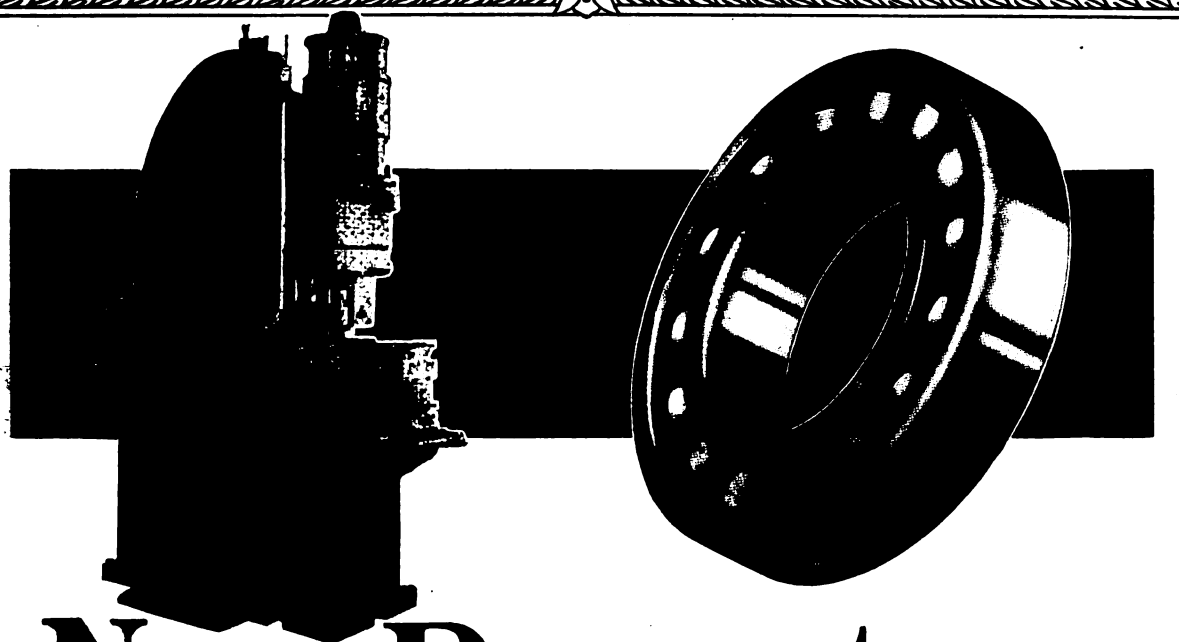
Fig. 2. From 200 to 250 amperes of welding current can be supplied to the electrodes from this portable set. Note the rolled-up curtains and weather top for protection against the elements.

In the automobile industry welding is finding many uses. Figs. 1 and 6 illustrate its application to automobile manufacture, Fig. 5 shows a completely welded tank truck and Fig. 7 shows a welder at work repairing a break in an automobile frame.

Applications of electric arc welding, however, are nothing if not diversified. Fig. 8 shows a completely arc welded tank barge prior to launching at Providence, R. I. Fig. 11 shows a welder at work building up the corroded metal work of a river bridge and Fig. 9 shows a completely welded locomotive tender now in use on the Boston & Albany Railroad.

[*Additional pictures on pages 42 and 44*]

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New Departure's Engineering Application Book may expose you to a new idea. May we send you a copy?

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[*Continued from page 40*]



Fig. 3. This bus provides transportation for the welder and his equipment including a self-contained arc welding generator driven by a gas engine. It can be driven anywhere at a moment's notice.

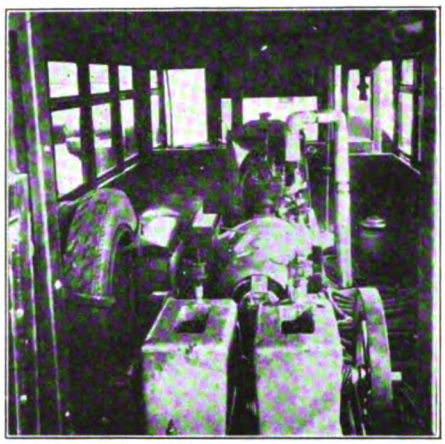


Fig. 4. The interior view, above, gives an idea of the welding equipment carried in the bus shown in Fig. 3.



Fig. 5. This 2,500 gallon oil tank, mounted on a 7 1/2-ton truck, is all-welded; making, in actual effect, a one-piece tank.

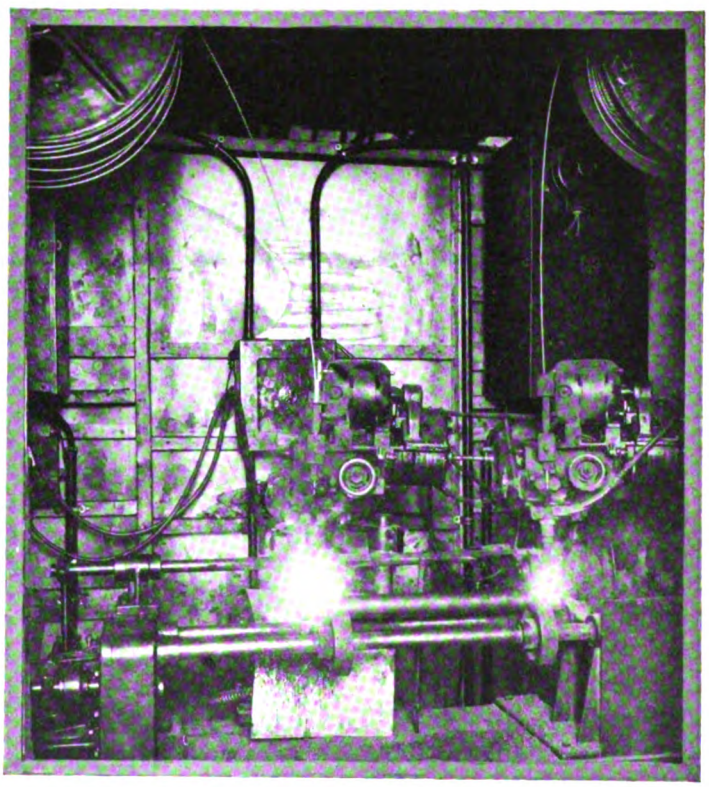
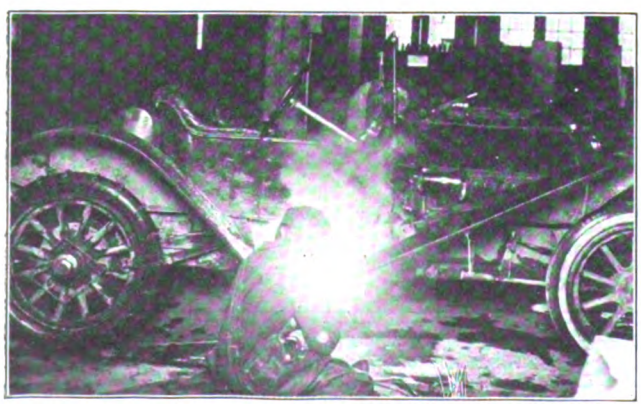


Fig. 6. Automatically welding two places simultaneously on an automobile front frame cross tube.

Fig. 7. Repairing a break in the frame of an old car. This is a third-hand machine, including parts from more than 12 other makes of automobiles. Far from being run down, it is now being used as a tow-car by a Ballston Spa. (N. Y.) garage.



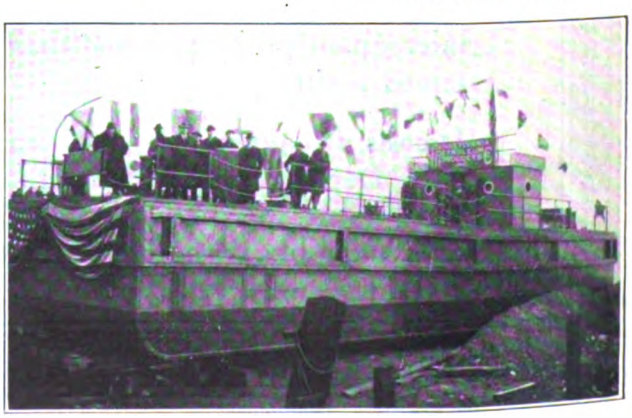
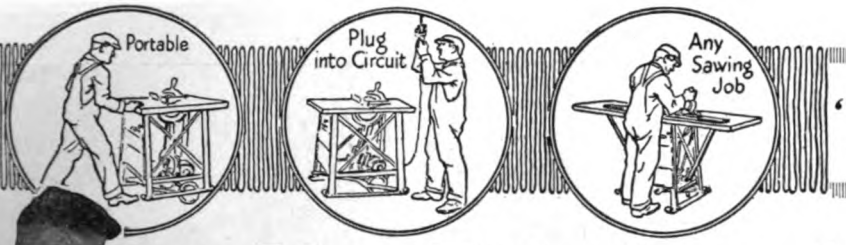


Fig. 8. The "Independent," an all-welded tanker barge built in Providence. Inside the welded hull are two longitudinal, riveted welded tanks. Oil is stored not only in the tanks but also around them, between transverse compartments.

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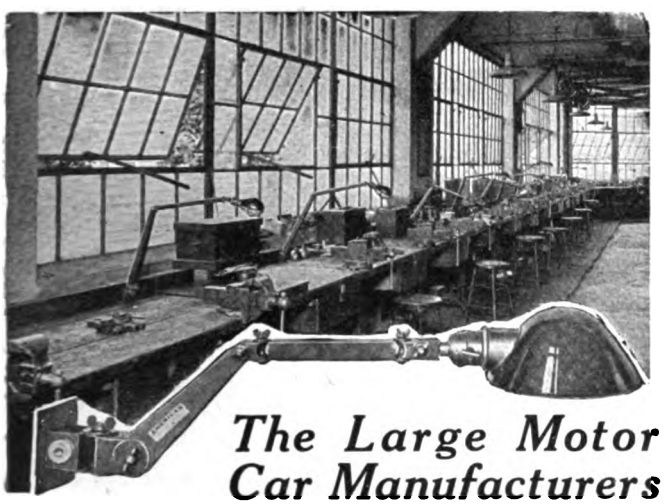
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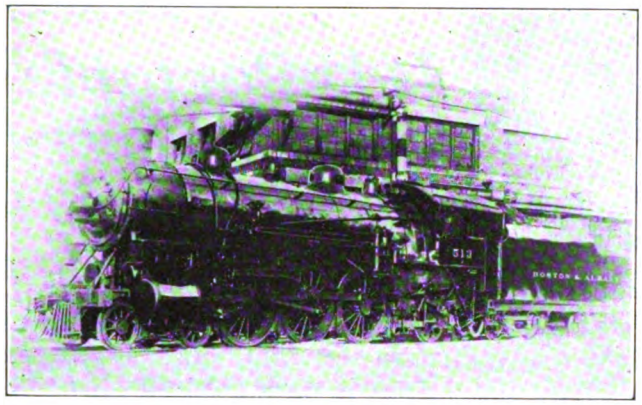


Fig. 9. B. & A. locomotive tender No. 513. The tank, holding 8,000 gallons of water and 12 tons of coal was completely arc welded except the grab handles.

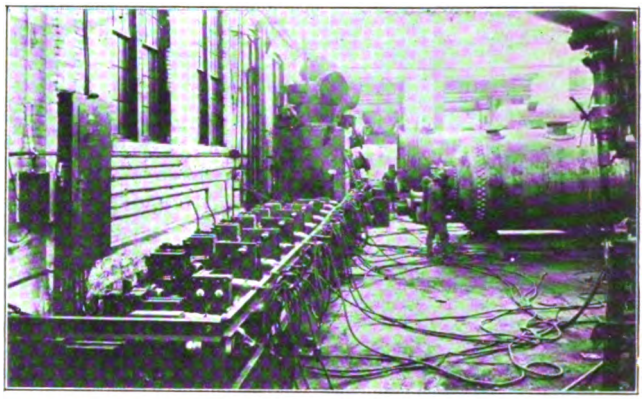


Fig. 10. A bank of electric arc welders used for sealing high pressure gasoline stills.

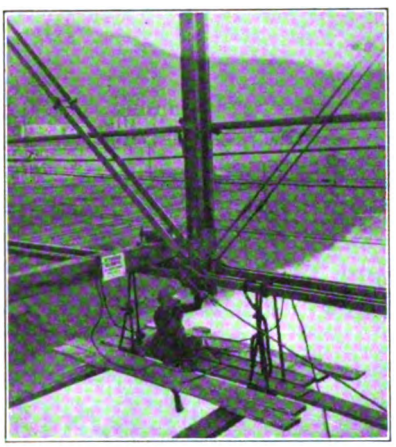


Fig. 11. Section of the Herrs Island bridge over the Allegheny River near Pittsburgh being repaired by electric arc welding.

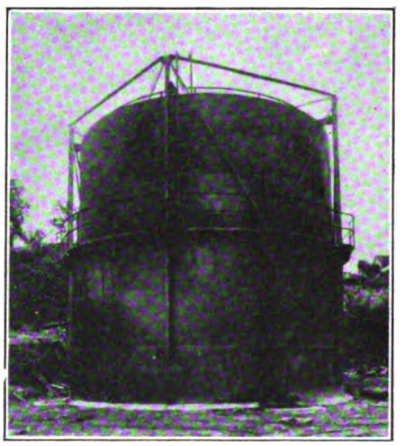


Fig. 12. Complete all arc welded gas holder of 15,000-cubic-feet capacity at Lexington, Mo.

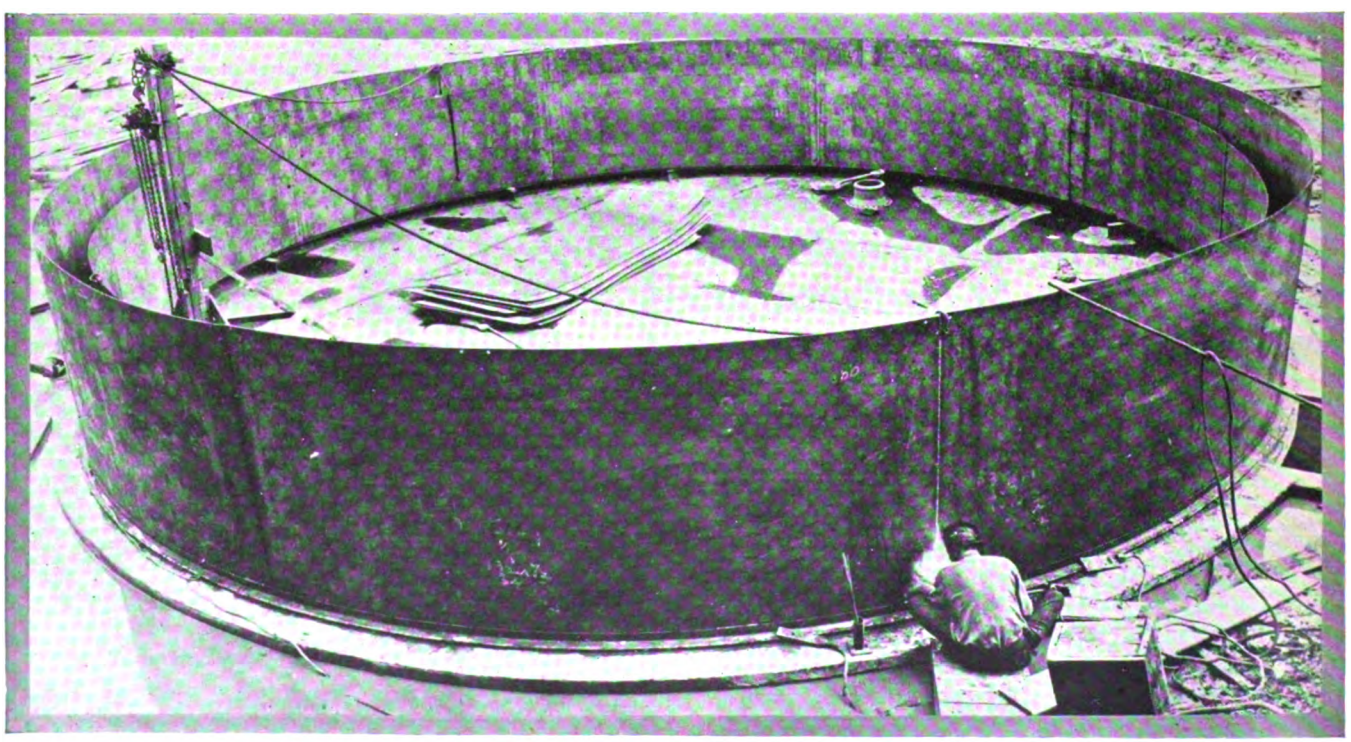
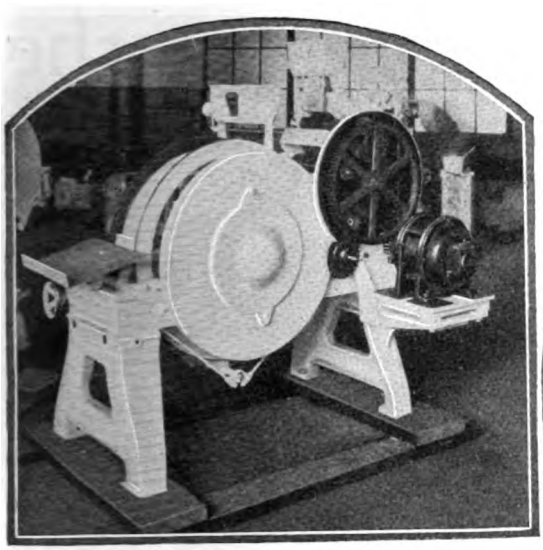


Fig. 13. First side course of the welded gas holder under construction. The welded bottom has been completed.

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How Conveyors Revolutionize the Modern Laundry

By A. C. Prendergast

PROBLEMS that nearly all laundries face in assembling clean shirts, sheets, socks and the like into a completed bundle without a multitude of steps and movements by the assembling operator, in putting the wrapped bundles in the hands of the routeman without soiling and crushing, and in returning to the starting point devices that identify pieces in the washing process, have been largely eliminated through the use of conveying equipment in the new plant of the Contra Costa Laundry, Oakland, California.

Assembling, or "distributing," as it is called in many laundry plants, is usually done from tables to rows of shelving marked off at intervals for each individual bundle. In this process the operators have to walk back and forth to deposit garments on the proper pile, confusion and a stream of conversation are likely to accompany the tying up of bundles, and the wrapped packages must be taken away in canvas hampers or carried by hand to the routemen's bins.

In the Contra Costa Laundry the assembling process has been reversed as far as possible through the use of a carrousel conveyor, the distributing shelves being mounted on a traveling base and moving past the operators, who stand still at their tables and load in the work as the shelves move past them, a few feet at a time.

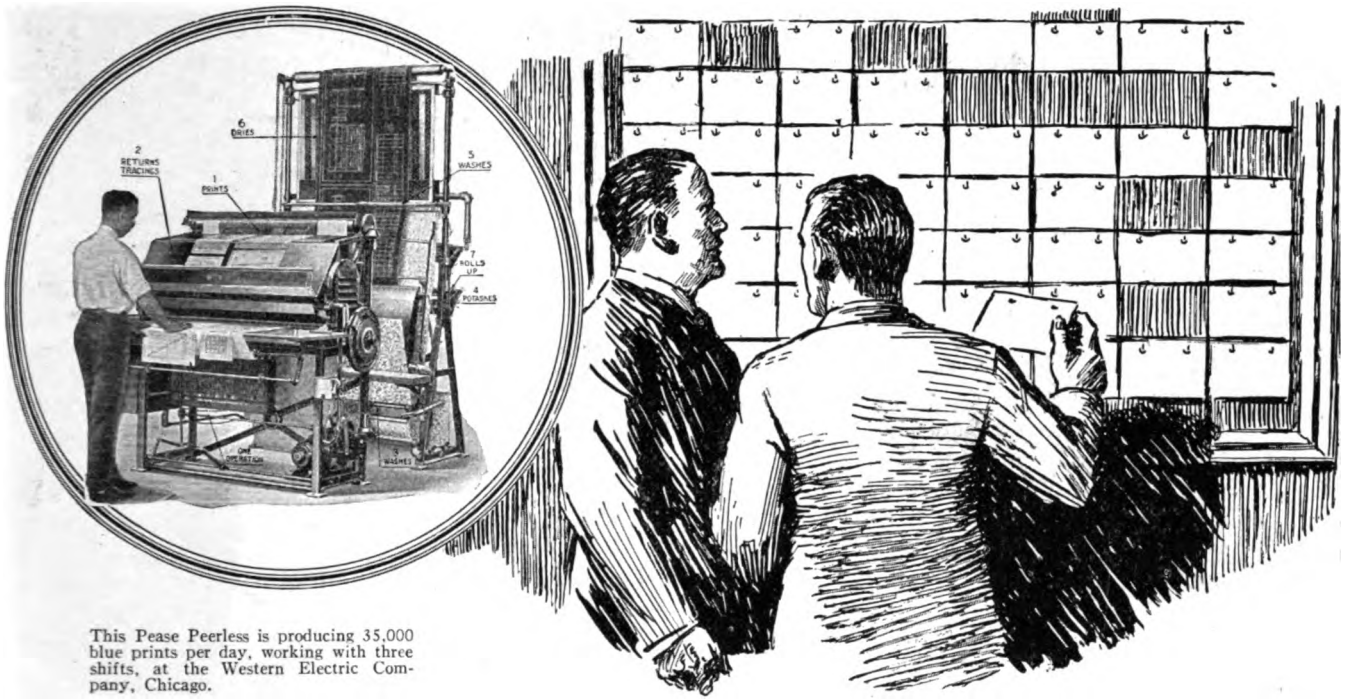
The ironing and finishing equipment is so arranged that all flatwork—sheets, tablecloths, etc.—is delivered at a table where the building up of the bundle starts, heavy underwear at the next table and so on until the collars finally surmount the pile. The conveyor, which is 250 feet long and elliptical in form, consists of units of steel shelving mounted on a motor-driven base and has a capacity of 1,700 bundles.

As the filled shelves stop on the opposite side of the ellipse, another set of operators check and wrap the bundles, tie them by machine and lay the wrapped bundles on a belt conveyor that carries them several hundred feet along two sides of the plant into the routemen's room. The conveyor not only saves the bundle from crushing or soiling but also keeps the routemen from coming into



Fig. 1. Traveling conveyor, wrapping and tying tables, showing bundle tying machines, and belt conveyor to take bundles off to drivers' room. The pieces that go to make up the bundle are laid in on the opposite side.

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Blue Print Production Increased from 400 to 1400 a Day

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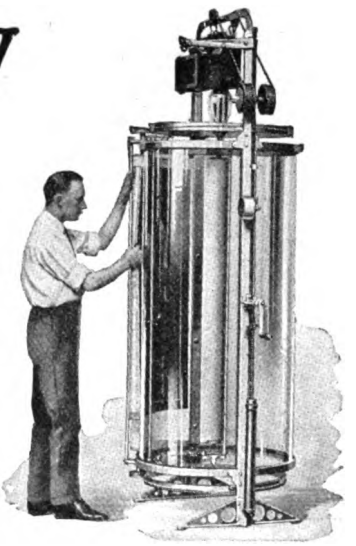
How would you like to increase your blue print production from 400 to 1400 blue prints a day without any extra help? That is what the Hawthorne plant of the Western Electric Company, Chicago, did, per machine, when they installed Pease Peerless Blue Printing Equipments. Their cost on certain blue prints dropped from 7 cents each to 2 cents. The savings the Western Electric Company are making amount to many thousands of dollars a year.

Western Electric Use 6,100,000 Blue Prints a Year

With the tremendous amount of work going through the Hawthorne plant, naturally they use a vast number of blue prints. Last year they made 6,100,000 blue prints. Ten Pease Peerless Units worked night and day, producing 14,000 prints during the day shift, and 21,000 during the two night shifts. It would be almost impossible to turn out such a volume of work if they did not use Pease Peerless Blue Printing Machines. But the prints always come through on schedule.

Few plants require as many blue prints, but the savings that the Western Electric Company are making everyday can be duplicated right in your plant. If you can keep a Pease Peerless busy but a few hours every day it will pay for itself. This remarkable machine turns out *finished prints* on non-fading Pease blue print paper—printed, washed, potashed, dried and ready to use—in one-quarter the time other methods require and the cost is considerably less—depending upon the size of the tracing and quantity needed.

If you use blue prints, by all means investigate the Pease Peerless Machine. It is the machine that turns out prints in *one continuous operation*—the machine that finishes its job. No open wash trays—no wet floors—no lines of dripping prints—no waste of sensitized paper. Nearly two thousand plants are saving money by using the Pease Peerless System. Investigate at once. Write for complete information and surveys showing the actual savings other plants have made.



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Fig. 2. Net bags and pins starting on their return journey to starting point on mezzanine floor without use of tracks, racks or cards that have to be carried by hand, etc. Nets thrown into vertical belt conveyor hopper (at extreme left), pins being hooked on to trolleys riding on a "roller coaster."

the laundry to look for their bundles from time to time.

Enroute around the plant the bundles are joined by others coming from a department devoted to the partly finished laundry services—rough dry and dry wash—where roller and belt conveyors also are used to focus the assembling at a point where one girl can build up, check, wrap and tie the bundle.

The identification devices to be returned to the starting point, referred to in the opening paragraph, are large net bags in which certain classes of work are washed, the large numbered safety pins used to close and identify these bags and the smaller pins which identify pieces that are washed loose. In most laundries the bags—or nets, as they are generally termed—are moved from one spot to another in canvas or wooden trucks, while the pins are sorted into racks and carried by hand.

In this laundry the nets are filled and the pins fastened on at stands on a mezzanine overlooking the main laundry workroom, and are emptied and unfastened at a table on the main floor. At this table the operators merely throw the nets in the hopper of a vertical belt conveyor that lifts them back to the height of the mezzanine, and thence by horizontal belts to deflectors that drop them off at the proper stands. To take care of the pins, a sort of "roller coaster" is used, a "Figure 8" track, on which ride trolleys to which the pins are hooked, the force of gravity taking the trolleys down from the mezzanine to the table and an escalator lifting them back up again.



Fig. 3. Conveyors carrying baskets of laundry work to be folded and ironed (in foreground) and carrying wrapped bundles out of the plant without soiling or crushing.



Fig. 4. This shows the use of the "Figure 8" "Roller Coaster" conveyor to return pins used for identifying loose pieces of laundry and for identifying and closing net bags.

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That turns Metal to Gas

"The fuse blows"—What a test of engineering achievement this casual statement hides.

Inside that fuse excessive current creating an inferno of heat has transformed a strip of cold fuse metal to gas. Pressure quick and tremendous has dealt the fuse casing a trip hammer blow.

To appreciate the service fuses meet is to recognize the care with which they should be chosen.

It pays to specify "Union"

UNION FUSES

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Features
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Simplicity Renewal of a Union Fuse takes but a few seconds. Unscrew two caps and slip out the knife-blade member. The small number of parts lessens liability of misplacement.

Assembly is accomplished easily and quickly. Design is such that incorrect assembly is impossible.

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Service Union Renewable Fuses are more economical because they stay in service longer. The heavy, rigid construction enables these fuses to withstand repeated "blows" without impairment.

The ease and speed with which renewal is accomplished save time and labor, and shorten the time equipment is kept idle.

Safety The casing of a Union Fuse is made of heavy grey horn fibre to withstand the repeated shock of blow-outs. Obviously the renewable feature of any fuse is of no advantage if the casing does not "stand-up." The brass ends are permanently secured to the casing.

Venting is obtained and maintained by means of a carefully proportioned longitudinal passage in the casing.

The exceptionally heavy construction of the knife blade member provides maximum rigidity and holds the blades in alignment to secure positive contact with the clips.

The fusible element is an exclusive "Union" feature. Fusion occurring midway between the contacts so that the connecting parts are always clean. The threads of the stud are not exposed so that molten metal can not cause them to "freeze."

Union Renewable Fuses always "blow" at the proper rating.

A convenient way to find the proper fuse



The Union Chart "How to select Fuses" shows quickly the proper fuse for all types of motors. One of these charts will be mailed for the asking.



A Union Renewable Fuse disassembled. Note the minimum number of parts and substantial construction.

Union Fuses are made in all standard ratings including renewable and non-renewable, indicating knife blade and ferrule types.

Plug fuses of a corresponding quality are manufactured under the trade name of "Gem."

Full information covering all types of fuses will be sent on request.

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Checking Fuel Wastes in the Small Plant

By M. P. Lawton

THE larger a manufacturing plant, the better equipment and personnel it can afford for investigating and building up the efficiency of its equipment. To illustrate: for many years large concerns who manufacture their own power have found it necessary to install apparatus for gauging their efficiency in the manufacture of this power. The total effect of even a small preventable loss would amount to so much in dollars and cents that it would be foolish to ignore it.

It is only in recent years, however, that executives have been shown that the *percentage* of costs is just as great in the small business. Urging of careful attention to these details is the order of the day. The technical press is united in a plea for the saving of ever so few dollars' worth of fuel, raw material, time, or what not. The operators of small power plants have been shown that elaborate instruments are not necessary for the testing of this equipment. After all, the most important things to know are the amount of money put in and the amount of value taken out, both of which are easily obtained. And these, with some standard of comparison, can be made to yield many times the value of effort put out to obtain them.

There is another element of cost which, though it affects fewer industries is nevertheless likely to play a more important part in those which it does affect. This is the matter of industrial heating. Here also the larger plants have their technical experts, elaborate instruments, and volumes of information. To the small plant, however, these are denied. Consequently, little attention is paid to the cost of heating material. A laborer is employed as fireman, and a prayer breathed that he will somehow discover the way to keep the plant supplied with heated material. Sometimes we hope—though hardly expect—that he will at the same time hold the expense as low as possible.

It was in such a mill that the following tests were run. The most important instrument used was a pair of ordinary platform scales.

The furnace was a continuous coal-fired reverberatory type, for heating billets.

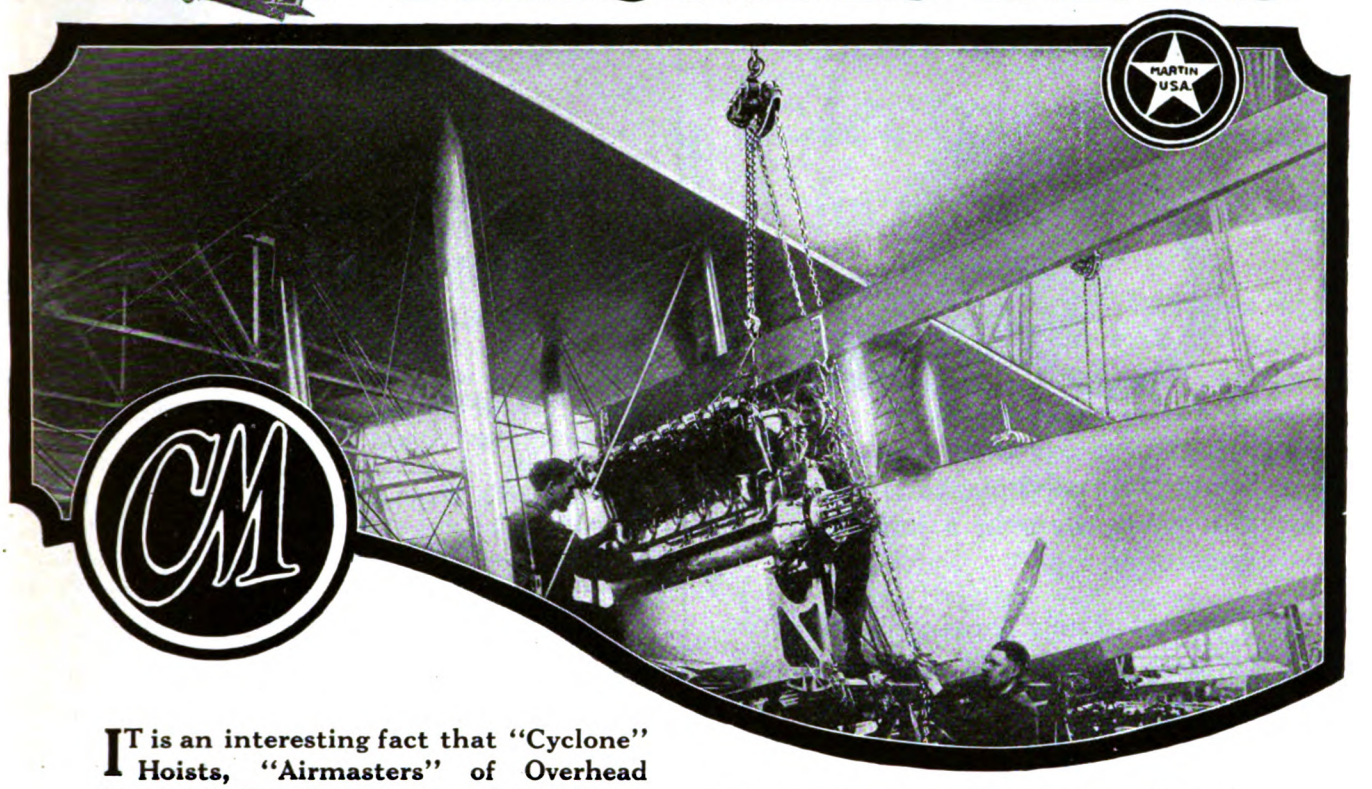
Width inside, 6′ 10″.
Length of hearth, 24′ 0″.
Billets—1½″ x 1½″ x 34″, double row.
Construction—13½-inch firebrick walls, covered with cast-iron plates. No special heat insulation.
Type—Top flame, non-recuperative, hand-fired and regulated. Electric pusher, hand pull-out.
Draft—Natural stack draft. Regulated by water-cooled damper.
Combustion Air—Furnished by motor-driven fan. Admitted cold into ashpit.

As can be seen, this furnace is of the simplest possible type—so simple that for years very little attention was ever paid to it. Its performance was measured monthly in terms of coal used per ton of steel; but the resulting figure was simply an average of a number of days and two or more firemen, and meant very little.

The whole story is given very simply in the following

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"AIR MASTERS"

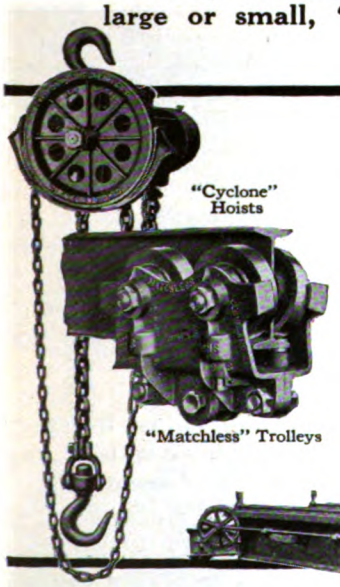


IT is an interesting fact that "Cyclone" Hoists, "Airmasters" of Overhead Material Handling, are used in assembling Glenn Martin Airplanes, "Airmasters" of Overhead Navigation.

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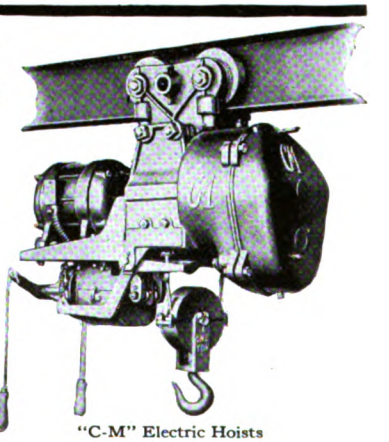


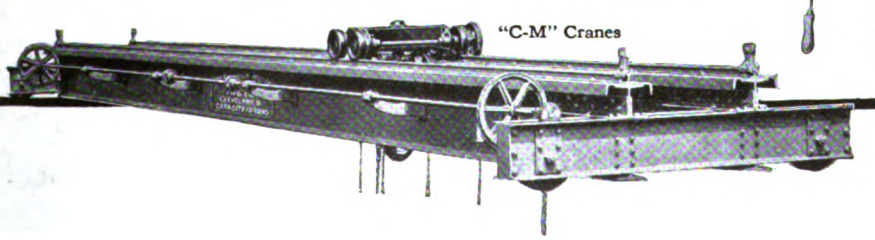
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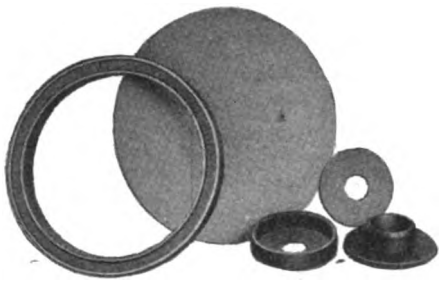
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table, which represents the results of two different tests. The furnace and operating conditions were identical throughout, with the exception of the firemen.

Test	*Fireman*	*Average Firing Interval (Minutes)*	*Average Coal per Firing, Lbs.*	*Coal per Ton Steel, Lbs.*
1	"A"	3.1	34	198
	"B"	7.2	92	244
2	"A"	3.5	34	185
	"C"	11.3	147	301

Fireman "A" had been on the same job for many years, and had worked out his own standard practice for firing. It is believed that this performance is as good as can be obtained with this type of furnace.

Fireman "B" has been instructed to a certain extent, but does not approach the efficiency of "A." Fireman "C" was fresh from the hand-fired locomotive and believed that he was still firing a heavy train up a steep grade. He did not stay long enough, however, to show very great improvement in his work.

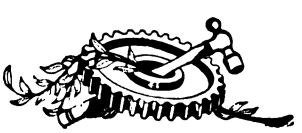
A considerable amount of other data were collected. As might be expected, "A" 's stack temperature was considerably below that of the others. This man also regulated his damper so as to keep the pressure inside the furnace as near as possible to that outside, while the other two ran either with flame blowing out the doors or with cold air being sucked in.

The executive, of course, is interested primarily in the dollars-and-cents aspect of such a study. Our contention is that after facts such as the above have been ascertained it is not a difficult matter to take steps to remedy the conditions disclosed. Comparing the good and mediocre firemen in the above example, it is evident that by correcting the glaring malpractice of the latter it should be possible to save forty-six pounds of coal per ton on all steel heated during his turn. Using the total weight (about 10,000 tons of steel per year) the saving would amount to something like $1,100 in a year—a fair rate of remuneration for the small amount of effort expended.

The foregoing example is merely cited as typical of the simplest problems which may confront the smal plant. Many others are encountered, both more and less complex. Steam, air, and water leaks total up to a surprising rate, and usually are so simple to remedy that they are often considered as not worth attending to. Exposed steam pipes represent greater loss than the average leak, yet they are often the rule rather than the exception, in small plants. Few of the average employees have any idea of the money value of these commodities, and are often careless in their use. Nor can they be blamed, for in nine cases out of ten these values have not been impressed on them by those in authority.

Cases will sometimes be found where men use compressed air in summer for cooling themselves. More frequently where high pressure steam is used in radiators we find a full blast blowing through.

The sum total of such losses will often pay the salary of an engineer in even a small plant. Invariably they will pay for a generous share of executive attention.



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WHITING

Electric Cranes for Structural Shops

Leaves from an Engineers Note Book

Client . . . A structural Iron Company
Problem . . Designing a Light Structural Shop of 50 tons per month capacity. To receive stock on a railroad siding, fabricate it and ship it out by truck for local delivery. Shop to be located in a metropolitan district where labor cost is at the maximum.

First—Assume Air Hoist and Overhead Trolleys.

Moderate initial cost for equipment and building. High operating cost on account of wasted time in moving material from place to place. Approximately 40 men required to produce the desired output.

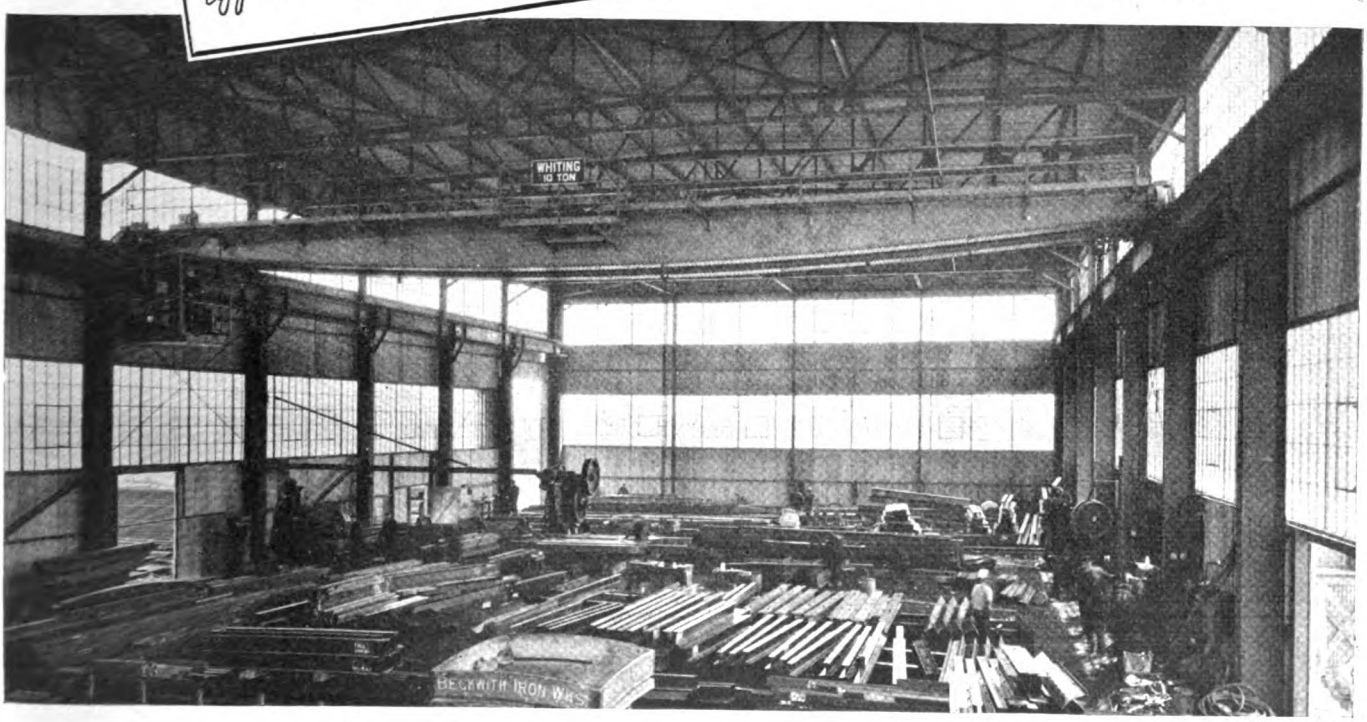
Second—Assume Electric Overhead Traveling Crane of 10 tons capacity serving entire building.

Additional height and running support increase cost of building. But operating cost greatly cut because 23 men can operate the shop. Including all fixed charges on investment as well as labor cost, the crane appears to pay for itself in about two years.

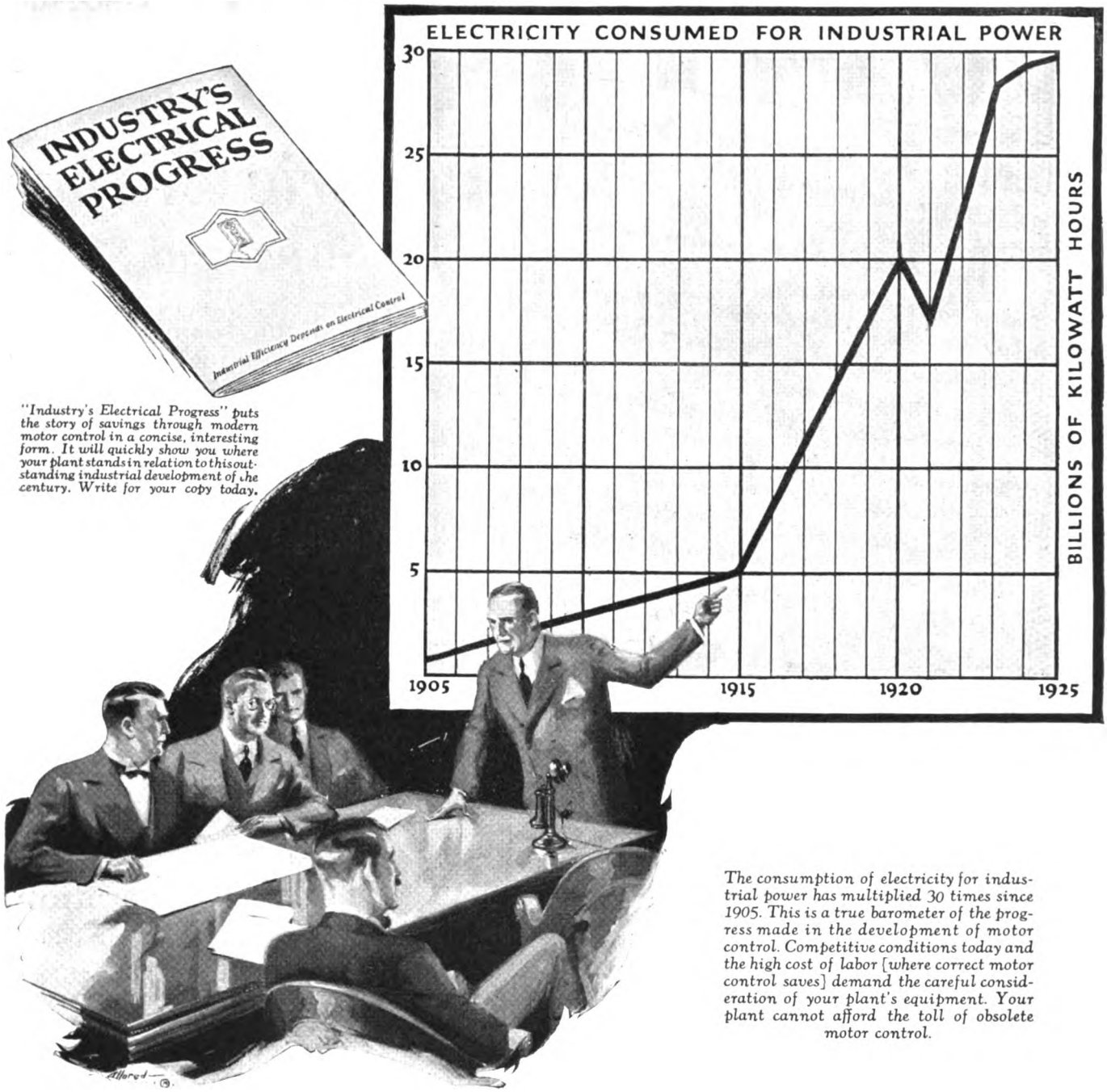
"NO use talking, you can't keep up with the crane," is the verdict of the superintendent of the plant pictured below. Speedy service is vital in successful operation of a structural shop. You *can* push the work around. But why double up on the labor cost to accomplish what a crane can do at so much less cost. Have you studied your shop thoroughly to determine whether a crane might show you an important saving?

We will be glad to send you further data to assist in such a study.

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Too often the men of industry consider the electric motor alone the symbol of plant efficiency. True, electric power with its flexibility, its ease of control, has brought a new standard of operating economy.

But motors by themselves are only brute force. The savings in labor that result—the savings that add substantially to industrial profits—come through the proper use of motors. They come through the effectiveness of correct motor control.

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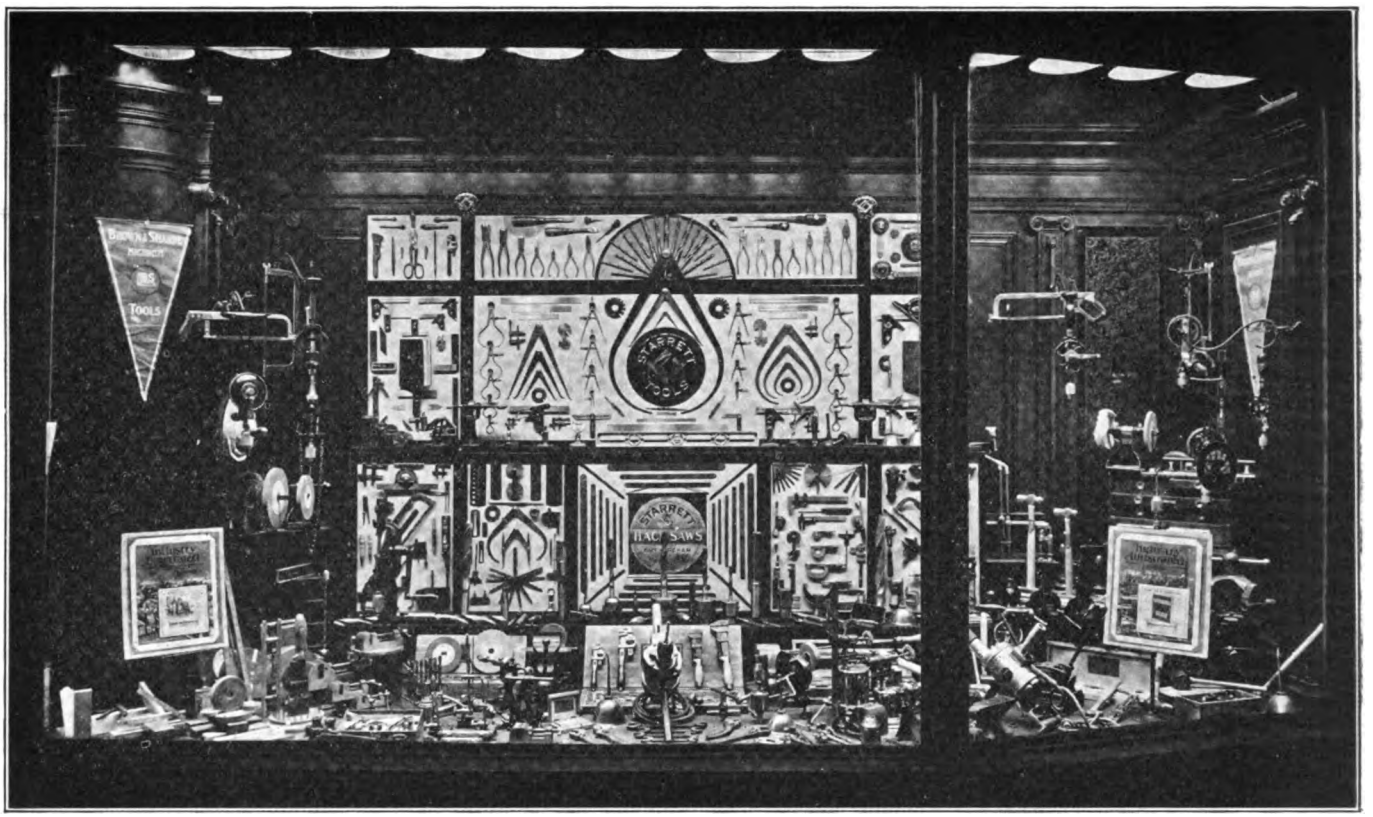
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Depends on Electrical Control

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Attractive Window Displays of Mill Supply Products

THE attractive window displays shown on this page are calculated to attract the eye and hold the attention of the mechanically-minded passerby. They were photographed in the windows of Hammacher, Schlemmer & Company, of New York City. Note the effective use of INDUSTRY ILLUSTRATED front covers in both cases. Evidently this concern regards INDUSTRY ILLUSTRATED as an efficient industrial tool.



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SPEED—

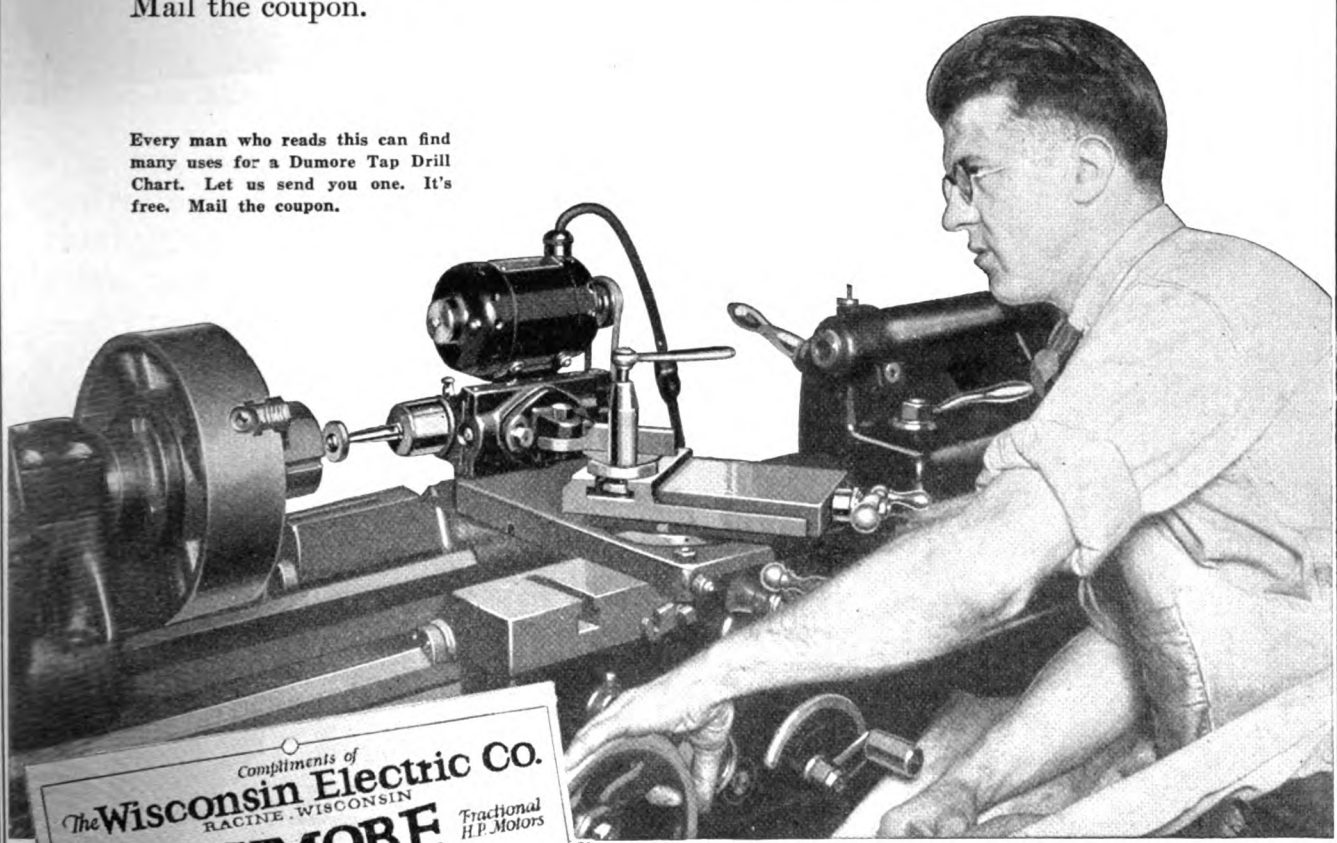
ACCURATE work can be carried to completion in less time, with more certain results, and at greater profit, by the use of Dumore grinders.

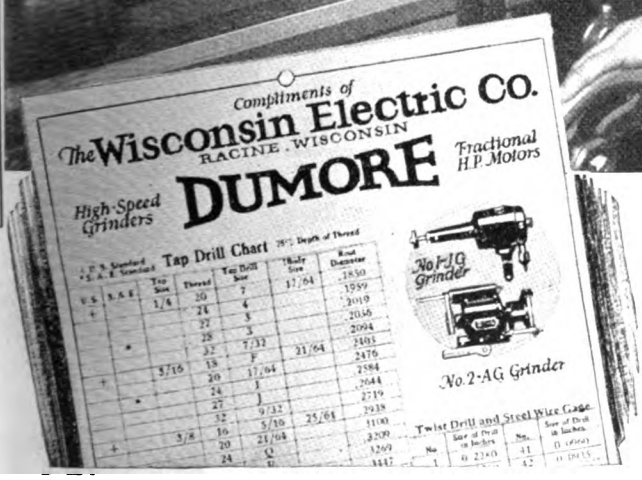
A Dumore grinder has often speeded up close limit work, for instance, so that five pieces instead of three made a day's output for a worker. It makes difficult jobs simple. It pulls the teeth of emergencies. It is one machine that always pays for itself.

It is easy for you to try and to own a Dumore Grinder. Mail the coupon.

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Every man who reads this can find many uses for a Dumore Tap Drill Chart. Let us send you one. It's free. Mail the coupon.





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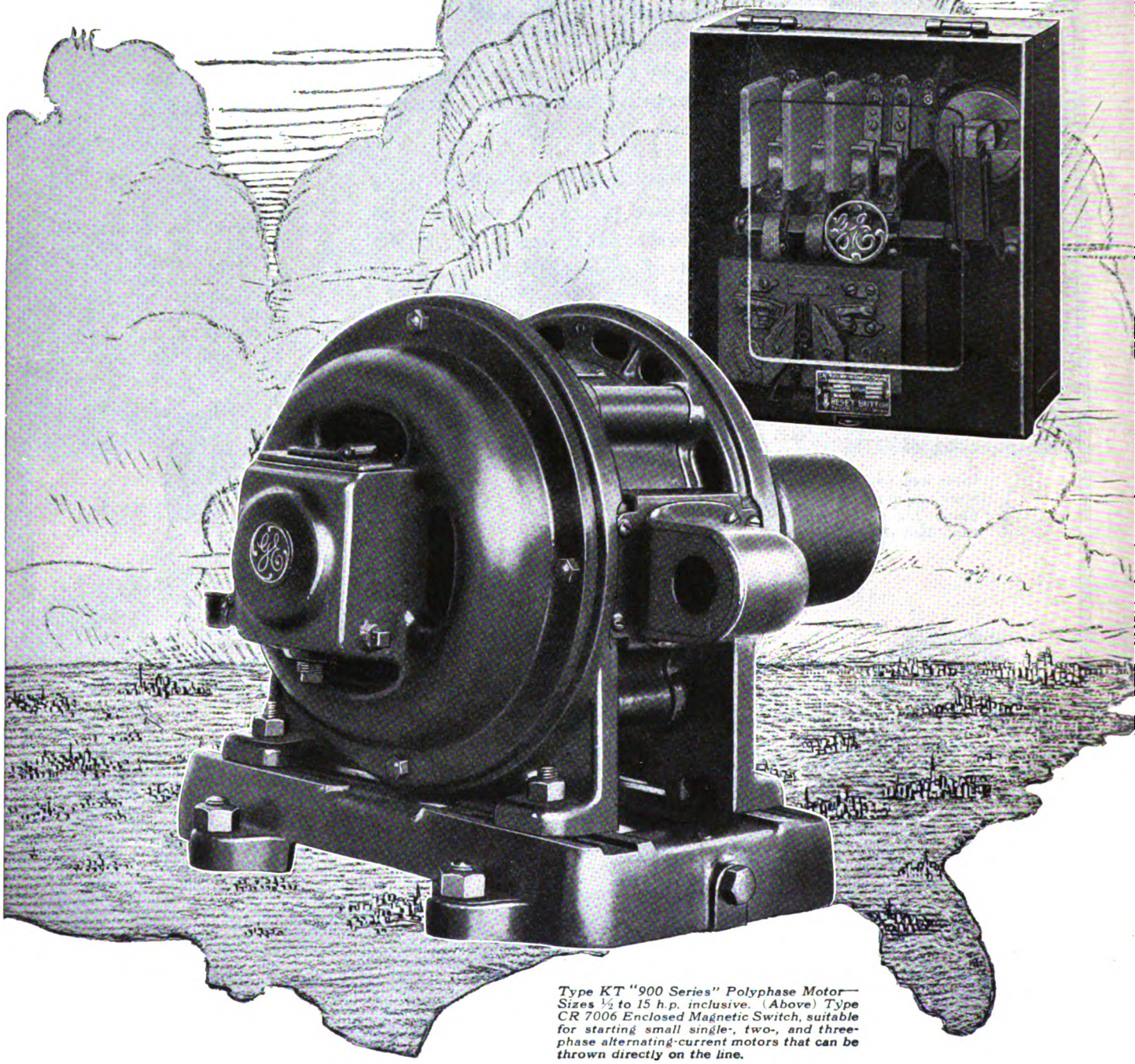
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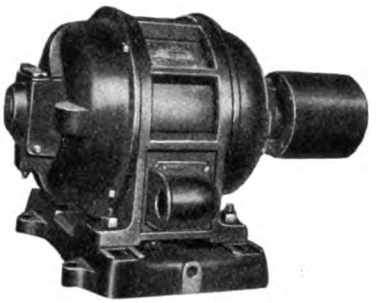
Whatever the circuit requirements or demands of service may be—whether the work be ordinary or extraordinary—whether you need a 1/200 h.p. motor or a giant of 22,000 h.p.—there is a G-E Motor to fit your need.

And for every G-E Motor there is suitable G-E control equipment—whether the requirements for starting, stopping, reversing, or motor speed regulation be simple or complex.

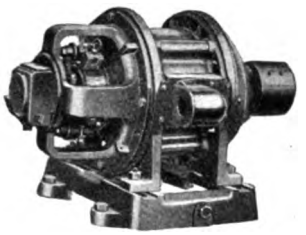
G-E Motorized Power is a practical means of increasing the productive ability and capacity of available man-power. "Built in" or connected to all types of industrial machines, G-E Motorized Power provides lasting assurance that you have purchased the best.

To obtain full value from your investments in electric motor drive, ask your nearest G-E office—or G-E Motor Dealer.

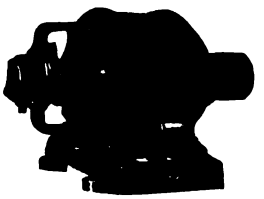
Four improved motors for general industrial uses



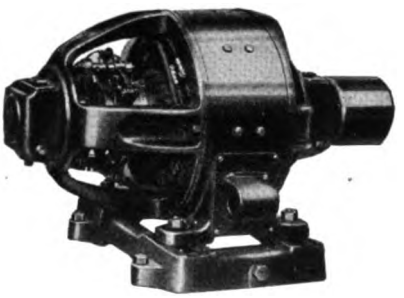
Type KT "500 Series" Induction Motor —Sizes 10 to 200 h.p. inclusive



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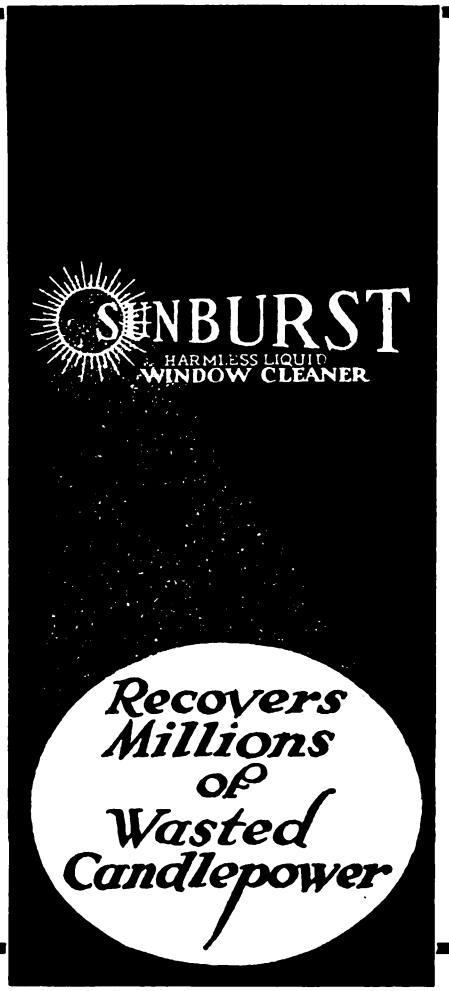
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Give a Thought to Maintenance

Avoiding Shutdowns in the "Key" Departments of the Plant

By William G. Ziegler

EVERY plant has one or more departments that require more than the ordinary amount of maintenance in order to keep them running. These departments are usually so-called "key" departments that are especially important and must be carefully taken care of in order to keep production schedules intact. In average plants these departments are usually one or more of the following: Polishing and Plating Room, Hardening Room, Drop Forging Room, Iron Foundry and Brass Foundry. A serious breakdown in one of these departments seriously affects the plant, and every plant engineer concentrates his attention on the maintenance of these departments and has important points carefully inspected either daily or at frequent intervals to preclude the possibility of a breakdown.

The Polishing Room

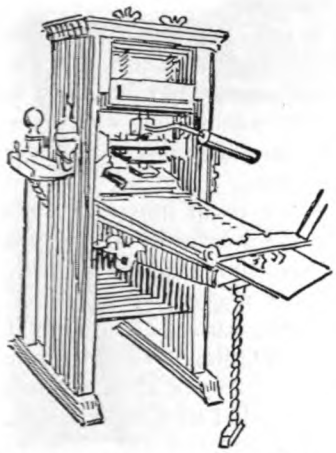
In the polishing room, direct motor driven polishing and grinding wheels are becoming more and more common, due to their advantages over belt driven types. With belt driven types a main line shaft and countershafts are necessary and the belts throw around the dust that is suspended in the air. The belts in a polishing room run at very high speeds and it is therefore advisable to glue the joints to avoid slapping of belt lacing over small pulleys. Direct motor driven types are very much easier to maintain, especially with alternating current motors, and a breakdown of one motor shuts down only one pair of wheels. With ball bearings the maintenance should be confined to greasing bearings every few months depending on the service. In some plants, the driving shaft is below the floor and the polishing wheels are set directly over it. This is usually possible on a ground floor only, but the absence of belts makes this method nearly as good as individual motor drives.

Grinding wheels require solidly constructed boiler iron guards to protect the operator in case of wheels breaking. It is well to have hoods over polishing and buffing wheels solidly constructed but the heavy guard is not necessary. These hoods should have a cleanout at the bottom so that the heavy grit and lint will be caught instead of being drawn through to the dust collector. This saves handling a large amount of this material and is quite a saving.

The piping from hoods to dust collector should be cleaned out every two weeks to avoid any accumulation of lint and heavy grit at corners or other places where the air suction is not strong enough to move this material. When dust collecting systems are not correctly designed or are overloaded by adding one pipe after another, various expedients may be used to remedy the low suction. In some cases the fan may be speeded up a little. This

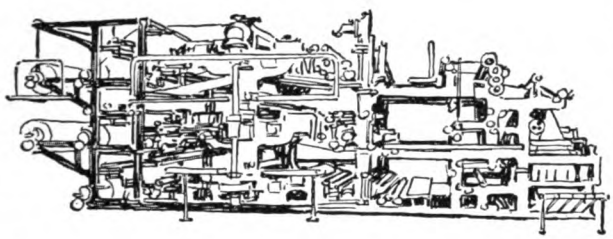
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Black on White



The first printing press is lost to history. The encyclopedia says that this fellow Gutenberg who invented printing must have had a press. It probably looked something like this.

But the periodical you are now reading was printed on a press of the character shown below. The old press was a wonderful invention, but the big one is a far better machine for the quantity production of information.



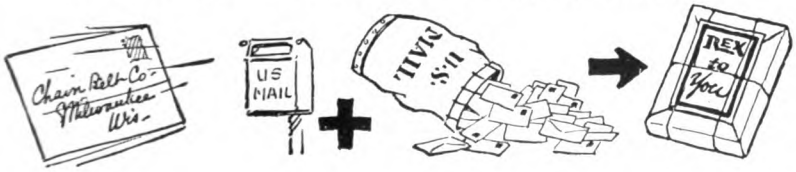
Here is a stack of printed information that was one busy man's file on power transmission and conveying equipment. The information was all there. Of course he had to hunt for it, but it was the best thing available until one day he answered an ad like this one and received the Rex 210 Engineering Handbook. He spent a while getting acquainted with the 210 and found that he could bundle his old file off to the bookcase and to the furnace. He found a nice place on his desk for the Rex 210, where it is always handy for quick use. Perhaps it will pay you to do the same. The printer left some space over in the right hand column for your name and address.

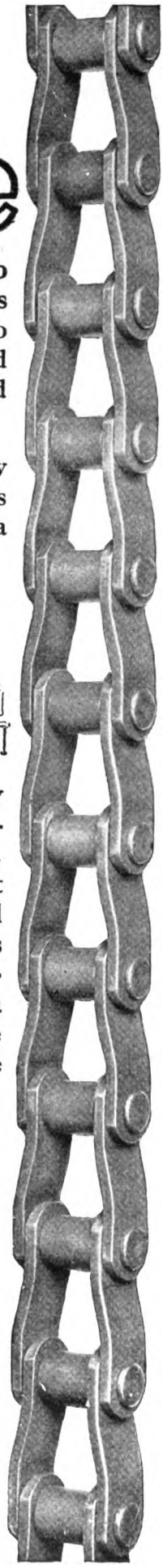


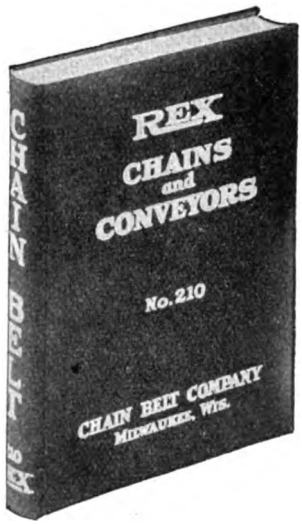


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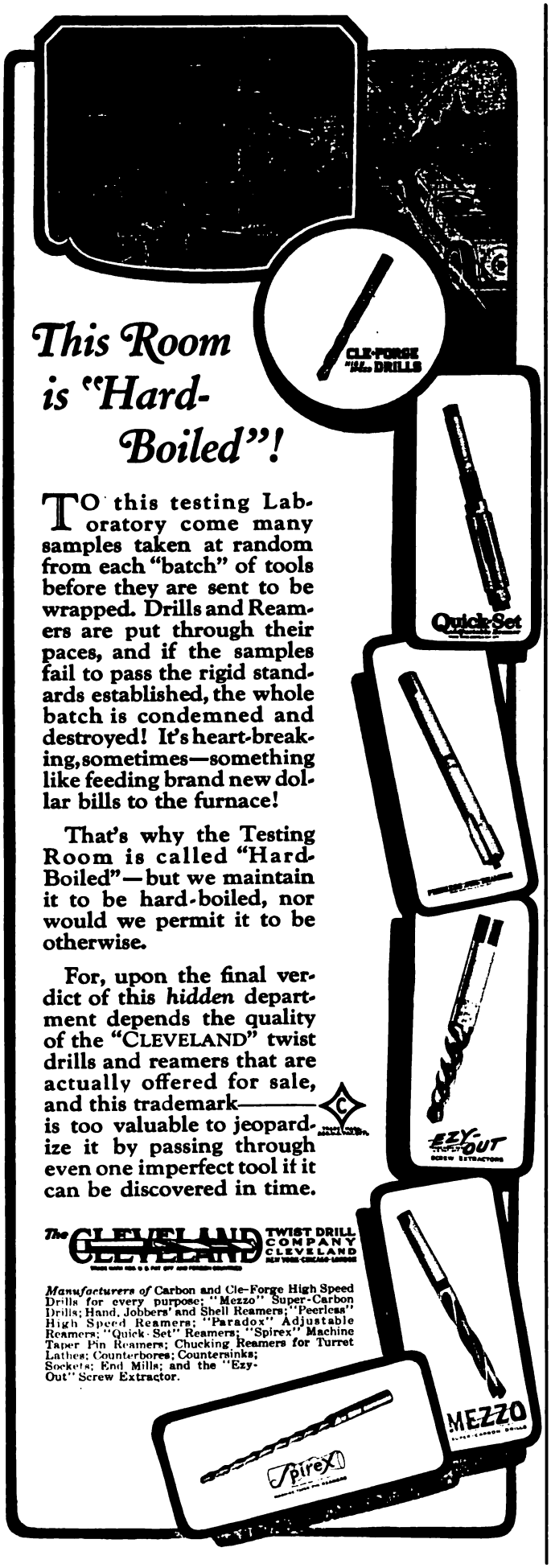
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should be carefully checked before doing it, in order not to exceed safe limits of peripheral speed, and with some fans the efficiency drops after reaching a certain speed. Usually the piping can be rearranged and straightened out to eliminate elbows and dead air pockets. Every elbow increases the air friction and reduces the capacity of the system. Fans with direct connected motors give positive speeds and eliminate belt slippage. All fans have a certain amount of air slippage but this is to be expected. Fan and motor bearings should be oiled at least once a week and thoroughly washed out with kerosene frequently. Ball bearing fans and motors require only occasional packing with grease.

The design of the dust collector is an important item because a good design will separate practically all the dust and allow practically clean air to escape, whereas a poorly designed dust collector will allow a great deal of dust to escape with the air. This often causes complaints if the plant is situated near other buildings. The outside piping, dust collector and steel framework that supports it are all exposed to rain and snow that tend to rust them very quickly unless they are kept well painted. The receptacle under the dust collector should be cleaned out every day to avoid clogging up.

The Plating Room

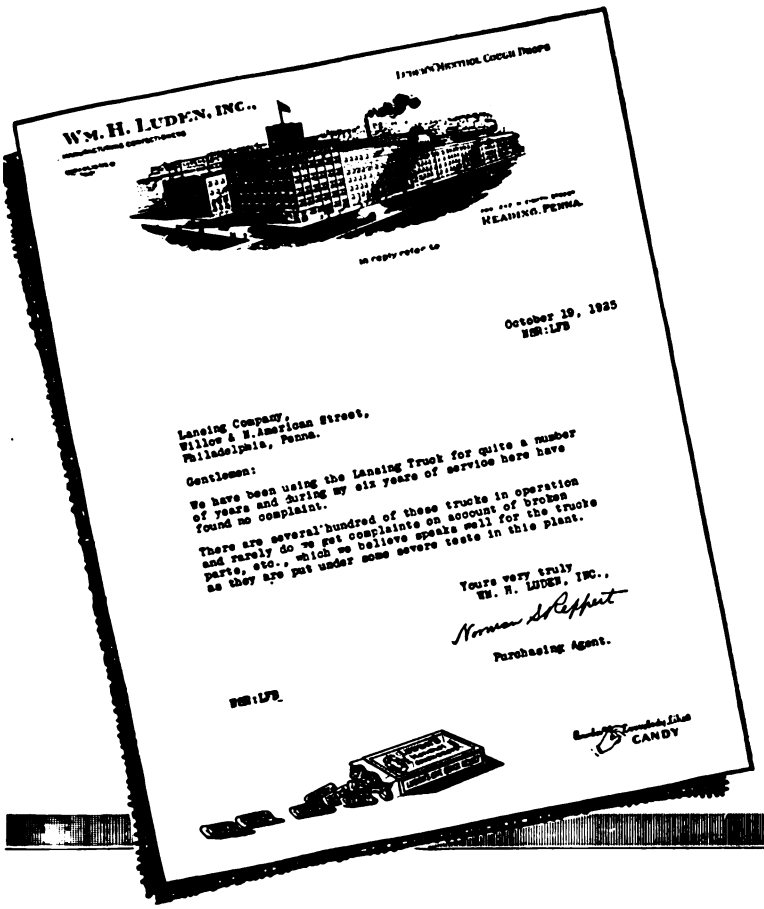
The plating room should have a special acid and waterproof floor sloped to drains. This floor should be washed down occasionally to prevent acid from standing on it. The waterproofing should be carried up about six inches above the floor all around the edges at walls to prevent seepage. It is best to have wooden grates on this floor to have a dry floor for the men. The drain pipes should be lead with burned joints and the lead pipe should extend all the way to the sewer so that there will not be any leaks within the building. Wooden plating tanks should be well built if they are to last. The weight of heavy solutions gradually bulges poorly made tanks, and leaks are to be expected. Old tanks may be repaired by giving them a new coating of hot pitch but this job is quite hard to do well, and it is best to call in a specialist. The overhead piping in a plating room is subjected to very concentrated acid fumes that quickly corrode it if it is neglected. All piping should be kept well painted preferably with an acid proof paint but at least with a regular oil paint.

Conserving the Electro-Plating Current

The low voltage generator is ideal if directly connected to a motor. This gives constant speed with no slippage and very little maintenance except oiling once a week. With ball bearings, a greasing once every month or two should be sufficient. The contacts on low voltage copper buss bars or heavy wires should be carefully made on account of the high amperage. Special connections are generally used for each kind of joint. The copper bars become corroded and should be kept bright where contacts are being made, as on the rods over the tanks.

In order to speed up the plating, many heated baths are used. The usual method is a steam coil in the bottom of the tank, the return end of the coil being run to the hot water or hot potash tanks in order not to dilute the plating solution. Air or mechanical agitation is another method used to speed up plating and it is also desirable because it keeps the plating from being porous or spongy. A chemically pure lead pipe with very small holes drilled

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HEADING, PENNA.

October 19, 1925
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Yours very truly
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CANDY

Wm. H. Luden, Inc., of Reading, Pa., uses several hundred Lansing-Company Trucks. Phrasing from their letter, these trucks are put under severe tests in everyday use, with breakage a rare occurrence.



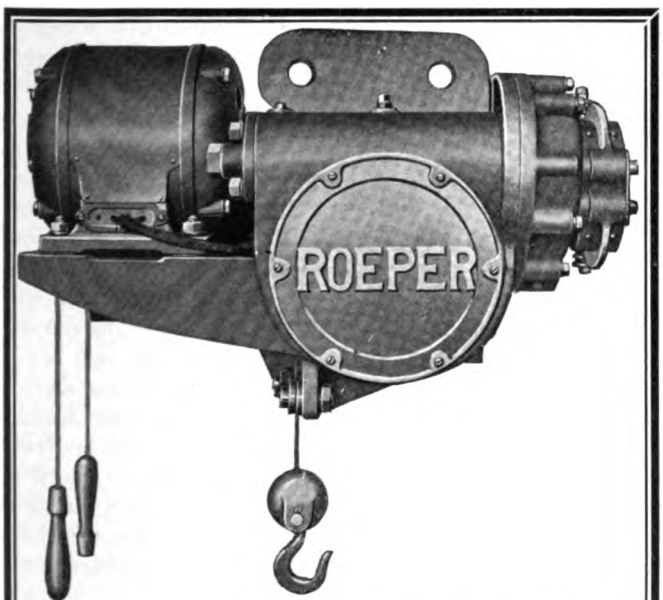
All Steel Nose Truck Fig. 732

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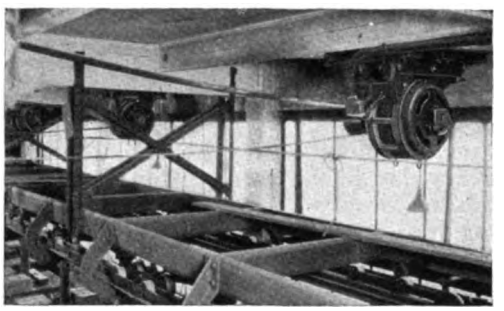


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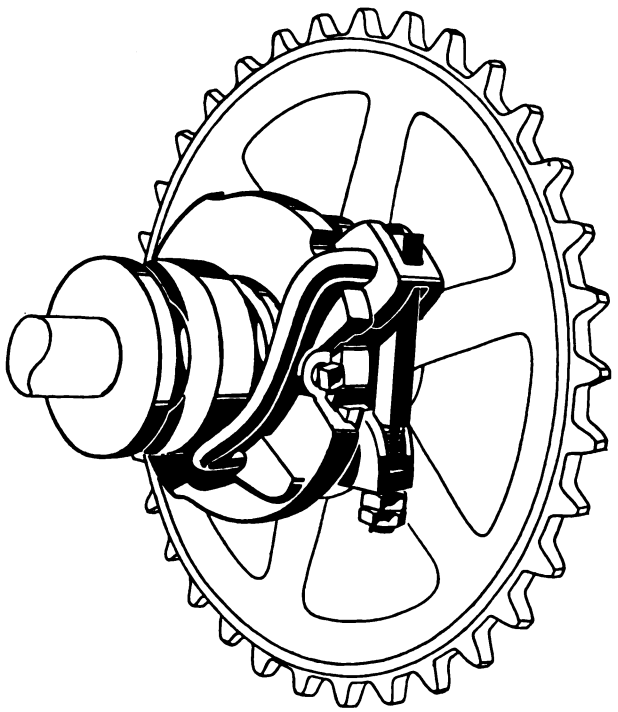
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in it at intervals is the usual method of agitation. This will last a long time.

The Hardening, or Tempering Department

In the hardening room the various furnaces and quenching tanks require constant attention. The burners for oil or gas are subjected to high temperature and burn out from time to time. New burner heads should be kept on hand at all times for quick replacement. The adjustment of the proper amount of air and fuel is very important for efficient operation. The firebrick in furnaces is exposed to very high temperatures, in some cases severe enough to soften the brick and allow them to be compressed. This causes trouble on arches as soon as the brick is allowed to cool. It is best to use high grade firebrick in order to have it last as long as possible. The firebrick should be backed up by an insulating brick to cut down radiation losses. The doors of large annealing and case hardening furnaces should be heavy cast iron lined with fire brick and perfectly counterweighted to make easy handling.

The piping in a hardening room is a very important item for there are so many different services. Some localities used natural gas when it is available, and oil or manufactured gas at other times. This requires the use of combination oil and gas burners and duplicate oil and gas piping. Besides these, there must be air for the burners, a cooling medium piped through the tanks, or a pump for circulating the oil or water, used for quenching, through a tank or other cooling medium. With good joints in the piping the amount of maintenance work on this item should not be large.

The cooling system is quite important, as proper hardening is dependent on correct quenching-bath temperatures. When artificial refrigeration is used, this needs special attention. In small hardening rooms cold water is usually used for cooling.

Air compressors of the newer turbine type with direct connected motor drives are very easy to maintain. They are also efficient, as they use power in proportion to the air delivered. With positive pressure blowers there should be an air receiver to remove pulsations from the air and make the pressure at the burners constant. In all cases, the oil pump should be driven from the air blower shaft, to guard against fires due to oil that is not properly atomized being pumped into a hot furnace after the air is shut off. The air supply to the blower should be as short and direct as possible and should be from clean air. When gas pressures in the mains vary, it is often advisable to install a gas booster for maintaining a constant gas pressure at the burners. With this system it is usual to depend on the gas drawing in the right amount of air, for proper combustion.

Tanks and Piping

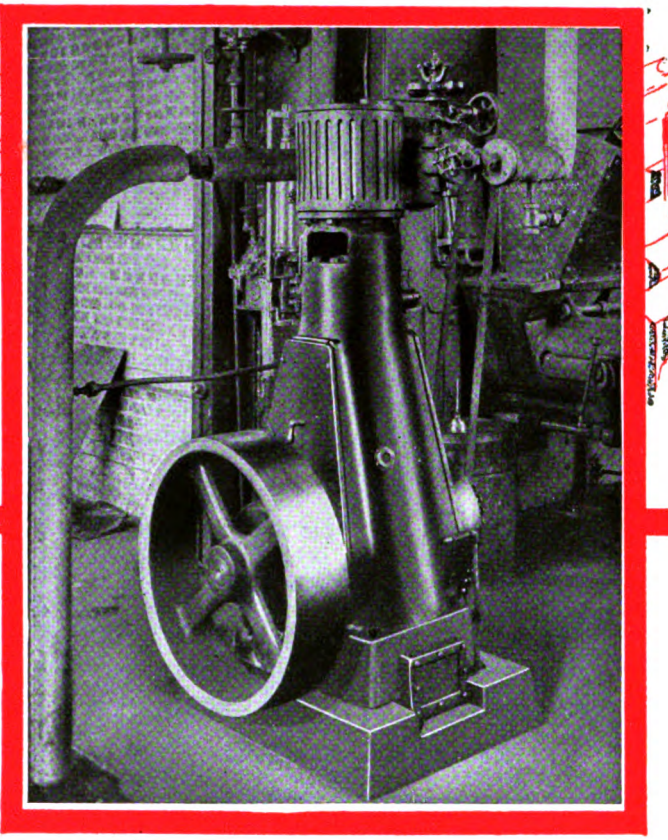
Underground oil tanks must be well painted before being put down into the ground. The piping should also be carefully planned, and installed in duplicate, so that a break in one line can be quickly overcome by shifting over to the other line. The better way is to have two tanks and two sets of piping so arranged that oil may be drawn from either tank through either pipe. In cold weather, heavy fuel oil is too viscous to flow, and it must be heated. Coils for this purpose should be installed in all tanks and if the filling pipe is more than a few feet

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TROY Engines have the self-compensating steam valve which automatically clears the cylinder of any condensation. They are oil and dust proof—entirely enclosed. Bearings are always assured of a continuous supply of oil through the TROY Automatic lubrication system.

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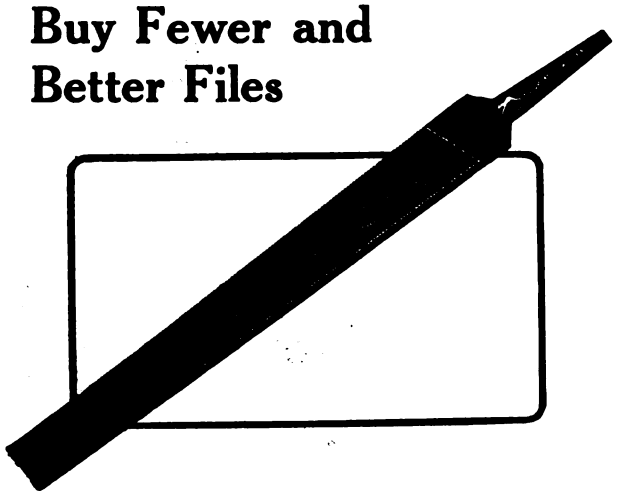
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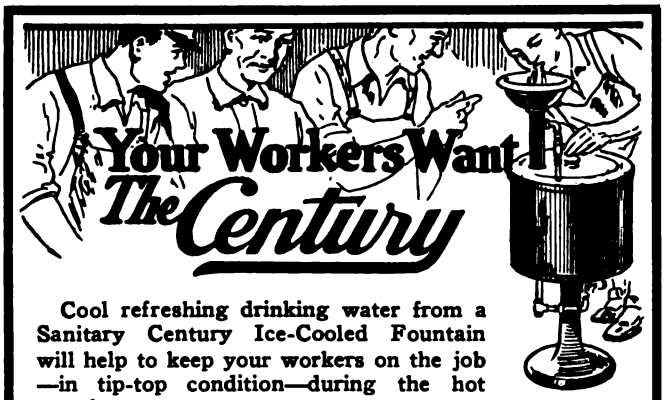
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All exposed fittings are brass, heavily nickel plated. The body is finished with a durable, rust proof, gray enamel paint.

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from car or tank wagon supply, the filling line must be steam heated in winter.

The Drop Forging Department

The drop forging room uses furnaces, oil tanks and piping similar to the hardening room and the maintenance of these items are similar. Forging furnaces, however, are different from hardening furnaces as they have no doors, because the work is constantly being put in and taken out and forging is usually done directly on the bar stock which sticks out of the furnace door while it is being heated. Oil fired furnaces have been found best for forging work as the oil flame seems to produce a heat that soaks into the steel more quickly. The flames must be kept just right so that the steel will not become oxidized or scaled while it is being heated.

The intense heat in forging furnaces makes quite a little maintenance work on the brickwork necessary. The writer has found it best to use high grade fire brick and a high temperature cement instead of fire clay. If the brickwork is well done and the whole inner surface is given a wash coating of high temperature cement, the edges of the brick will be protected and they will not spall off so quickly. Everything possible should be done to prevent a tie-up in case of a break in piping and the best way to do this is to have duplicate oil and air piping. Many methods have been tried to protect the operator from the intense heat of forging furnaces. Chains hanging in front of the door have the drawback of being in the way. If properly installed a compressed air screen is very helpful in keeping the heat from the operator. A three inch pipe is drilled with small holes in a row and this pipe is mounted slightly away from the door of the furnace, parallel to it and a few inches below it. The holes are tipped slightly inward so that the air blast will counteract the heat waves coming out of the door. The air supply to this drilled pipe should be preheated to avoid chilling the work in the furnace. This may easily be done by laying the air supply pipe in the top of the brickwork, where it will get a good supply of heat.

Hammer Foundations

The foundations for drop hammers and steam and air hammers are very important and should be carefully designed for each particular hammer. Great care should be used in the construction of the foundations because a poor foundation is very dangerous if it settles on one side. Depending on the subsoil a good concrete footing should be put in and a sand cushion about an inch thick put in a depression in the concrete. The hardwood timbers at least twelve inches square should be stood on end on the sand cushion and bolted together in both directions. The timbers should fit together closely and the bolts should be about two feet apart in each direction so that the whole will be a solid mass. Nine, twelve or sixteen or more of these timbers should be used depending on the size of the hammer. The sand cushion at the base should be carefully enclosed to prevent the sand from getting out.

Boards on drop hammers are usually of rock maple to withstand the severe service. They are apt to break at any time and should be replaced at once in order not to hold up production. The clutches on all kinds of hammers are very important on account of the danger to operators if the clutch should slip. No slipshod repairs should be allowed on hammers; either the job should be done

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1 Lapidolith is the original concrete floor hardener. It will add years of wear to even an old concrete floor. It is a liquid, chemical compound that penetrates the porous cement, binds the loose particles together, and fills up the voids. It will make your concrete floors almost as hard as flint, and make concrete dust a thing of the past. Lapidolith is as easy to apply as water. Floors treated at night are ready for business in the morning.



2 Lignophol will add years of wear to old, worn-out wood floors. It is a preservative dressing that penetrates the wood fibres, and restores the natural gum and oils. It will give you smooth, hard, dustless wood floors.

The Standard Sanitary Mfg. Co. of Birmingham, Alabama, users of Sonneborn products. Contractors — Ferro Concrete Construction Co. of Cincinnati.



3 When your next repainting job comes around try Cemcoat. The wearing qualities of this paint are remarkable. Even on brick, plaster, or concrete walls it will not crack or peel. It may be washed again and again. Because of its unusually heavy body it generally requires one less coat to a given surface than most paints. Cemcoat comes in white and colors for exteriors and interiors.

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Five methods they have used for years with excellent results

1 They make their concrete floors dustproof and wearproof with a treatment of Lapidolith, the original concrete floor hardener described above.

2 They protect their wood floors against splintering, rotting, or drying out. A dressing of Lignophol adds years of wear to any wood floor. Read the detailed description at the left.

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4 They guard their buildings against dampness. A treatment of Hydrocide Colorless on your exterior walls permanently damp-proofs your buildings. Further details are given above.

5 They stop roof leaks before they become dangerous. Stormtight is an adhesive, rubberlike substance that stops leaks instantly and permanently. See the complete description at the right.

L. Sonneborn Sons, Inc.

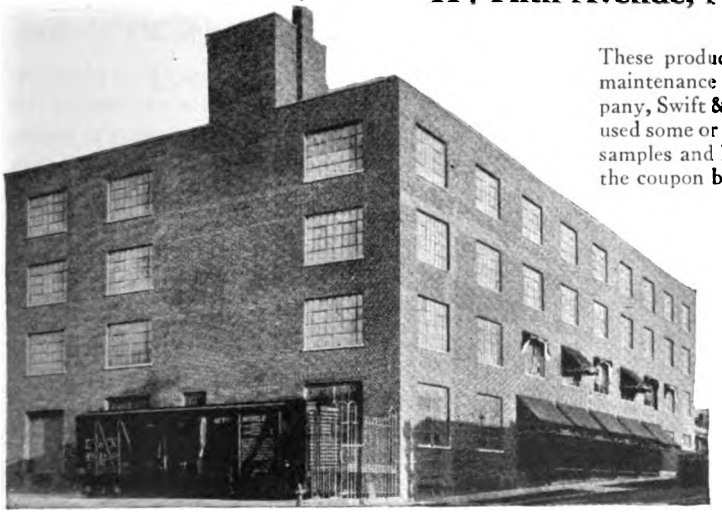
114 Fifth Avenue, New York City



4 Hydrocide Colorless, applied to the exterior of a building, penetrates the brick or concrete and effectively keeps out all moisture. As it contains no paraffin it will not run in hot weather. It will permanently damp-proof the walls of your buildings, and yet since it is invisible it does not detract from the natural beauty of the walls.



5 Stormtight is an adhesive, rubber-like liquid, ten times thicker than paint. It will prolong the life of your roof and protect it against leaks quickly and permanently. Stormtight quickly stops leaks that have already started. It is very easy to apply. It is not a temporary makeshift, but has saved the cost of new roofs again and again.



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HERTNER CHARGING EQUIPMENT

Valuable Information

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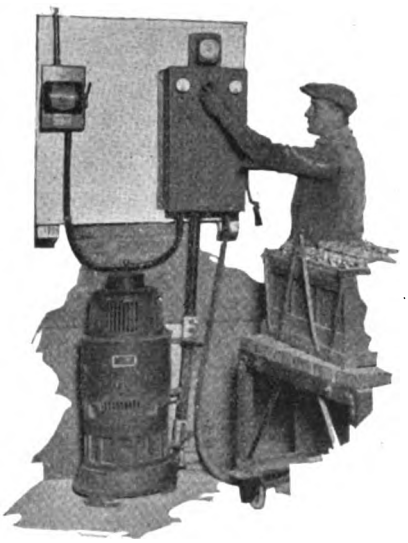
or are contemplating doing so—

you can read with profit the recent article in Industrial Engineer, April issue, written by Mr. John H. Hertner.

A copy of it will be mailed to any executive on request.

A few Nationally Prominent Users of our Equipment.

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right or not at all. Steam and air hammers require the regular attention usually given to steam engines if they are to operate continuously.

Maintenance in the Foundry

The foundry requires constant inspection and repairs to its vital units in order to keep producing day after day. As iron and brass (non-ferrous alloy) foundries have many points in common, both will be considered simultaneously. The lining of cupolas, melting pots and ladles is usually done by the foundry force itself and not by the maintenance crews. This work must be done every day and is therefore taken care of. In the iron foundry the most important units are the cupola and cupola blower. If the cupola is properly lined the only thing that can go wrong during a heat is the blower, and if for any reason the blower fails for more than a quarter to half an hour, the melt must be dropped and the whole lot of coal and iron remelted the next day. Usually the blower is direct connected to a motor and therefore all the bearings of blower and motor should be inspected and oiled every day. Unless the motor is of the totally enclosed type, it should be protected from sand and dust by a housing or room enclosing the blower and motor, so arranged that it will be supplied with fresh air from outside the foundry. If there are two cupolas and two blowers the piping should be arranged so that either blower can be used for both cupolas.

The Charging Floor

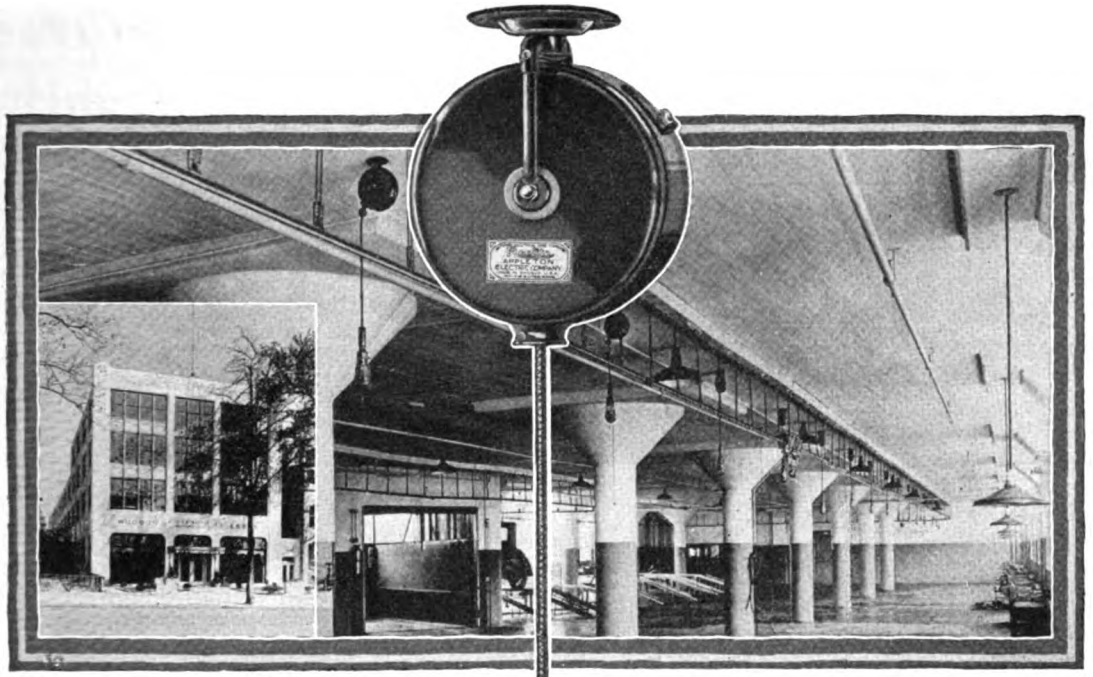
On the charging platform, various types of equipment are used. With a good layout the tilting car is perhaps the best method of getting the coal, coke, pig iron and scrap into the cupola. The bearings of the wheels on cars should be well oiled in order to make them easier to push around. In smaller foundries, two wheel carts and wheelbarrows are often used for loading. A platform scale is a necessity and this can be set to read net weights if all the cars or carts are of the same weight.

The motor units on conveying equipment on charging platforms are exposed to dust and grit and when possible should be completely enclosed or have sheet iron hoods to protect them as much as possible. These conveyors have to handle a variety of material such as pig iron, scrap, coal and coke and therefore must be rugged and capable of handling all this material. It is to be expected that there will have to be renewals of wearing parts and these should be kept in stock.

Severe Service Requires Careful Crane Maintenance

Cranes require daily inspection of important electrical and mechanical parts. The exceptionally severe service which they are required to render in a foundry makes constant care necessary. The electrical contacts burn out quite often and spare parts should be on hand at all times. The large traveling cranes in a foundry are next in importance to the cupola itself, for without the big cranes the melted metal cannot be handled. The electric brakes and hand or foot operated brakes are especially important in handling molten metal and they should be inspected every day. Safety limit switches should be installed on the hoist to avoid breaking cables in case the load is raised too high. Frayed cables or worn pins, bearings or shackles should be replaced immediately in order to avoid accidents. A ladle full of hot metal is a mighty dangerous thing when it is suspended over the heads of scores

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of men and no precaution should be overlooked to make their work safe. The cables should fit into the grooves on the drums and this point should be watched to see that the cables do not run up on the sides of the grooves and get cramped and cut. The small cranes under balconies and jib cranes on columns are not so important because a breakdown on one of them would only shut down a small area. They should be given weekly inspection instead of the daily inspection given the large important cranes. Air hoists are largely used in foundries because of the smoothness with which loads may be raised or lowered. They are used especially for lowering the cope on large flasks. Craneways should be regularly inspected and the rails on which the crane runs should be lined up at least every six months.

Sand Handling Equipment

The equipment for handling and tempering the molding sand in a large foundry is very important and must be kept in good running order to keep production flowing. If sand is received in bottom dump cars it is usual to have a bucket elevator to carry it up to the horizontal distributing conveyors over the sand bins. In the winter the sand is often frozen in the cars and has to be thawed out before the car can be unloaded. A portable gasoline torch is a very handy way of overcoming this difficulty. If belt conveyors are used for distributing the sand to the bins, a distributor capable of being adjusted to any position along the conveyor should be used to deliver the sand into the desired bin. With trough conveyors a tripper tilts the sand out of the buckets at the desired bin. The bearings on all sand handling equipment are exposed to very severe conditions and every precaution possible should be taken to protect them from grit.

The gates at the bottom of the sand bins are usually subjected to rough treatment by the men and often do not close tight. They should be straightened up so they will work freely at all times. The tempering equipment for wetting and mixing the sand is the most important, as the condition of the sand has a great deal to do with the quality of the finished castings. Water is usually added by spraying and this operation must be carefully watched for good results, as the spray heads sometimes get clogged up. The motor drives should be given daily attention and should be protected as much as possible from sand and dust.

If overhead sand storage bins are provided for each molder or every two molders, they should be of large enough capacity to take care of their needs but not so large that the sand will get dry before being used. These bins can be kept full automatically or the molders can set a scraper or trip to replenish their supply. The tempered sand should travel from the tempering mixer to the various molders' bins and in order to keep it in good condition any surplus should be returned to be reconditioned.

The speed of tempering and distributing should be synchronized with the use of the sand in order not to temper much more than is needed. After molding, the flasks are dumped and the sand is returned to be used over again. The castings with cores still in them are dragged onto a knockout conveyor level with the floor that takes them to the cleaning room, where the cores are knocked out and the castings chipped and ground. The used molding sand must be screened to take out wires and chill pieces and run over a magnetic separator to remove any small pieces of iron that went through the

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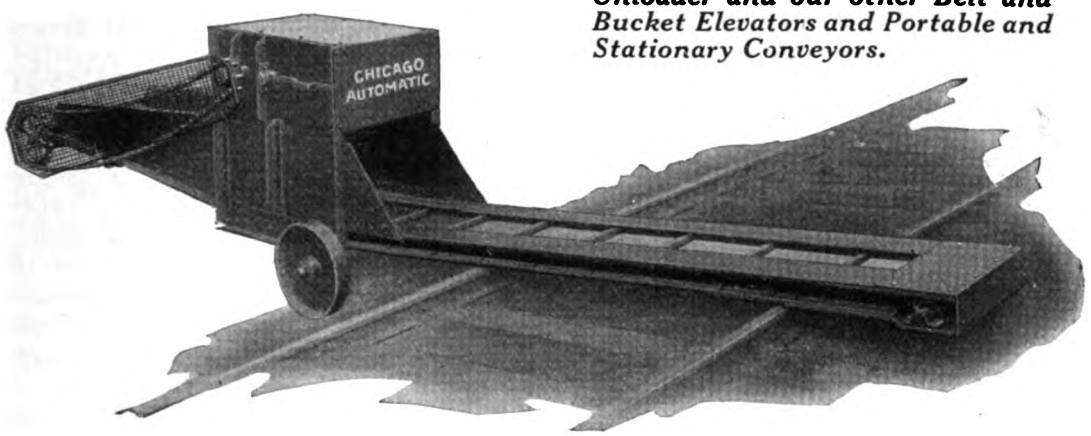
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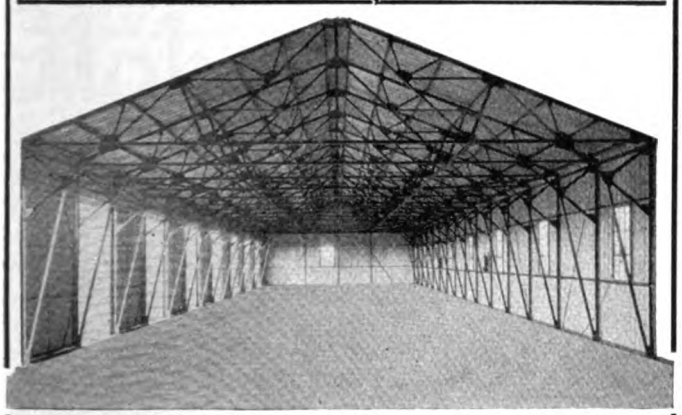


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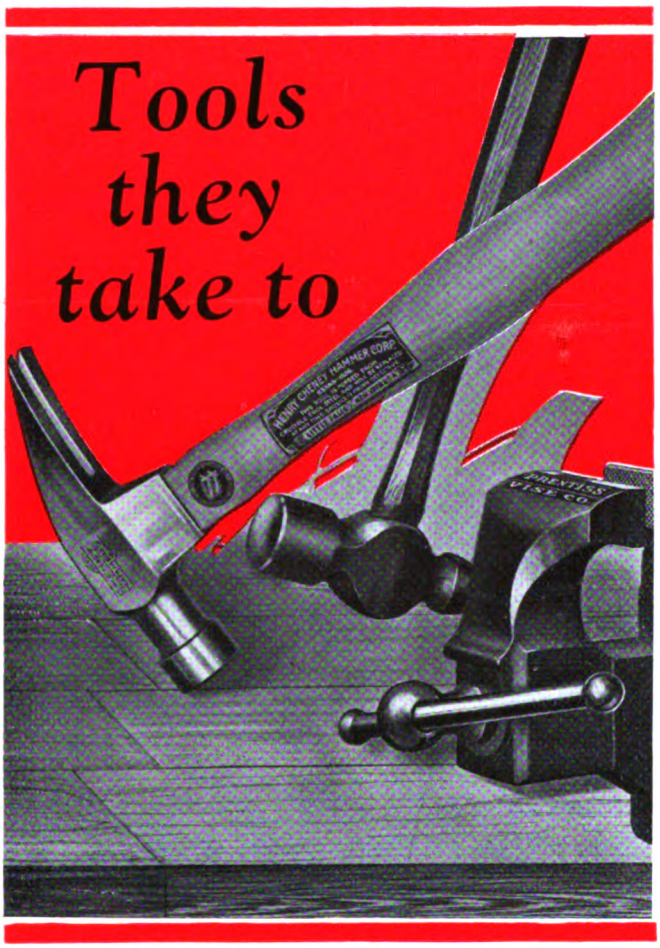
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revolving screens. This sand handling equipment must function day after day without let up and it receives such severe service that it must be well maintained to keep it functioning properly.

The Core Making Equipment

Good cores are a necessity for good castings and an evenly heated core oven is one of the most important items in making good cores. Electrically heated ovens are now very largely used but on account of the cost of running them, they are confined largely to medium and small sized ovens. For particular work they are ideal and as auxiliary equipment for this work they are excellent. The heating elements are good for a long time and are easily replaced when they burn out. With automatic control to cut the current in and out they hold a uniform heat. The older ovens were coke fired and the newer ones oil or gas fired. As oil fired ovens are cheaper than gas, as far as fuel charges are concerned, they are more often installed. A large combustion chamber and properly designed flues are necessary with oil fired ovens in order to get uniform heat throughout the core oven. With automatic temperature control, a steady heat is easily obtained with oil or gas and these are much to be preferred over the older coke fired ovens. The brickwork must be carefully maintained to prevent cracks, and burners should be kept in stock to replace any that need replacing.

The Sand Blast Department

Sand blasting equipment is subjected to the most severe conditions of any equipment in the plant and all parts subject to wear should be kept in stock for quick replacement. For small work the sand blast barrels or rotating table types are best, while for large work a room with an operator inside is the only practicable method. The screens in dust collectors should be kept in repair to prevent dust getting out into the air. If dust collectors are well built and if screens are easily replaced the maintenance work is not excessive.

In brass or aluminum foundries the same equipment is necessary with the exception of the cupolas. These non-ferrous alloys are melted in electric, gas or oil fired tilting furnaces or in crucibles heated in pits by hard coal fires. Electric furnaces pull a heavy load and require constant maintenance of all the electrical parts and furnace lining on account of the tremendous heat. It is best to have some spare furnaces so that the maintenance work can be done regularly without interfering with the output. The lining of all electric and gas and oil fired furnaces should be of the best materials and well put in, or it will not last long. When the melting is done in crucibles over a coal fired pit there is not much maintenance work. Crucibles become broken and have to be replaced with new ones, but that is about all that is necessary.

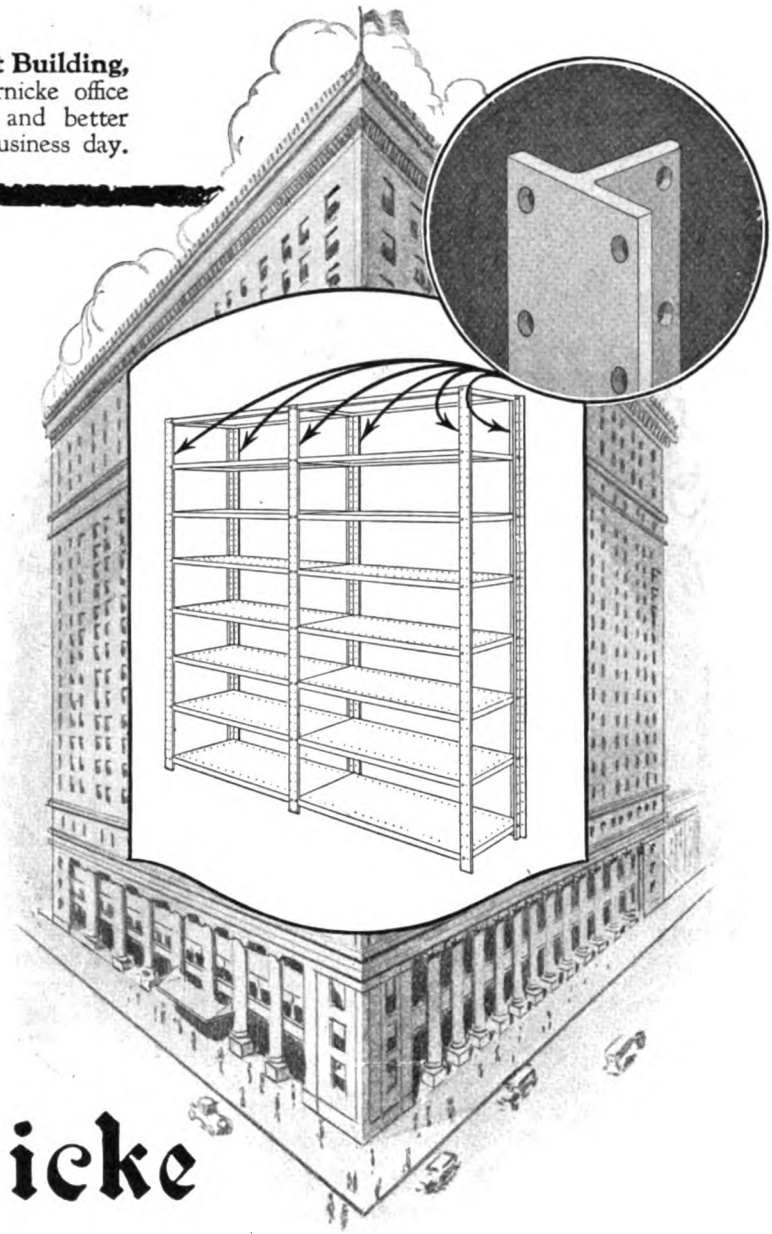
Keeping Cafeteria Equipment Ship-Shape

Most medium and large sized plants now have a cafeteria because it has been found to be a paying investment. Although the books may not show a profit at the end of the month, and in most cases they show either no profit or a small loss, the increased output per man in the afternoon, due to having eaten a well cooked hot luncheon, repays many times over the small loss per man usually found in the cafeteria. The kitchen equipment must be

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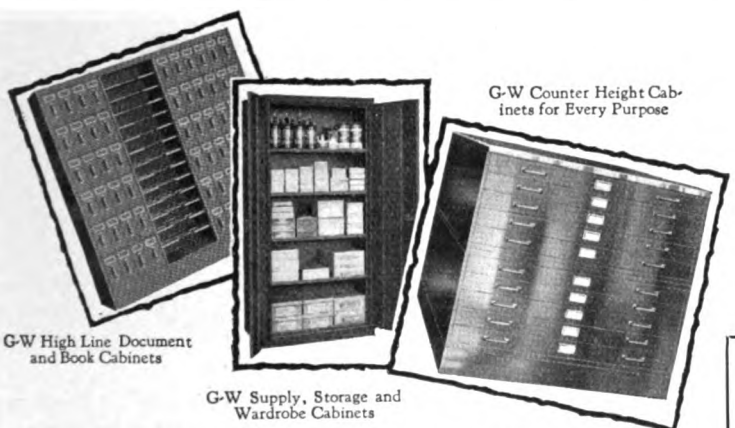


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WILL you let us prove to you that it is easy and economical to eliminate glare and reduce heat 10° to 15° with *Skyco No-Glare?*

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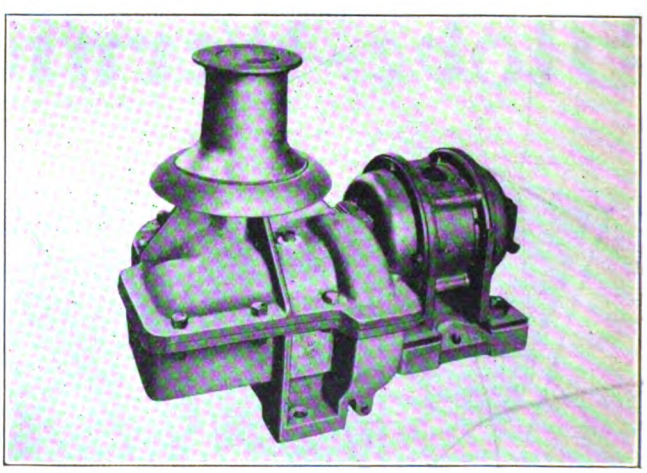
kept in first class condition in order to be sanitary and this is a primary consideration in a plant cafeteria, because men are very fussy about anything managed by the company. Refrigerator drains must be kept clean to prevent stoppage due to dirty ice. Gas, steam, hot water and drain pipes must be kept tight and the joints at equipment such as steam tables and dish washers must be kept tight. Large grease traps should be installed on the main drains, a cold water line is often run into them to chill the grease and prevent it from being carried into the sewer. This hard grease may be easily removed. Coffee urns are usually gas heated, these may have automatic temperature controls to keep the coffee at the correct temperature. The proper maintenance of all the kitchen equipment helps the cooks and helpers to keep the place neat and clean and inviting and tends to make the men feel that everything possible is being done for their comfort.

The New Caldwell Car Spotter

SAID to represent the demand for a small, self-contained and compact motor-driven unit, a new vertical capstan electric car spotter, called the Caldwell Car Spotter, has been announced by the H. W. Caldwell & Son Company, 1700 S. Western Ave., Chicago.

It seems that the name "Car Spotter" has been adopted because, in addition to being pulled, a car must be "spotted." One invariably speaks of "spotting cars." Thus, this name is more definitely descriptive of the principal use for the machine.

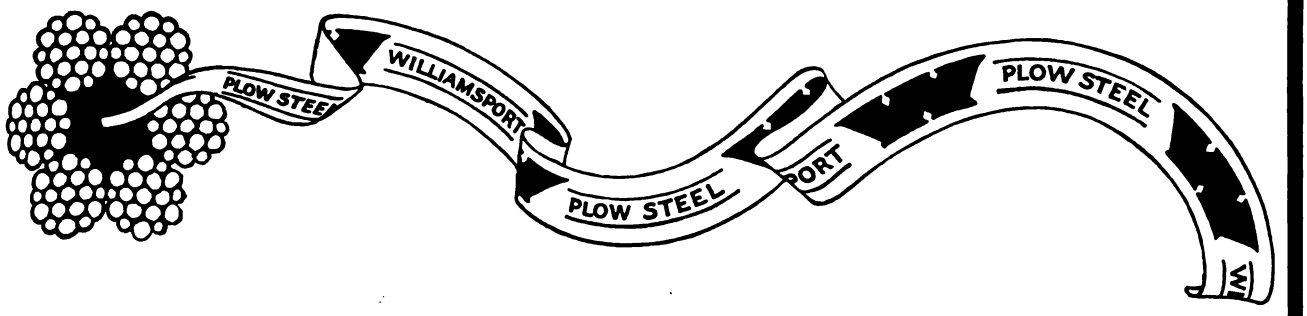
Although this company has been manufacturing various types of car spotters (or pullers) for more than 35



years, their latest machine differs from any of those previously produced in several points, the most important of these being, perhaps, its essential newness of design. Simplicity of operation is also claimed; and, it is said, in addition, to sell at a very low price.

Two sizes—No. 1 and No. 2—are announced by the manufacturers of this unit. The former size has a speed of 40 to 60 feet per minute, while moving one, two or three cars; and the latter size is said to move between three and six cars, at the rate of 26 to 42 feet per minute.

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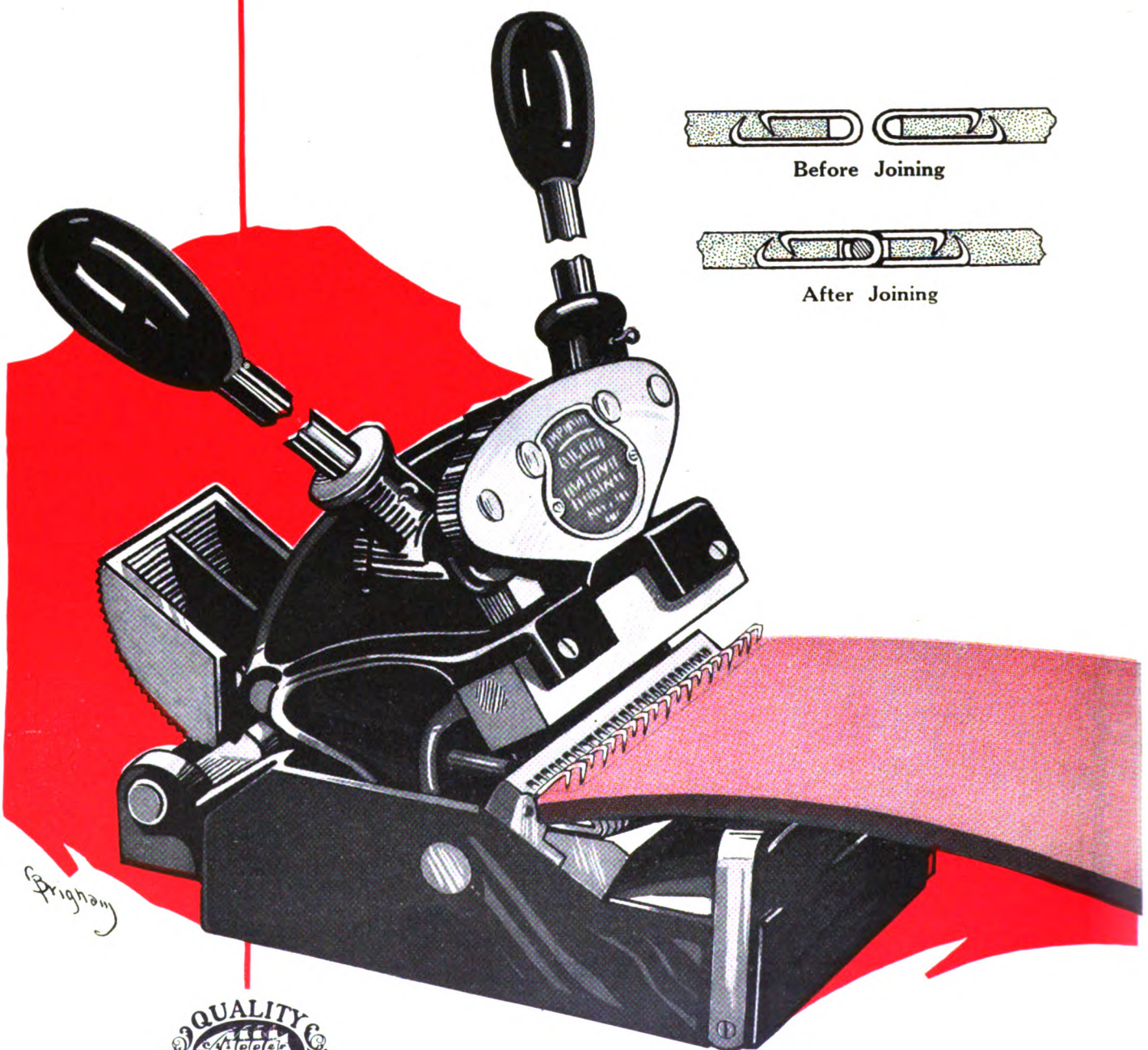
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Before Joining

After Joining



QUALITY Alpaca BELT LACING

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Clipper Lacings

In nearly every branch of manufacturing the proper connection of joints is a problem worthy of serious consideration—and each manufacturer has his own individual joint problem.

Practically every factory man is familiar with the present accepted method of joining machinery belts with Clipper Lacings. He recognizes the superiority of Clipper Hooks, Clipper Pins and the Clipper Lacer.

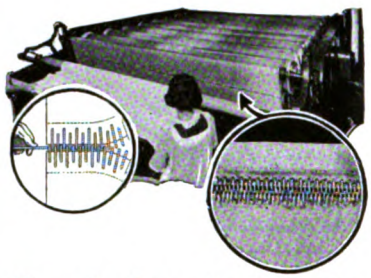
But why apply the wonderful efficiency of Clipper Lacings only to belts? A Clipper Lacing can be used with equal success in many other cases where flexible materials require a smooth, firm, quickly joined connection.

Study the joints in your factory equipment or in your product itself and consider them in terms of Clipper Lacings. Experiment with your Clipper Lacer where you now glue, nail, rivet or sew. You may find in Clipper Lacings, as many have already found, an ideal solution to your joint problem.

We will be glad to cooperate with manufacturers in the application of Clipper Lacings to their purposes.

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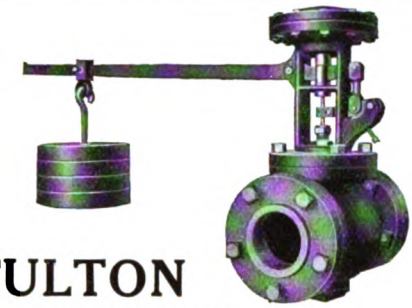


Clipper Lacings Prove Invaluable in the Automotive Field

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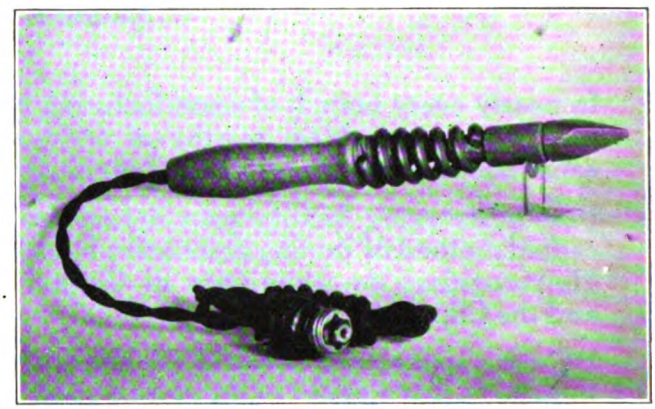
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A New Electric Soldering Iron

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Power consumption ranges from 70 watts for the smaller iron for light and intermittent use, to 350 watts for the larger size on heavy duty. The irons for heavy duty are provided with radiating stands for the purpose of maintaining the iron at the correct operating temperature when temporarily not in use. The rapid rate of initial heating is brought about by unusually good heat conduction between the heating element and the copper



tip. Heat from the tip is said to be prevented from reaching the handle by means of a special mechanical construction between the two, this being in the form of a spiral made from a steel rod. This also provides a rigid connection between the handle and tip.

Instead of mica, usually used for an electrical insulator in the heating unit of soldering irons of this type, the heating unit has an insulating powder so highly compressed that it becomes a good heat conductor and will withstand temperatures of more than 2,000° F.

The iron is provided with a standard lead and connection plug. Its construction is simple, parts are few and all parts are equally replaceable.

Yale K23E Elevating Platform Truck

THE Yale & Towne Mfg. Co., of Stamford, Conn., has recently brought out a new elevating platform truck, which is designated as Yale K23E.

This truck is designed primarily to carry the unusually



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TOLEDO SCALES

NO SPRINGS HONEST WEIGHT

Save This Man $5 a Day Per Scale

"A MINIMUM of five dollars a day on each scale would be very conservative," writes C. W. Marwedel, tools, metals, and shop supplies, San Francisco, as to the amount of labor and time Toledo Scales have saved him in his receiving and shipping departments.

The National Yarn Corporation, Chicago, estimates an annual saving of at least $500 in time, labor and prevention of actual losses, and states that the satisfaction of absolute certainty of correct weight when dealing with claims is worth perhaps more than this saving.

The Southwestern Portland Cement Co., El Paso, which ships three million bags of cement annually, writes that since the Toledo Scale was installed in its packing house, "we haven't had a complaint from a single customer on short weight, whereas formerly we had many;" and so that company has eliminated refunds.

"The installation of Toledo weighing equipment has greatly expedited the handling of our mail," writes the Florida Times-Union, of Jacksonville.

All over the country important concerns in every line of industry are enthusiastic over the results derived from measuring materials or counting parts with Toledo Automatic Scales.

A survey of the weighing operations in your plant may reveal unsuspected losses. It will certainly be to your interest to allow a Toledo Scale man to specify recommendations.

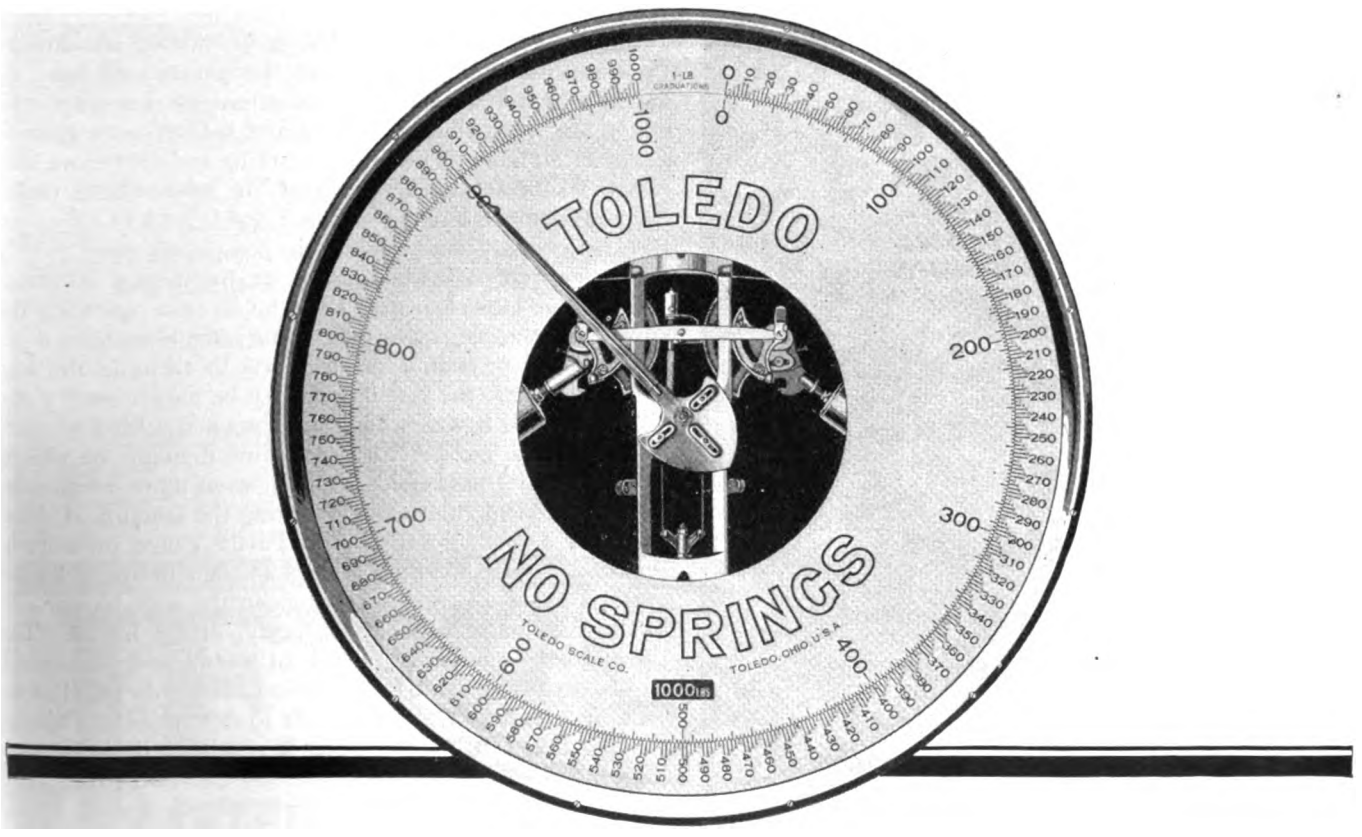
The survey will cost you nothing and may save you much. Kindly address Industrial Sales Department, Section U.

Toledo Scale Company, Toledo, Ohio

Canadian Toledo Scale Co., Limited, Windsor, Ont.

Manufacturers of Automatic Scales for Every Purpose

Offices and Service Stations in 106 Cities in the United States and Canada



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The New



Every Part Hardened

Ettco

Eight Good Reasons for Using the New Ettco.

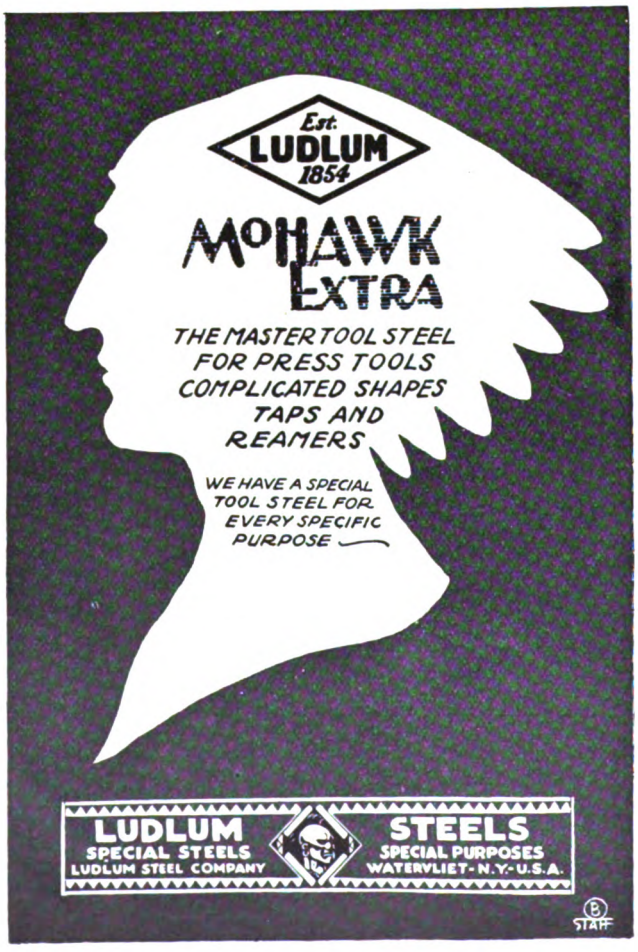
1. Lighter in weight.
2. All Hardened Body.
3. Keyless.
4. Hand Operated.
5. Ball Bearing.
6. Continuous Grip.
7. Self Centering.
8. Simple Construction

Send us your old drill Chucks. We will allow 15% on the exchange.

No. 1A	Ettco—0 to ¼ in.	$ 5.50
No. 2	Ettco—0 to ⅜ in.	6.50
No. 3A	Ettco—0 to ½ in.	9.00
No. 3½A	Ettco—⅛ to ⅝ in. ...	11.00

ETTCO Chucks Increase the Value of Your Electric Drills

EASTERN TUBE & TOOL COMPANY, Inc.
594-602 Johnson Avenue, Brooklyn, N. Y.



heavy loads that are found in many industries. Although this machine is not of the high lift type, such as the Yale K22, it does embody the self-loading feature.

The short turning radius and the narrow width of this machine makes it easy to drive in and out of box cars or narrow aisles. Hardened steel steering pivots with bronze bushings and the high pressure lubricating system are said to reduce friction and make steering easy, even when carrying a full load.

The manufacturer points out that heavy pressed steel frame members and large elevating links, which support the platform, admit of its carrying its load with an ample factor of safety; the links being wide and heavy, afford secure support to the platform.

The elevating platform is raised by means of two large eccentrics mounted on the hoist unit shaft, which draw the platform forward and upward on the platform links. Mechanical upper and lower limit stops assure simple and safe operation of the lift mechanism.

The majority of parts, units and sub-assemblies of the K23E Elevating Platform Truck are standard and interchangeable with those of all other models in the K-series.

Some Practical Pointers on Soot Blowers

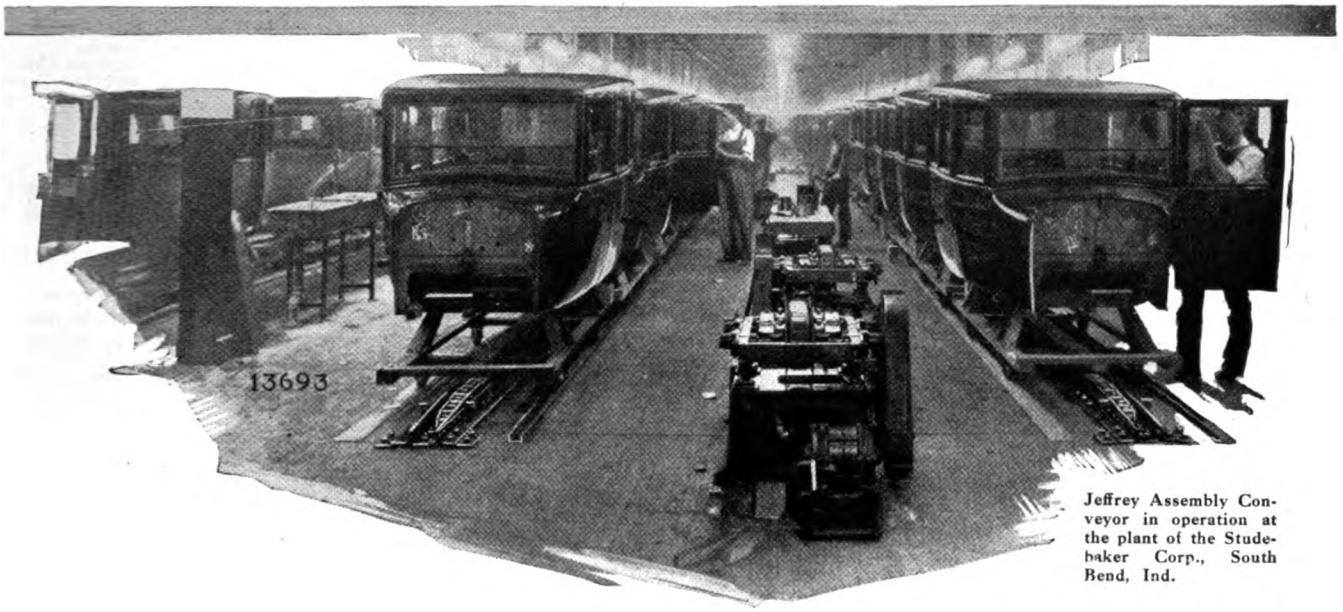
A POINT that is oftentimes overlooked by the average engineer is that when using mechanical soot blowers it is not necessary to turn the steam on so long on later passes of boilers as on the first passes. Much valuable steam can be saved by proportioning the amount of steam almost directly with the amount of heat absorbed by the tubes in the various passes. The first rows of tubes with which the gases and radiant heat come in contact do most of the heat absorbing and therefore they should have more attention than the tubes in the passes which do much less absorbing.

If it is impractical to clean the last passes more quickly than the first passes because of the mechanical construction of the blower, it may be better to omit operating the blower in the last passes every time some blowing is done. It is better to confine one's efforts to cleaning the first passes. Thus, the last passes may be blown once a day or even once a week, depending upon the kind of fuel, the overload, etc. At the same time it might be well to clean the first pass twice a day or even more frequently.

An excellent rule for determining the amount of steam used by a soot blower is this: To the gauge pressure in pounds per square inch add 14.7; then multiply by the total area of all of the openings in the soot blower element in square inches; and, lastly, divide by 70. The result is the number of pounds of steam used per second. By applying this rule to the various elements installed on the boilers, it is a simple matter to determine the annual saving that can be effected as a result of timing operations and saving steam. Steam is becoming more and more valuable as time advances and we can no longer afford to waste it.

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How Does the Automotive Industry Effect Such Remarkable Economies?



Jeffrey Assembly Conveyor in operation at the plant of the Studebaker Corp., South Bend, Ind.

IT is generally conceded that quantity production is primarily responsible for the outstanding cost reductions in the Automotive Industry —MECHANICAL HANDLING makes quantity production possible.

And, the reason why the Automotive Industry is reaping a larger percentage of the maximum possible benefits of modern mechanical handling than any other industry is

Because it applies MECHANICAL HANDLING so as to take advantage of all its cost reducing or overhead cutting qualities.

Modern methods of organized material handling do not apply *only* to the continuous production industries such as automobiles, food products and the like.

They apply to every industry; to practically every plant, large or small. Perhaps your industry, your plant has been missing profits because your executives have been too ready to say, "That doesn't apply to us."

Jeffrey engineers, with nearly 50 years of experience gained in studying and analyzing material handling methods, will gladly help you to plan material handling operations which will place your plant on an economical basis. Tell the nearest Jeffrey Office about your problems.

The Jeffrey Mfg. Co., 946-99 North Fourth St., Columbus, Ohio

New York	Pittsburgh	Cleveland	Milwaukee	Los Angeles
Buffalo	Scranton, Pa.	Charleston, W. Va.	St. Louis	Birmingham
Rochester, N. Y.	Boston	Chicago	Denver	Charlotte, N. C.
Philadelphia	Cincinnati	Detroit	Salt Lake City	Montreal

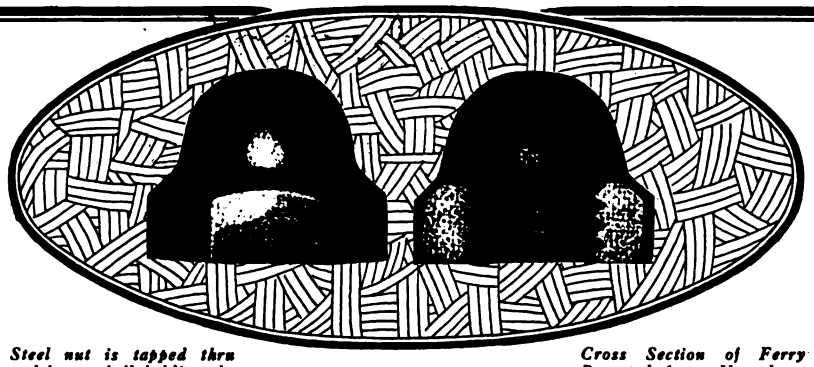
JEFFREY
MATERIAL HANDLING EQUIPMENT

Jeffrey Products

Elevators, Conveyors
Portable Loaders
Coal and Ashes Handling Equipment.
Skip Hoists
Chains and Attachments
Sprocket Wheels—Gears
Crushers—Pulverizers
Sand and Gravel Handling, Screening, and Washing Equipment
Locomotives
Coal Mine Equipment
Ventilation Fans

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Material: Brass — Steel Hex. Nut Centers.
Size: 3/4" Across Flats.
Tapped: 1/4", 5/16", 3/8", 7/16" and 1/2" inclusive. USS and SAE thread
Size: 15/16" Across Flats.
Tapped: 1/2" — 9/16" and 5/8" inclusive— USS and SAE thread.
Plain Brass Finish
Nickel Plated — Barrel Finish
Nickel Plated—Hand Polished



Steel nut is tapped thru and brass shell holding the steel nut allows nickel-plating over brass.

Cross Section of Ferry Patented Acorn Nut showing how steel hexagon nut fits snugly into brass shell.

Material: Nickel Silver-Steel Hex. Nut Centers.
Size: 3/4" Across Flats.
Tapped: 1/4", 5/16", 3/8", 7/16" and 1/2" inclusive— USS and SAE thread.
Size: 15/16" Across Flats.
Tapped: 1/2", 9/16" and 5/8" inclusive— USS and SAE thread.
Plain Finish
Burnished
Hand Polished

A New Ferry Product-Brass and Nickel-Silvered Acorn Nut, non-corrosive and strong

The Hexagon Steel Nut is covered with sheet metal, either brass, copper, or nickel silver. This covering gives the nut a beautiful appearance, making it rust-proof, and lends itself to any finish desired. It can be plated, burnished, polished and buffed or left in its original color.

The steel nut is tapped all the way through and inspected for any defects before the covering is put on, eliminating any chance of a misfit.

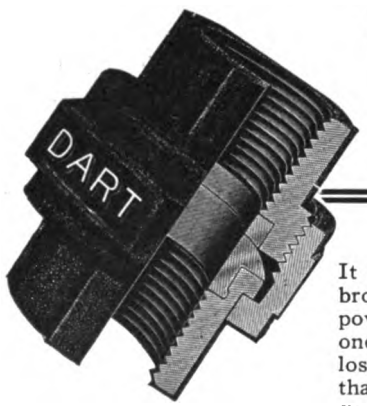
These nuts are used largely for ornamental purposes, such as cylinder head nuts in the manufacture of gas engines, automobile bumpers, switchboards, plumbers' supplies, etc.

The only ornamental nut with the strength of Steel and the non-corrosive qualities of Brass, Copper, Nickel Silver, or other non-ferrous metals.

Write for prices. They will interest you.

THE FERRY CAP & SET SCREW CO., Cleveland, Ohio

FERRY
PROCESS SCREWS



No Steam Escapes Here!

It can't—the Dart bronze to bronze seats hold this elusive power and pass it along from one pipe to the next without a loss. And when you can say that of all your unions, there's good dollars in your pockets.

Dart Unions always stay tight. The bronze to bronze seating surfaces are ground together into an absolute tight seating ball and socket joint. As bronze cannot corrode or rust absolutely tight joints are assured.

Our guarantee is ironclad. Here it is—two Dart Unions in place of any one that proves defective.

Write for sample

Sales Agents
THE FAIRBANKS CO.
New York

Canadian Factory
DART UNION CO.
(Ltd.)
Toronto, Canada

E. M. DART MFG. CO.
Providence, R. I.



Keeps Watchmen Conscientious

DETEX
"ALERT"
Portable Watchclock System

A Watchclock System is something you want and expect to last a long time. Many of them do—but don't forget the cost of maintenance. Consider the keys and the methods of recording. It will save you money. Detex Alert keys and the Matrix (female die) in the clock, show practically no wear even after years of use, because the recording is accomplished by direct pressure of Matrix on key.

There are many other fine features about Detex Alert Watchclock Systems. Let us send you literature giving complete information.

DETEX WATCHCLOCK CORPORATION
77 Varick Street NEW YORK — 4148 Ravenswood Ave. CHICAGO — 24 Beach Street BOSTON

Other DETEX Watchclock Systems

NEWMAN Portable—The best known and most extensively used watchclock system in the world. 1 to 30 stations.

PATROL Portable—The latest and most versatile of all portable watchclock systems. Equally satisfactory for 1 or 100 stations

ECO Portable—Most accurate watchclock. Records practically to minute. Important in some cases. 1 to 20 stations

BOSTON (Magneto Type)—For large plants desiring records of a number of watchmen on one dial. Any number can register simultaneously and each record will show separately.

One night of faithful watching may prevent months of non-production. DETEX Watchclocks insure faithful watching every night

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Soldering

General Electric announces to industry the introduction of five new electric soldering irons whose range of capacity varies from the lightest to the heaviest of work. Examine them!

An improved cartridge type heating unit enclosed in a heavy nickel silver case.

This casing threaded into a massive tip of high quality copper —thus insuring intimate thermal contact.

A non-conductive coil which disseminates any heat threatening to reach the handle.

A sturdy wooden handle perfectly fitting the hand.

Bolts, screws, and nuts—so easy to lose and so hard to replace —are entirely absent.

These are some of the improvements in the new G-E Soldering Irons which give to them a simplicity, efficiency, and economy of operation that is unexcelled by anything on the market.

Although electric heat will not supplant all other forms of heat for industrial purposes, there are processes in every industry where it is the ideal heat—the most economical heat—the heat that ultimately will be used.

ULTIMATELY
ELECTRIC HEAT
IN EVERY INDUSTRY

570-8

GENERAL ELECTRIC

GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y., SALES OFFICES IN ALL PRINCIPAL CITIES

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PERMANENT STORAGE SATISFACTION



Wooden shelving and racks have gone the way of the stage coach and pony express. Useful in their day but modern business has demanded better storage facilities.

Steel storage equipment was inevitable. Fire resisting, space saving, strong and durable, it is today used for every storage purpose. It will stand unavoidable hard knocks and rough usage. Nothing to break, wear out or be replaced through constant use. It can be torn down, reassembled, moved or adjusted without loss. Truly a permanent investment.

Careful selection of shelving according to the uses served is necessary. The supporting uprights must be of a strength to carry certain loads. The weight per square foot must be considered. This scientific construction is necessary for longevity.

A knowledge gained through years of experience enables Durand to build the correct type to meet individual requirements. Every piece of steel used in Durand equipment is specified because years of experience have shown that it is required. When you purchase Durand equipment you know it is right—that it will last. Time has proved it so.

Durand suggestions, gained from long years of experience, will assist you in purchasing or installing steel shelving, bins or racks. Call a Durand engineer before you decide.

Our catalog describing Durand steel lockers, shelving, bins and racks available to you. Send for it today.

BRANCH OFFICES:

New York, N. Y. — Newark, N. J.
Los Angeles, Cal. — Philadelphia, Pa.
Detroit, Mich. — Pittsburgh, Pa.

Representatives in all principal cities

Manufacturers of Steel Lockers, Shelving, Bins and Racks

DURAND STEEL LOCKER CO. INC.

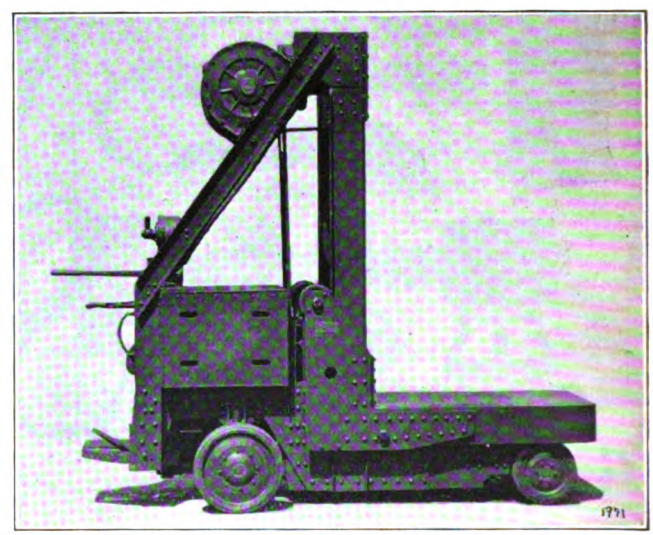
1539 Ft. Dearborn Bank Bldg., Chicago, Ill.

A New 6-Ton High-Lift Truck

THE accompanying photograph shows the new Baker 6-Ton Hy-Lift Truck being marketed by the Baker-Raulang Company, Cleveland, O. For several years the steel stamping and automotive industries have recognized the Hy-Lift type of industrial truck as a most practical machine for changing dies conveniently and at low cost. But every year dies have been getting heavier and heavier until some of the large cowl and fender dies have reached six or seven tons.

Naturally, these enormous loads have proven rather destructive to trucks designed to carry two or three-ton loads, but this 6-ton machine has been designed with the necessary strength and ruggedness for this work.

The main frame consists of two 8-inch and two 9-inch channels tied together by a 1-inch gusset plate. The roller frame is fabricated from four 1-inch plates and



the 5/8-inch steel platform is carried by four 8-inch channels. The vertical track on which the roller carriage runs consists of two 8-inch nickel-steel I-beams rolled specially for the Baker Company. The power plant employs a Baker totally enclosed series motor driving through a worm reduction and full floating axle shafts. The driving axle is connected to the frame by means of the patented duplex compensating suspension, which is claimed to relieve all axle strains and maintains accurate alignment between the axle and truck frame under all road conditions. The hoist is of the 2-cable type and the drums are driven by a compound wound motor through a combination worm and planetary reduction.

How Safety Increases Production

SAFETY methods actually increase production, according to W. Dean Keefer, director, industrial division, National Safety Council, who tells of a large bed manufacturing concern whose output in a single department of 700 power presses has leaped 62 per cent. after the installation of safety devices and safe practices. During one year 36 hands were injured in this department. Then the system was changed and as a result there has been only one finger lost in the past four years.

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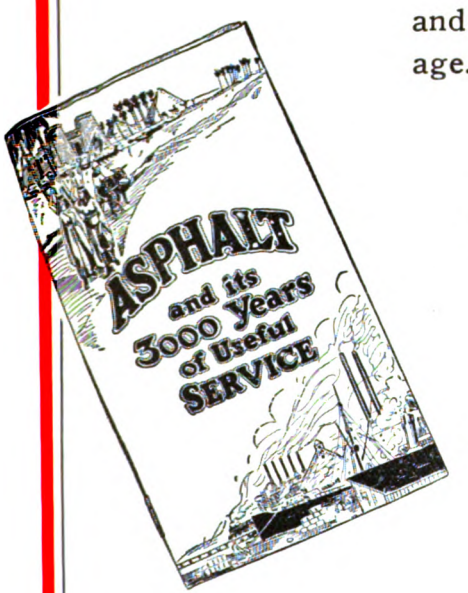
Valdura—a natural waterproofing

VALDURA ASPHALT PAINT is a natural waterproofing. The very nature of its ingredients makes it so.

The genuine Gilsonite Asphalt—99.5% pure—which forms the base of VALDURA is in itself a remarkable waterproofing material. And, the other ingredients are all of the finest grade; therefore, when you use VALDURA you can feel certain that the surface painted is getting as near 100% protection as it is possible to get.

VALDURA forms a rubber-like covering that is impervious to moisture. It is also acid and alkali resisting. Brine, sulphur fumes, etc., have little effect on it.

Used by leading industrial companies for many years, and their satisfaction is evidenced by continued patronage.



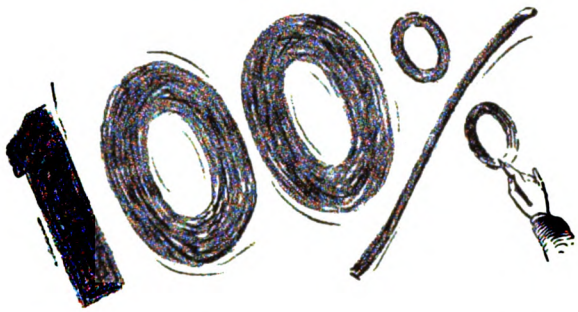
Booklet "Asphalt and its 3000 Years of Useful Service" will be sent for the asking. You will find it interesting, also educational.

AMERICAN ASPHALT PAINT CO.
844 Rush Street Chicago
Factory: LINCOLN, N. J.
Warehouses: OAKLAND, CAL.; CHICAGO, ILL.

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Mercury

[This is No. 6 of a series]



Mercury believes in the tractor-trailer method.

Mercury builds no power unit except the tractor—4 types and 10 models.

Mercury is the only tractor manufacturer who makes a full line of trailers to work with the tractor.

Mercury sales engineers are tractor-trailer specialists. They know the equipment and how best to apply it.

Mercury installations predominate. A little investigation will convince you of this fact.

Mercury can—and will—demonstrate a complete installation in your own plant.

We welcome the opportunity to tell and **prove** *our story.*

Mercury Manufacturing Company
4112 So. Halsted St. Chicago, U. S. A.

Tractors and Trailers

The Biggest Storage Battery-Operated Locomotive Crane

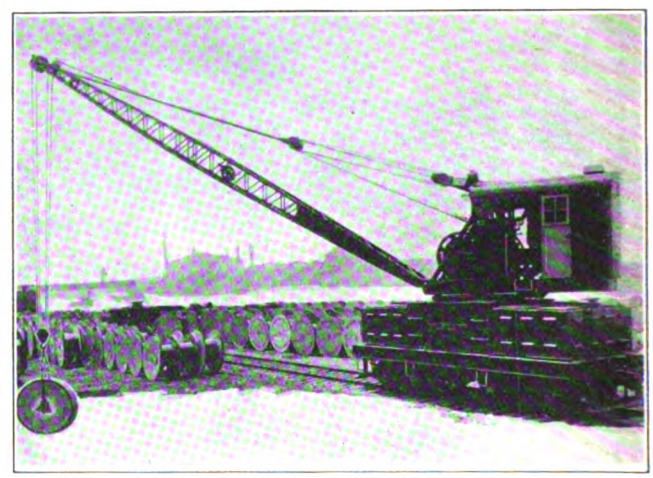
THE value of storage battery locomotives in yard service has been demonstrated. Already several heavy electric locomotives of this type are in use. Now we have the storage battery locomotive crane hoist, the largest of which was recently placed in service at the Kearny, N. J., plant of the Western Electric Co., near Newark, N. J.

This crane hoist was installed for the purpose of moving cable reels from point to point around the yard. In addition, it draws ash cars back and forth from the ash-handling building to various parts of the yard, where ashes are being used for filling in what originally was a swamp.

The hoist was designed to handle a maximum of 150 reels a day over a maximum distance of ten miles. Reels vary in weight from two to five tons each and the average round trip is 500 feet. The maximum number of trips amounts to 100 daily.

The crane weighs 105 tons complete, which is quite a load for a storage battery to move, in addition to a freight car of the gondola type, but it does it easily and smoothly.

When hoisting a full load, the operating speed is 60 feet per minute with a 2 r.p.m. speed when rotating full



load on a 50 foot radius; track travel over level track is 150 feet per minute. The length of the boom is 40 feet. A 100 hp. motor operates the boom, whip and travel and a 25 hp. motor rotates the crane. These motors are 250 volt D.C. 2 commutating inner pole switch crane full-enclosed type motors.

It is equipped with a 100 cell type battery, which has 1,080 ampere hours capacity, 205 kw. hours at the six-hour rate of discharge.

For recharging of the battery the hoist is run into the generating plant, where the battery is charged by a 250 volt motor generator set. With this motor-generator set is a panel containing a 500 ampere locomotive type meter with an 1,800 ampere hour dial. These are used for recording the charging and discharge of the battery, together with the necessary ammeter and volt meter.

A feature of the hoist is the layout or arrangement of the operating mechanism. Insofar as it has been possible, levers and foot pedals have been arranged in positions corresponding to those having similar functions in

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All *for* One and One *for* All



Jacobs Chucks

How They Grip



Dumas' *Three Musketeers* and the Gascon who made the greater fourth, repeated with one voice, their oath:

"All for One, and One for All"

But what have the Three Musketeers to do with JACOBS CHUCKS? Nothing—a JACOBS CHUCK, though, has four essentials tooled into one—Greater Accuracy, Ease of Operation, Gripping Power and Lasting Quality—

"All for One, and One for All"

A chuck that hasn't these four essentials tooled into one will spoil the drills, mar their shanks, break their backs and dull their edge. And what is the worth of such a Drill Chuck. Nothing.

THE JACOBS MANUFACTURING COMPANY

HARTFORD, CONNECTICUT

The World's Largest Producers of Drill Chucks

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All types of casters with Metzgar wheels

NOW —

YOU MAY EQUIP ANY TYPE OF TRUCK OR CASTER WITH METZGAR FLOOR-SAVING WOOD WHEELS.

MADE INTERCHANGEABLY WITH ALL OTHER WHEELS.

They are low on up-keep and high on the long and heavy service they deliver. They will never break thru the most severe use, handling 100% heavier loads than iron wheels.

Write for booklet, or send in an order for a few sets to be used under the worst conditions you have and start saving money on your trucking maintenance and floor bills as thousands of the largest and shrewdest buyers are now doing thruout the world.

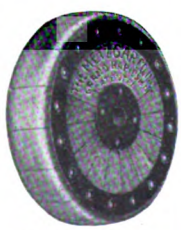
Metzgar Co. Inc.

GRAND RAPIDS MICHIGAN U. S. A.



Heavy Duty Hyatt Bearing

METZGAR *END-GRAIN WOOD* **WHEELS**



Regular Duty Wood Bearing

a steam or gasoline engine-operated hoist. Thus an operator accustomed to the latter type of hoist will feel perfectly at home in the newer type storage battery hoist almost from the start.

A volt meter and an ampere hour meter are located in the cab beside the operator's place. In the forward part of the cab a scale records the height of the boom from the ground, as it travels up and down while a dial outside, but in full view of the operator, registers the weight of the load on the boom.

Thus the operator can easily ascertain at a glance without having his attention diverted from his main duty, the exact conditions under which he is operating.

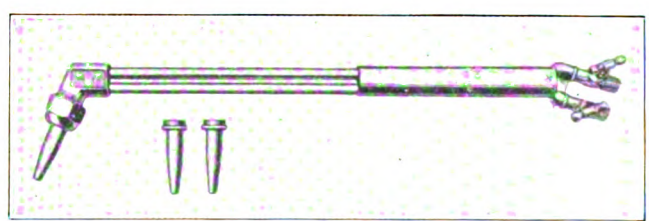
Besides the operator, only one other man is normally required to shift the cable reels from one place to another. This man merely couples and uncouples the huge clevis which, by means of a drawbar, hooks the reels.

Complete control of the hoist is maintained at all times by the operator, who can lift or deposit a five-ton cable reel with the nicety of a woman dropping a piece of sugar into a tea cup.

A New Small Size Welding Torch

CONSISTENT with the demand for a small welding torch for work not requiring the usual standard torch, The Alexander Milburn Company, Baltimore, Md., has perfected the Type J-Jr. Torch. The torch uses the same tips as are supplied with the standard larger torches and is said to be adaptable to all classes of welding. It uses low and comparatively equal pressures of oxygen and acetylene.

The manufacturers claim the following advantages for this new product: due to its light weight, it is untiring to operate continuously; the supermixing of the gases through a standardized system of multiple mixing assures a complete intermixing of the gases and a uniform flame;



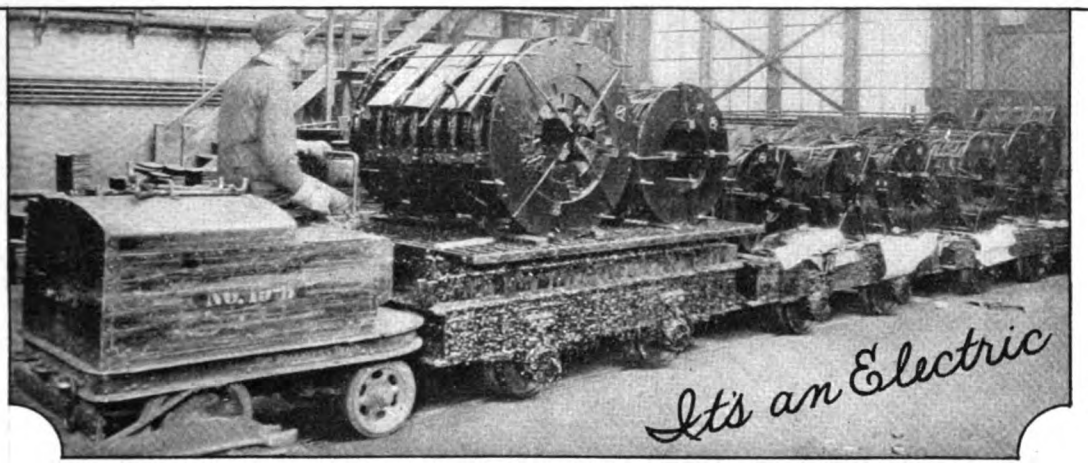
the seats of the tips are flat, with annular grooves coinciding with those in the head, the gas passages entering through the annular grooves or rings which separate the gases; the construction of these seating surfaces allow lateral expansion of torch head and tip without distortion and the seats are very easily refaced.

The J-Jr. Torch is adapted to gas supplied either from generators or compressed in tanks. The torch is made of bronze forgings and specially drawn stainless tubing. It is said to be very simple in construction, with all parts easily accessible.

The J-Jr. is 18 inches long, weighs 25 ounces and is furnished with three welding tips adaptable to a wide range of welding.

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How your trucks can handle more material in a working day



Your electric industrial trucks and tractors start out in the morning full of pep and speed. Does this speed hold up all day long? It should. Read below and you will learn why.

The speed of an electric industrial truck depends upon the voltage of its battery. When the voltage is high, the truck's speed is good.



The long-life, trouble-free, power-full battery.

THEREIN lies the secret of the extra speed Exide-Ironclad Batteries give your trucks. An Exide-Ironclad maintains a high voltage throughout the entire day's operation. Not only is the voltage high when your trucks start out in the morning with freshly charged batteries, but also when those trucks return to the charging panel at night.

Packed with power

In addition to its speed, an Exide-Ironclad Battery always has plenty of power. When faced with a steep ramp or extra-heavy load this battery delivers current faster than usual and goes right ahead. It is built so rugged that it hardly ever needs repair. Rare indeed is it for an Exide-Ironclad to spend any time out of service.

Efficient on charge

The charging efficiency of this battery is enough to delight the heart of any battery man. It takes current in easily, quickly and with very little waste. Its life is long and its first cost reasonable. Don't fail to learn all about this cost-cutting battery that has worked such wonders for the handling system of so many leading factories. Send now for a free copy of our booklet, "15 Points of the Exide-Ironclad Battery."

Exide
IRONCLAD
BATTERIES

A few of the many manufacturers that use Exide-Ironclads

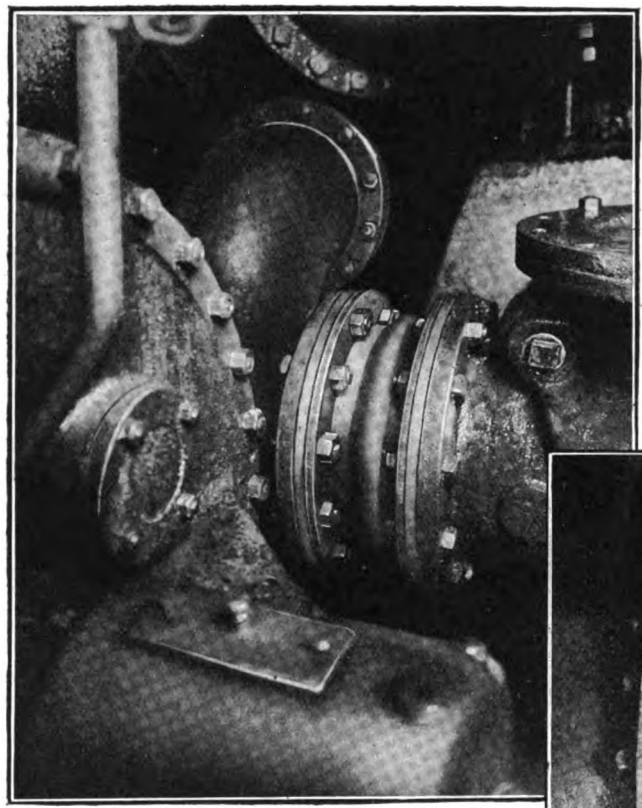
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Crane Company, Chicago, Ill.
Eagle-Picher Lead Co., Joplin, Mo.
U. S. Playing Card Co., Cincinnati, O.
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Dodge Bros., Inc., Detroit, Mich.
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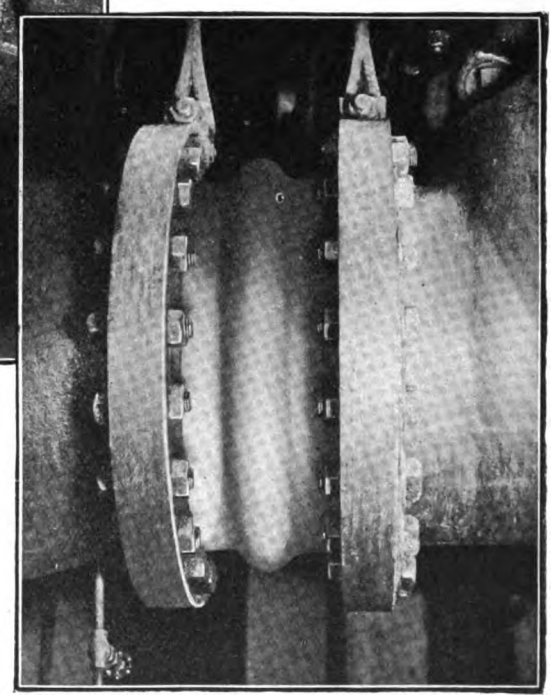
THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

Exide Batteries of Canada, Limited, 153 Dufferin Street, Toronto

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Above—A 14″ "U.S." Expansion Joint on a circulating water line from a Westinghouse condenser. This joint is subjected to extreme vibration by pulsations of water pump.

At right—22″ "U.S." Joint on a cold water inlet to condenser, where flanges are 3/8″ out of parallel.

Trade Mark

Save your pipe lines from fatigue

Most materials are rapidly fatigued by vibration such as is frequently caused in pipe lines by the action of pumps on the line. Rubber is not affected nor is it liable to crystallization. The "U.S." Rubber Expansion Joint, for that reason, is the ideal joint for installations which are subject to frequent or continual vibration, or any other special stress.

The regular "U.S." Joint with parallel flanges is also flexible enough to serve as a connection between flanges which are out of parallel and which would otherwise require a Dutchman or special joint.

Descriptive catalog of "U.S." Expansion Joints sent on request.

The United States Rubber Company is the manufacturer of "U.S." Rainbow gaskets, made from the famous "U. S." Rainbow universal red sheet, and of "U.S." Vanda and Wizard gaskets for high pressure and superheat conditions.

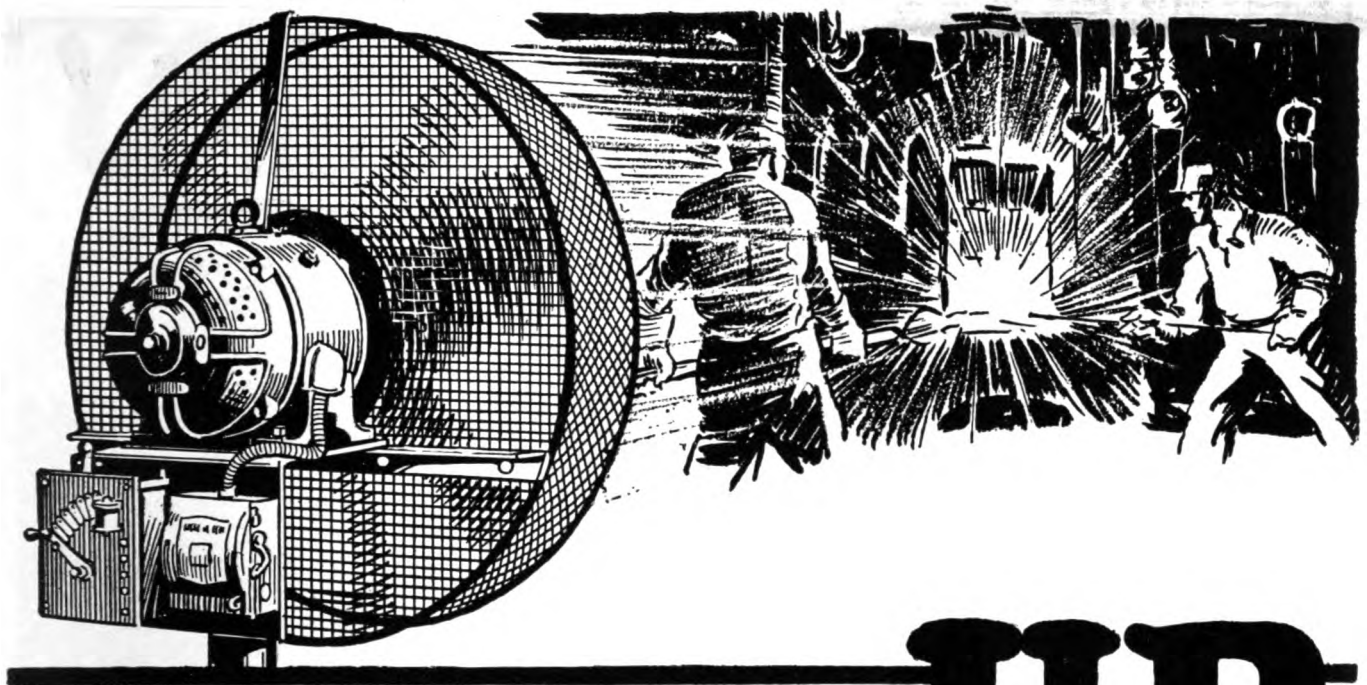
United States Rubber Company

1790 Broadway **New York City**

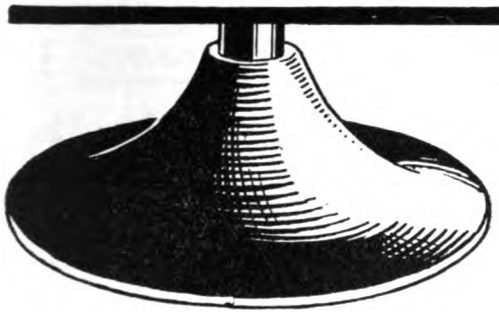
Branches in every industrial center

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Keep production UP with man cooling fans



7 reasons why You Should Install *Man Cooling Fans*

1 Man Cooling Fans will cool the "hot spots" in your plant

2 —will keep men "on the job" regardless of summer heat

3 —will cut your labor turnover on jobs requiring high temperature treatment

4 —will cast a cool, refreshing breeze in any desired direction at any time

5 —will enable men to work on hot products with less delay

6 —will enable men to work longer shifts

7 —will speed up production and increase your profits

Every time you turn on the desk fan that makes your office a comfortable place in which to work, stop and think!

What are the men doing who are sweltering away on the hot jobs in your plant? What relief have they from stifling heat? Is the heat going to interfere with your production schedules? Will you have to hire more men to meet your shipping dates? Is your labor "turnover season" opening up? How much more efficient and contented would the men in your shop be with relief from the intense heat?

American Blower Man Cooling Fans are like giant desk fans. They provide cool, refreshing breeze on the "hot spots" in your plant. They will make your men contented, enable them to work longer shifts during terrific heat and make it possible for you to meet production schedules that would otherwise be out of the question.

Fortify your shop NOW against delays and losses caused by excessive heat by installing American Blower Man Cooling Fans.

AMERICAN BLOWER COMPANY, DETROIT, MICHIGAN
BRANCH OFFICES IN ALL PRINCIPAL CITIES
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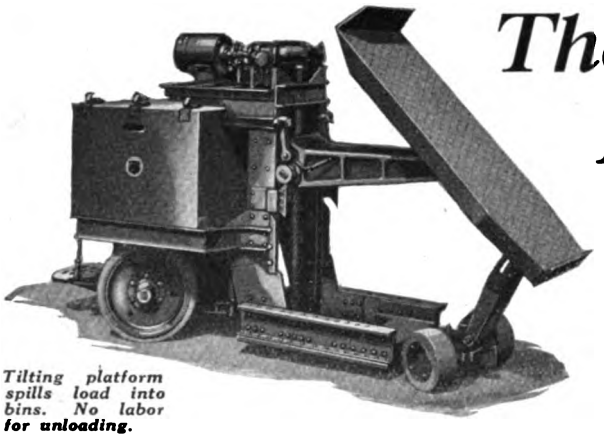
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VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT

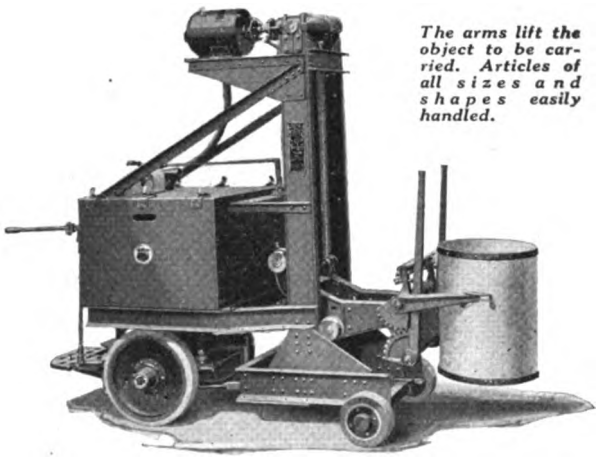
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They Get Things Done—QUICK!



Tilting platform spills load into bins. No labor for unloading.



The arms lift the object to be carried. Articles of all sizes and shapes easily handled.

And, after all, speed in accomplishment cuts costs and helps make profits.

For that reason the Lakewood Tier-Lift Truck, fitted with special carrying attachments to meet your particular needs, will soon prove its value in your plant.

Tell us what you want to handle. There's a standard Lakewood Tier-Lift to move it faster for less.

The

LAKEWOOD

Engineering Company

CLEVELAND

Originators and patentees of the Tier-Lift Truck

FABRICATION OF SHEET METAL

into parts to replace castings has been proving its worth as an economical means of reducing manufacturing costs.



When you can save on machining; save on freight bills, because fabricated

SHEET METAL PARTS

are light in weight; and save on breakage, because each part is perfect, you are eliminating three items that in the past have increased your overhead.

We maintain an Engineering department to help bring about these economies for you. Just send us pencil sketches or blue prints.

STEEL—IRON—BRASS—COPPER—MONEL METAL
Requiring
Stamping—Forming—Drawing—Blanking—Punching

See Data A.S.M.E. Condensed Catalogue of Mechanical Equipment. Also Hendricks' Sweets Engineering, and Thomas Catalogues.

THE BREESE BROS. CO. Cincinnati, Ohio

Type MP 5
¼ H. P. Motor



Strand

Flexible Shafts and Equipments

for the

Tool Room
Machine Shop
Pattern Shop
and
Foundry

1/10 to 2 H. P.

Several Types and Sizes

Grinding—Polishing—Drilling—Rotary Filing—Scratch Brushing—Power Screw Driving—Nut Setting and many other operations performed with these machines.

Catalog Upon Request.

Manufactured by

N. A. Strand & Co.

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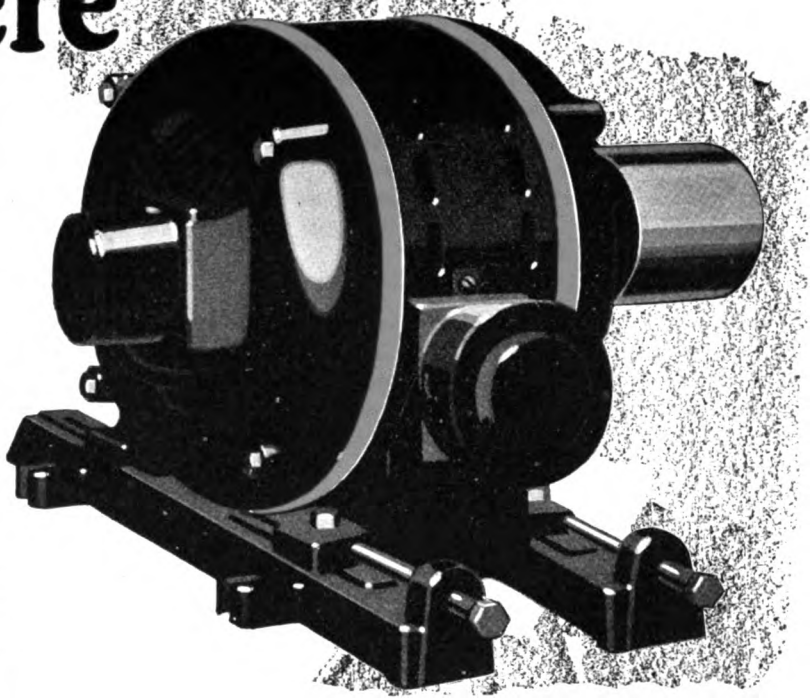
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Within easy distance everywhere Howell Red Band Motors are carried in stock—and Howell representatives, are as close to you as your telephone.

It will pay you to get in touch with the nearest Howell office.

Howell Electric Motors Company, Howell, Michigan

Howell RED BAND ELECTRIC Motors (75)

Make Good On The Hard Jobs

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"Edwards, how'd you save that $1680 last month?"

"My congratulations—but, how did you do it? Steal the coal?" queried the President, with a smile.

"We could have cut the coal bills about that much per month for the past year if you had let me spend a little money for steam traps when I first asked for them," answered the Superintendent.

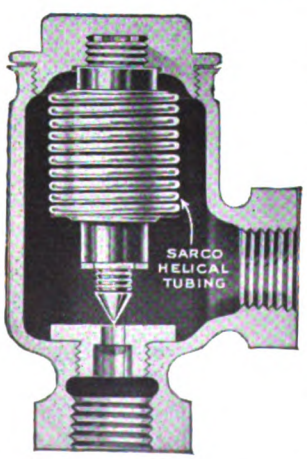
"A little money," blurted the President. "Why you wanted over $5,000—while you were satisfied with about a third that sum recently. Why the big difference?"

"Well, I put in lower-priced traps called 'Sarco.' I'd heard for years that they'd do the same work as bucket or float traps but I was afraid to try 'em because they cost only about a third the price, and didn't see how such a low-priced trap could do the work."

"How do they work?"

"Fine. The manufacturers sent me a long list of users, including many of the biggest plants in the country. I wrote to eight of them and every one reported entire satisfaction. There really isn't any reason why they should not hold up, because they have no complicated parts to need fixing or wear. And they adjust themselves for all pressures from 0 to 100 lbs."

"Where did you get the extra help to install them?"



"Didn't need any. Simply screwed them into the pipe line. No pits or platforms were needed."

Let us send you a Sarco on 30 days' free trial. You, too, can save money by installing the Sarco. Booklet R-275 on request.

SARCO CO., Inc.

183 Madison Avenue, New York

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Detroit Cleveland Philadelphia

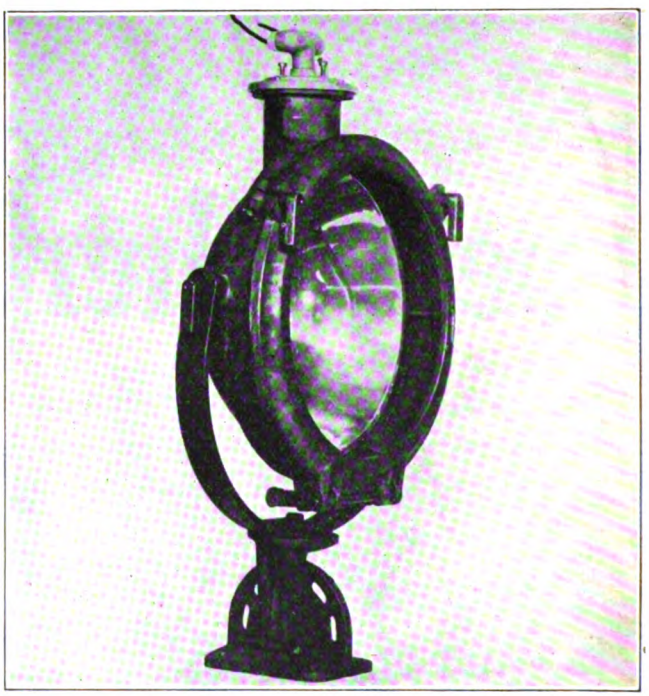
Peacock Bros., Ltd., Montreal

SARCO STEAM TRAP

A Cast Aluminum Floodlight With Chromium Face Reflector

CHROMIUM plated reflecting surface, lightweight and airtight construction are the outstanding characteristics claimed for the new cast aluminum floodlight being manufactured by the Westinghouse Electric and Manufacturing Company. It is said to be particularly well adapted to railroad roundhouse and industrial plant use.

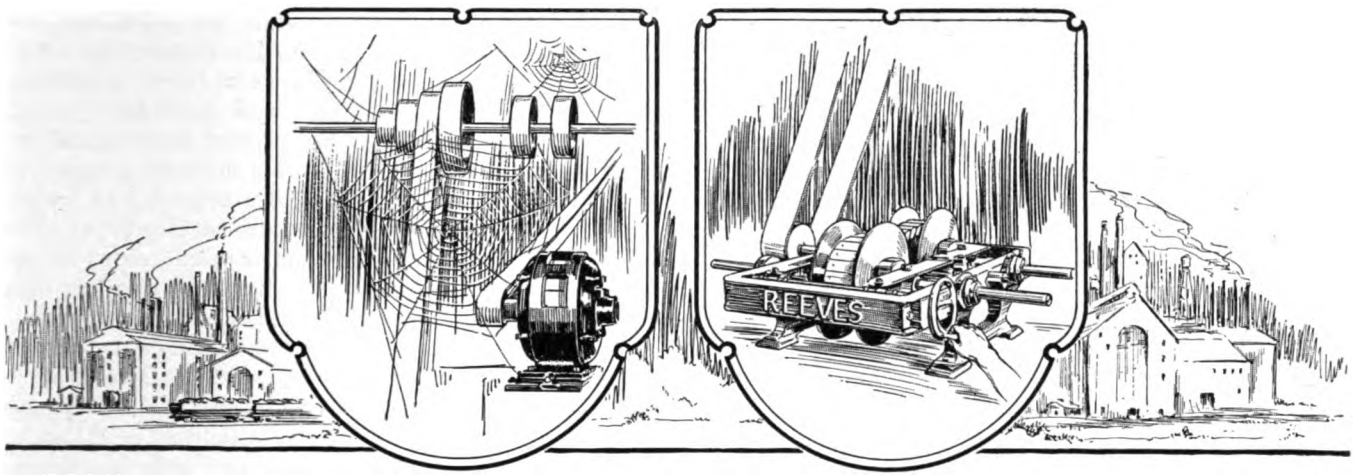
The manufacturer points out the chromium plated surface of the reflector is an important achievement in lighting equipment, for it lengthens the life of the reflector and is economical because it eliminates the necessity of delicate care that is essential with other types of surface. The chromium plated surface has high reflecting properties and at the same time it is of a tool steel hardness.



The reflector, it is claimed, will not tarnish or break and is not subject to corrosion from either sulphur or water vapor fumes; it is even possible to wipe off dust with a gritty waste and still do no damage to the reflector.

One of the features stressed by the makers of this new floodlight is the light weight that is obtained without losing any of the qualities of rugged and sturdy construction. It is claimed to be practically airtight and weatherproof, preventing all moisture and dirt from entering. This feature is obtained by sealing the lamp and reflector chamber. In this way the initial efficiency is maintained over long periods of time without any great upkeep costs.

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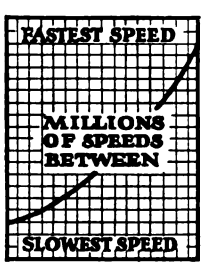


Brush the Cobwebs From Your Speed Control!

GET rid of the inaccuracy in your variable speed control. Be able to run *any* machine at *any* time at *any* speed you desire. Make your machines *flexible,* so you can get the exact speed you need to meet any different operating condition.

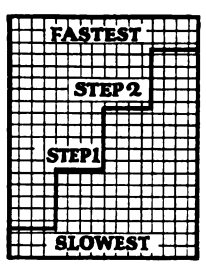
Modern production methods demand accurate, flexible speed control. Make-shift and stop-control devices *limit* your machines to only a few set *steps* in speed. And steps are not *exact* enough for best results. Often, the speed you need is *between* the steps —and it is impossible to get that speed.

But getting the "in-between" speeds is a simple matter when your machines are REEVES-equipped. The REEVES Transmission has no *steps*—it enables you to get instantly *any speed between fastest and slowest*, even to the smallest fraction of a revolution. It regulates the speed of machines just as quickly and easily as the accelerator controls your motor car. Send for catalog L-66 and full information about this simple, inexpensive, accurate device which will give automobile flexibility to the production machines and conveyors in your plant.



Get this

REEVES PULLY COMPANY
Established 1887
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Not this

REEVES
Variable Speed Transmission

INDUSTRY COMES TO REEVES FOR ACCURATE SPEED CONTROL

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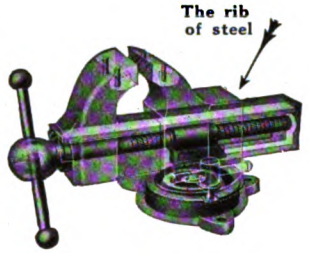
The Strength of one Rib



This rib grew

to be a power in industry for it was cast into a strengthening bar of tough steel over the full length of a vise slide. Thus Parker made what was once the weakest part of a vise into the strongest.

The steel rib in the Parker "Superior" Machinist's Vise, together with other notable improvements recommend it as the vise you want in your shop.



Write to W. R. B. for latest catalog

THE CHARLES PARKER CO., *Master Vise Makers*
Meriden, Conn., U. S. A.

GRIP LIKE A GRIZZLY

PARKER VISES

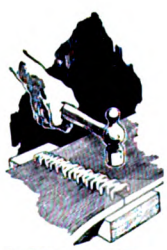
BRISTOL'S STEEL BELT LACING PATENTED

strength

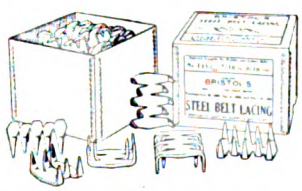
The strength in the Bristol Method of lacing belts lies in its simplicity. Without the aid of special equipment or training, any man of practical turn can repair a broken belt, or join the ends of a new belt.

There is strength in the cold-rolled steel fasteners, too, for Bristol's hold their grip on the ends of the belt as long as it lasts.

Carried at most hardware and mill supply houses. Write direct to the factory for samples and bulletin CE-719. THE BRISTOL COMPANY, Waterbury, Conn.



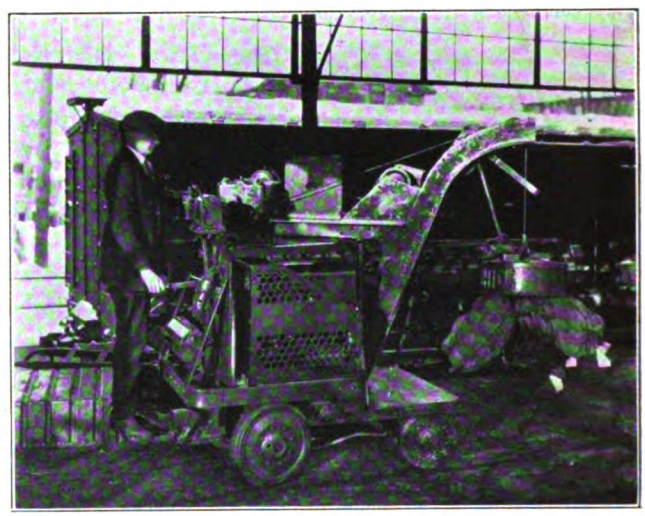
A Hammer is all you need



A New Magnet Truck

A VERY interesting innovation for unloading loose castings from box cars recently installed by a large automobile manufacturer is shown in the accompanying illustration. This small crane truck is compact enough so that it may be conveniently operated inside a standard box car, and it is used for picking up loose castings off the floor of the car by means of a magnet and loading these castings into skid boxes or else bagging them. This device is said to have made the unusual record of unloading a car of loose castings in forty-five minutes while the best previous time was three hours for four men.

This equipment was designed and built by the Baker-Raulang Company, of Cleveland, Ohio. The crane is known as type S-477 and has a capacity of 1,000 pounds at a 40-inch radius. The truck wheelbase is 40 inches and the tread 30 inches. The driving axle is equipped with 20 x 3½ tires and the trailing axle with 15 x 3½. All four wheels steer. An automatic cutoff opens the hoist motor circuit when the magnet reaches the top of travel and an automatic interlock, which is controlled by the brake pedal, opens the travel motor circuit when the operator leaves the driving platform or releases the foot

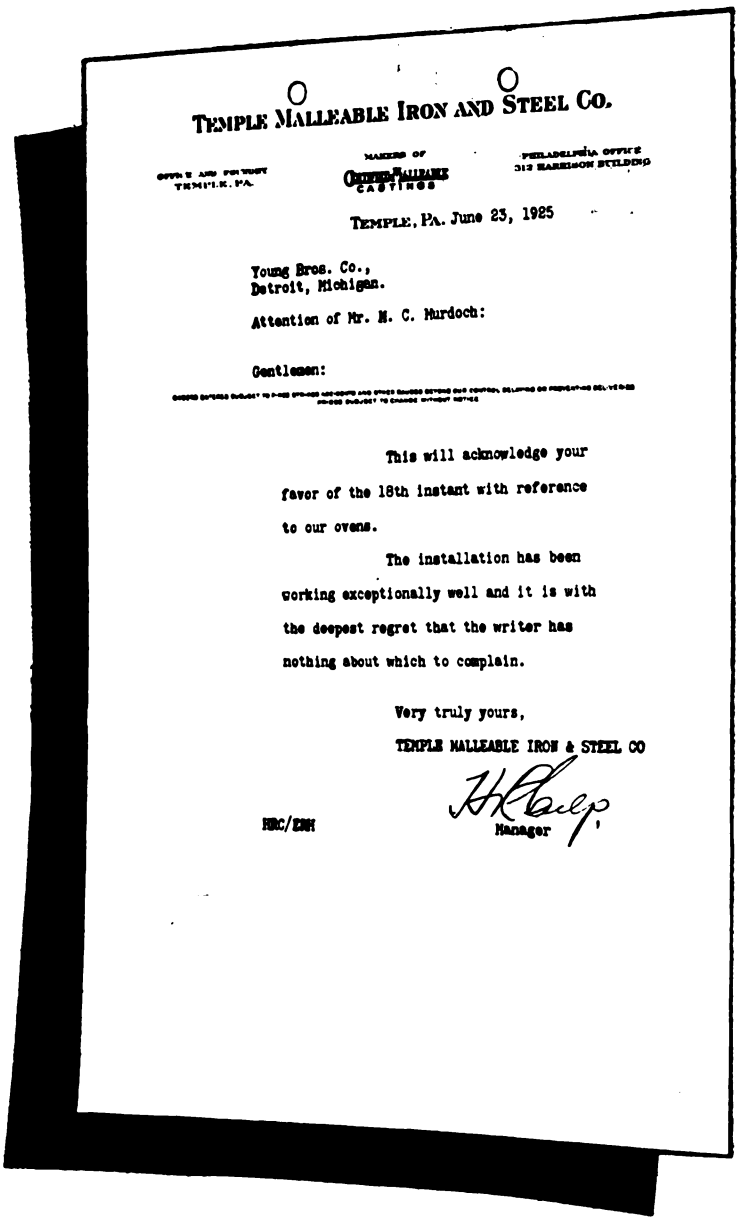


pedal. This is claimed to be a practical safety device, as it is impossible to secure power again without first returning the controller to the neutral position. The hoist and magnet controllers are located directly in front of the operator and the hoist may be slewed by means of the conveniently located handles. A lock is provided to retain it in the central position.

The power for operating the travel and hoisting motors as well as the magnet is supplied by a gas-electric unit manufactured by the Ready-Power Company, Detroit, Michigan. This unit consists of a compound-wound ball bearing generator, with a maximum output of 250 amperes at 30 volts, belted by means of a silent chain to a 4-cylinder Continental engine governed at 1,000 r.p.m. Engine specifications include pressure feed, three main bearings, helical timing gears, 15.62 horsepower at S. A. E. rating, water cooling with pump circulation and magneto ignition with impulse starter.

The magnet is the 20-inch circular type manufactured by the Ohio Electric and Controller Company, of Cleveland, Ohio. The magnet is designed to operate on 1,320 watts and is controlled by the switch mounted on the crane, which is in turn operated by the controller mounted on the dash next to the hoist controller.

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TEMPLE MALLEABLE IRON AND STEEL CO.

MAKERS OF CUPPLES-MALLEABLE CASTINGS

OFFICE AND FOUNDRY TEMPLE, PA.

PHILADELPHIA OFFICE 312 HARRISON BUILDING

TEMPLE, PA. June 23, 1925

Young Bros. Co.,
Detroit, Michigan.

Attention of Mr. M. C. Murdoch:

Gentlemen:

This will acknowledge your favor of the 18th instant with reference to our ovens.

The installation has been working exceptionally well and it is with the deepest regret that the writer has nothing about which to complain.

Very truly yours,

TEMPLE MALLEABLE IRON & STEEL CO

HRC/EMH

Manager

THE OTHER MANS STORY

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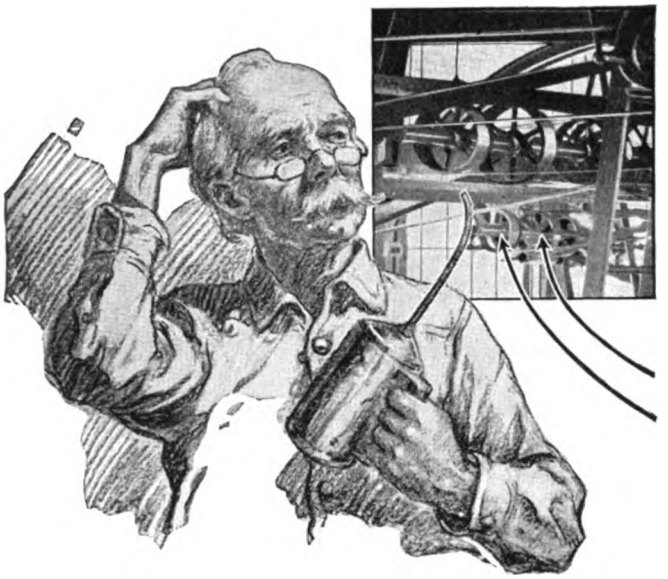


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Core and mould baking.
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Adapted to all methods of heating.

INDUSTRIAL OVENS

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"It's So—
But D—— If I'll Believe It!"

"When they installed those bearings twenty years ago, they said they didn't need any oil. I've been waiting every day to see 'em burn up. But they ain't done it yet."

Do you believe that any bearings can run for 20 years without a drop of oil? Do you believe you can buy a bearing like that for one-sixth the price of bronze?

If you don't believe it, we can't blame you. But there is such a bearing. It is called the Arguto Oilless. And if you care to be convinced—just drop us a line.

Actual experience shows that Arguto Oilless Bearings effect a 300% increase in the life of a power belt—prevent slipping and eliminate belt dressing as well as the labor of applying it.



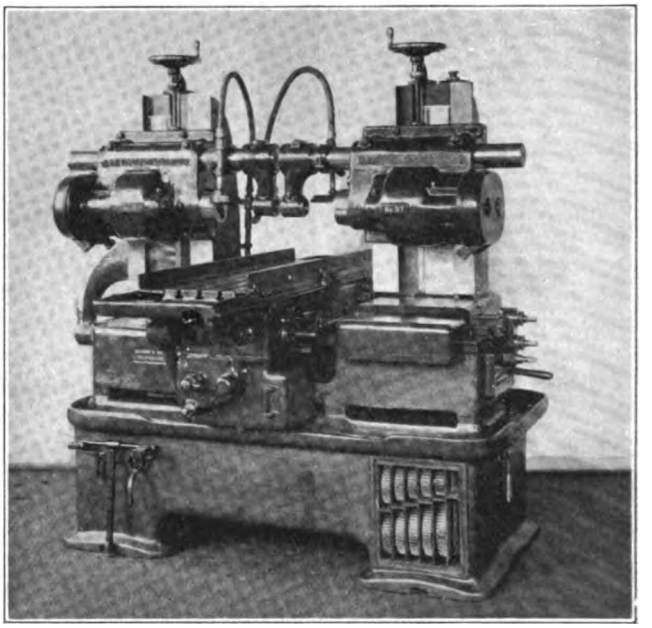
Arguto Oilless Bearing Co.
Wayne Junction, Philadelphia

OILLESS BEARINGS

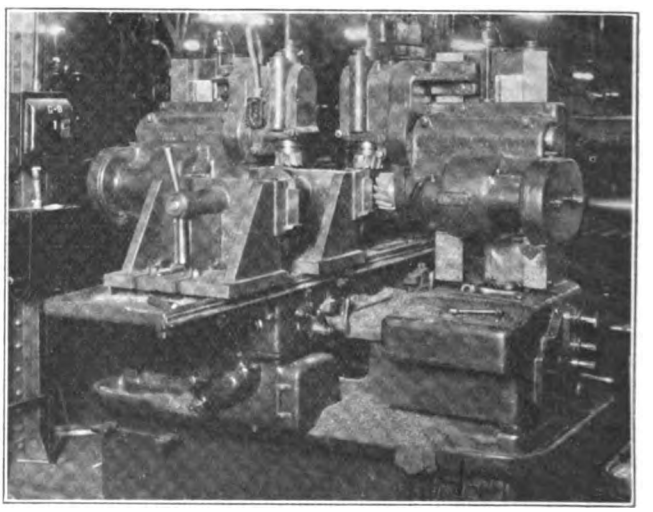
Arguto

A Recent Addition to the Brown & Sharpe Line

BROWN & SHARPE MFG. CO., of Providence, R. I., has recently added to its line of Automatic Milling Machines the No. 37 Automatic Duplex, a two-spindle machine of the manufacturing type. Being of the duplex type its two uprights and opposed spindles permit



the use of two face mills or of two gangs of cutters working simultaneously. This machine is claimed to be especially adaptable to face milling operations or, by using cutters on arbors, the piece can be milled both above and below at the same time. The inside spindle rotates in one direction only, at a speed determined by the change gears used. The outside spindle runs either forward or reverse at a speed also controlled by change gears. Its reversal is accomplished by throwing a lever at the base



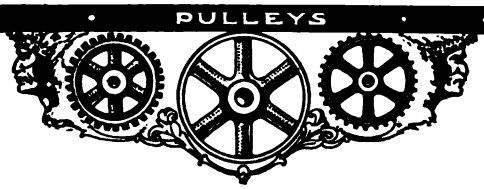
of the head. On work requiring the use of only one spindle, the outside spindle can be set to remain stationary.

An exceptional feature of the machine stressed by the manufacturer is the full automatic table control. Both the fast travel and cutting feed of the table operate automatically in either direction, making the machine adaptable to the Brown & Sharpe method of milling with a fix-

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PYOTT POWER WHEELS

GEARS · PULLEYS · SPROCKETS



"As Good As Pyott"

For more than a quarter century Pyott has been making cast iron pulleys better than they were ever made before. So consistently have these pulleys been better that today the recognized standard of pulley quality is the

PYOTT RED FACE PULLEY

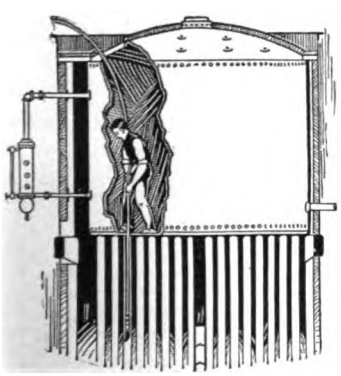
No matter what your use of pulleys is—no matter whether you need one or a thousand—from three inch to twelve feet in diameter—you will have your order promptly filled. And there'll be no question as to balance, true-running, crown or weight—those qualities are inbuilt. Compared with ordinary pulleys, Pyott Red Face probably cost more; but they are cheapest when belt wear and power loss are figured.

Write for booklet on Pulleys, Gears and Sheaves.
It's yours for the asking.

PYOTT FOUNDRY CO., 332 N. Sangamon St. CHICAGO, ILLINOIS

Leaders in Quality Pulleys for over 25 years.

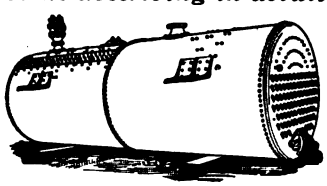
Vertical Water Tube



Man Stands Erect Cleaning

WICKES Steam Boilers

Ask for Bulletins describing in detail—sent free.



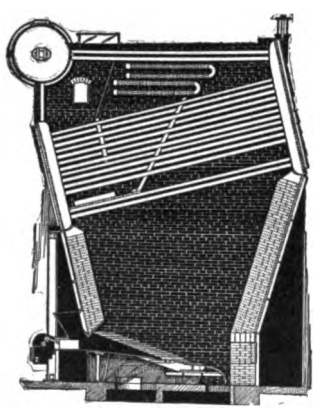
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THE WICKES BOILER CO.

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SALES OFFICES:
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Horizontal Cross Drum Water Tube



The One Joint Header Boiler.

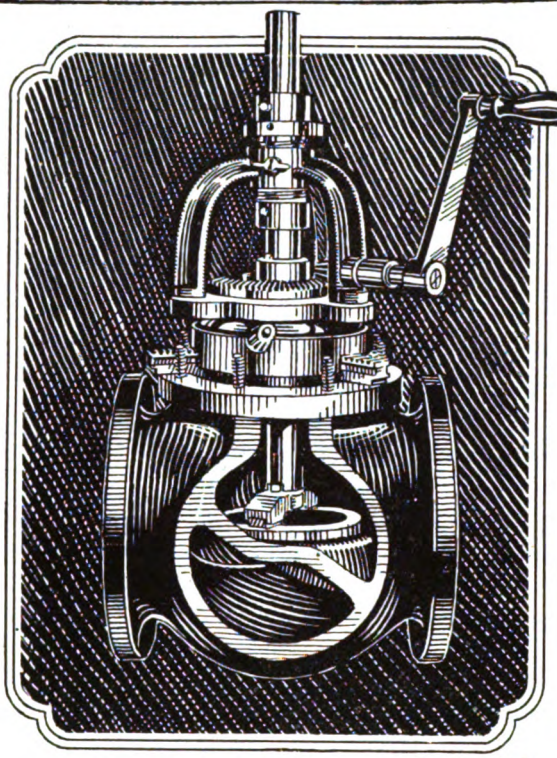
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with an Acquaintance Among Industrial Executives

AN opportunity for men who have sold to industrial plants or for others with a knowledge of plant practices who are looking for the chance to become salesmen. Positions open in industrial centers and good territories will be assigned. Earnings are unlimited and good future for men who make good.

The work consists of selling subscriptions for one of the best known publications in the industrial field. A magazine published for 35 years with an enviable reputation for its service to industrial executives. Men who can give only a part of their time will also be considered. Write giving an outline of your experience. Address box 535, Care INDUSTRIAL MANAGEMENT, 120 West 32nd Street, New York.

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Dexter Globe Valve Reseating Machine

A 90% Saving in Valve Expense

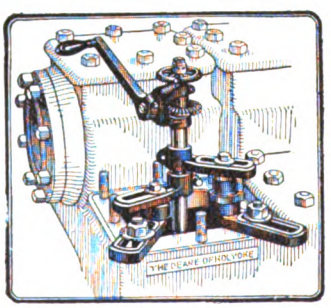
Your valve replacement cost alone, not considering leakage losses due to worn valves and the labor cost of taking leaky valves out of the line and replacing them, is much too high, unless you're equipped with a Dexter Valve Reseating Outfit.

With the Dexter Outfit you can be certain that every valve in the plant is leak tight. Valves last 10 to 20 times as long. Labor expense becomes negligible.

Valve repair and replacement cost is reduced 90 per cent or more.

Let us send you Catalog 23, giving complete information about this money-saving valve repair outfit.

9103



Dexter Pump Valve Reseating Machine

THE LEAVITT MACHINE CO.

28 East River Street, Orange, Mass., U. S. A.

Canadian Agency: Darling Bros., Ltd., 120 Prince St., Montreal.

British Agency: Cromil Engineering Co., E. Floor, Milburn House, Newcastle-on-Tyne.

Valve Reseating Dexter Machines

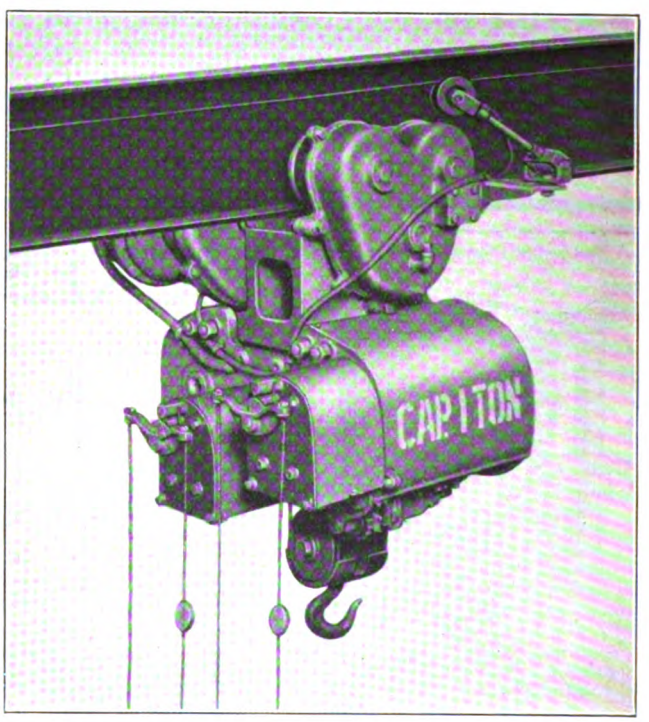
ture at each end of the table. This feature is also of advantage, it is pointed out, when part automatic operation is desirable or necessary for special working conditions. Accurate setting of the table is said to be quickly and easily made and the tripping levers are located for convenience in starting.

The machine is of the constant speed drive type. Speed changes for both spindle and table are accomplished independently of each other. It can be readily equipped with individual motor drive.

New Motor Trolley for Small "Lo-Hed" Hoists

A MOTOR-DRIVEN trolley has recently been developed by the American Engineering Co., Philadelphia, for use with its half-ton and one-ton Class A, "Lo-Hed" electric hoists, which have been built, heretofore, in bolt suspension and plain trolley types only.

The trolley can be supplied with travel speeds of 80 or 120 feet a minute, so that the trolley and hoist provide an inexpensive overhead system for handling loads of one ton or less at high speed, both in lifting and moving. The manufacturers claim that its accurate control makes it very efficient in spotting work for machine tool



operations. It can be arranged for remote control, if desired. Any Class A, "Lo-Hed" hoist now in service can be easily converted into a motor-trolley hoist by adding the new trolley.

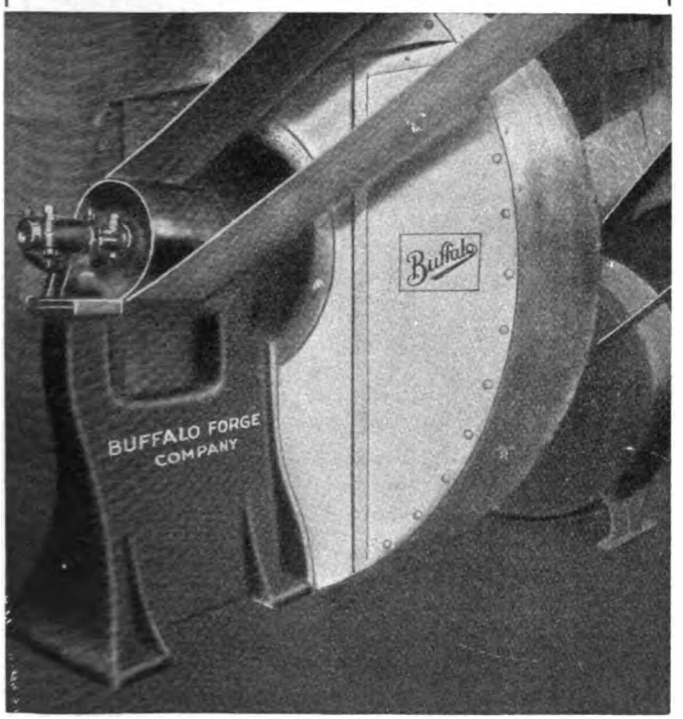
The following points are stressed by the manufacturers: Only 22-inch headroom is required for the hoist and trolley. The trolley is ruggedly built and maximum traction is obtained by driving all four wheels. The three main castings, from which the hoist and load are suspended, are of cast steel. The spur gear drive is totally enclosed and runs in an oil bath. Hyatt roller bearings are used on all shafts. The motor also is totally enclosed and has high grade ball bearings. All parts are completely accessible and the motor can be readily removed when necessary. The motor can be furnished for D.C. or A.C., either 2- or 3-phase.

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Here's evidence-

If you've ever doubted the remarkable savings to be made with Buffalo Slow Speed Mill Exhausters read what Mr. Geo. Lockwood, Supt. Lockwood Manufacturing Co., South Norwalk, Conn., says:

. . . "after extensive experience with high speed exhausters, we have adopted the more efficient slow speed fans for exhausting dust and dirt. On this work 3 Buffalo Forge Fans are giving us wonderful service.



"A 60" Buffalo Forge fan operating at 488 R.P.M., delivering 11,000 c.f.m., removes the dust from our 30 iron polishing wheels. This fan has been in operation 5 years.

"Last winter we installed a 50" 520 R.P.M. Buffalo fan delivering 6,550 c.f.m. This fan replaced 3 high speed exhausters, which were less efficient than this one slow speed fan.

"The success of this fan led us to install a 55" 600 R.P.M. Buffalo fan of 10,000 c.f.m.

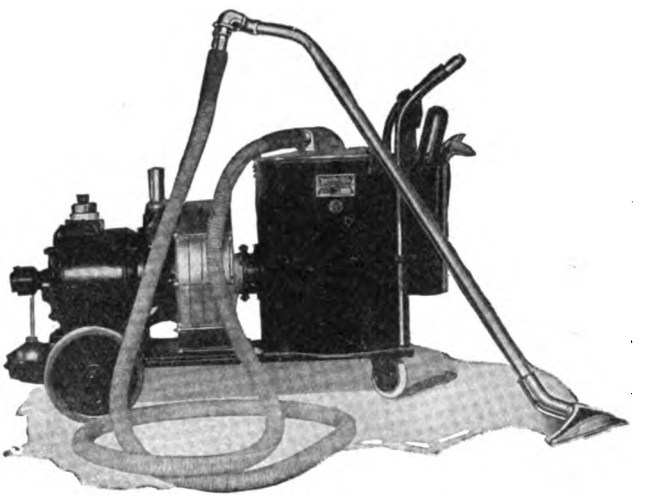
"All 3 of these Buffalo fans consume about 29 H.P. when operating at rated speeds."

This indicates the high regard users have for Buffalo Slow Speed Exhausters. Why not start saving money on your exhaust system NOW?

Buffalo Forge Company
440 Broadway, Buffalo, N. Y.
In Canada—Canadian Blower & Forge Company, Ltd., Kitchener, Ontario

"Buffalo" Slow Speed Exhausters Use LESS POWER

Cut your Cleaning Cost 20 to 40%



With Invincible Portable Vacuum Cleaners

Would you throw away a dollar? Probably not, but when you allow dust and dirt to accumulate, due to obsolete push-broom cleaning, and then shut down for a semiannual clean-up, you are throwing away thousands of dollars. "INVINCIBLE" Portable Vacuum Cleaners are cleaning floors, walls, ledges, overhead pipes, shafting, machinery, and lighting fixtures, in most every kind of factory. They pay for themselves in a few months time in cleaning labor saved.

Mail Coupon for Complete Facts

INVINCIBLE VACUUM CLEANER MANUFACTURING CO.
Dover, Ohio

INVINCIBLE VACUUM CLEANER MFG. CO.,
Dover, Ohio.

Please send facts on "Invincible" Vacuum Cleaners.

Name .....

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Attention of .....

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The MORSE High Speed Forged Type Drills



with the oversize shank will meet the demand of production jobs for drills of the staunchest character

When ordering High Speed Forged Type drills specify MORSE

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Morse High Speed and Carbon Drills, Cutters, Reamers, Taps and Dies sold by reliable dealers everywhere.

Introducing a Service Department in a Small Factory

By M. S. Rossy

IF a factory employs less than a thousand workers, it possibly has not abandoned the old method of hiring and installing an employment manager; but some day the value of a systematized employment office will become apparent and the factory will put the name of an employment manager on its payroll. Since there is necessarily a variation in the number of new employees desired on any one day, the factory will probably give the new manager additional duties to perform, making sure that his time is fully occupied. The different branches of service (or personnel) work are usually assigned to him, since there is attached to them the distinct value of indirect advertising. Therefore, though employment may have been the first thought in the minds of the executives—as is commonly the case—the new official (man or woman) becomes a service manager, bearing an appropriate title, and the Service Department is fully established.

In most cases, men are glad to turn over some of their duties to someone else, but foremen do not relish giving up the job of hiring their men; they consider that their position is shorn somewhat of its dignity and do not at first have a friendly attitude toward the one who has deprived them of so much importance. The new service manager must understand this antagonistic feeling, which, after all, is quite natural, and he must make an effort to overcome it. The executives do not want dissension on the premises, aiming rather toward perfect harmony, and the new service manager must influence the foremen to coöperate.

Before doing any hiring at all, it is well for the service manager to put the file of active employees' names and addresses in order. In most cases, this file is very incomplete and in a few cases is entirely missing. This file, giving information as to the employee's address, age, nationality, marital condition, length of employment, etc., is valuable in many ways and quite worth the time spent in preparing it. After the present employees are all listed, it becomes a routine matter of a few moments to prepare a card for a new employee as he starts to work.

Foremen appreciate this file. When they want to look up an absent employee, his address is immediately available. When they are obliged to lay off some workers in order to curtail expenses, they can tell by consulting the file what employees have dependent families and what employees have worked for that company the largest number of years. The foremen usually coöperate willingly in the making of this file and begin to see that the new service manager may have some good points.

Because the service manager stands as a link between the management and the employees, it is important that the workers should consider him as a friend and understand that he is interested in them. In the preparation of this factory file, he has a chance to meet them individually and to ask them questions about themselves. The employees are willing to answer these questions if they realize that these are not asked merely out of curiosity.

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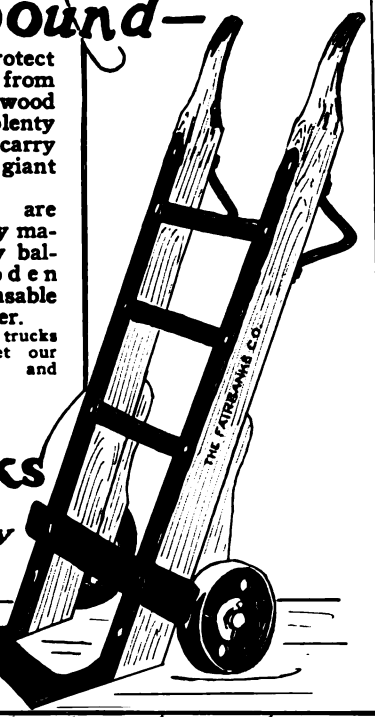
The best will always be made of wood —steel-bound—

—steel-bound to protect all wood surfaces from wear. The selected wood stock itself is plenty strong enough to carry the weight any giant might handle.

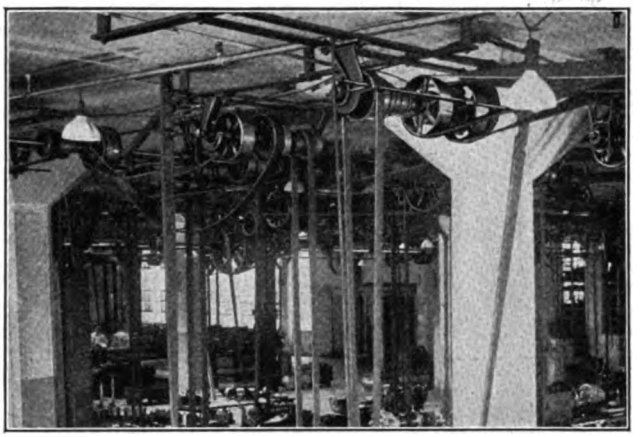
Wooden trucks are light, flexible, easily manipulated, perfectly balanced; and wooden grips are indispensable during cold weather.

Ask the men what trucks they prefer—then get our booklet on models and prices.

The **Fairbanks** Company New York City



"Ask the man who does the pushing"



"Everything In Line Shafting Equipment"

From Turned Steel Shafting—including every related power appliance—up to Pulleys 16 ft. in diameter—Medart is always ready with quick service on "Everything in Line Shafting Equipment."

Established in 1879, Medart made the first steel rim pulley ever built. Since that time the company's activities have expanded to a point where today the plant occupies more than one-quarter million square feet of floor space—devoted to the manufacture of every type of equipment used in the mechanical transmission of power.

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Now, as for 50 years past, Lay brooms are the predominant preference of the steel industry and of over 4000 industrials.

They are strong, resilient, perfectly balanced and hold their shape till worn to the last stub. Sweeping tips are extra wide and flexible, fibres are held without shed or spread in the vise-like grip of staples. There's a LAY Broom for every industry.

Every user is a booster

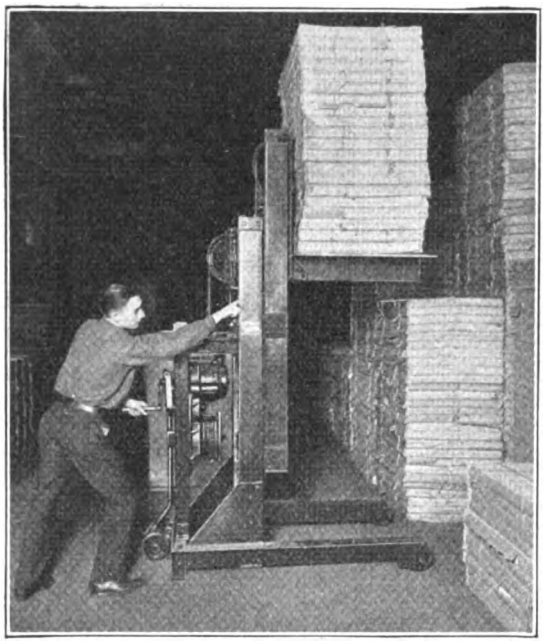
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PORTABLE
ELEVATORS
Governor-Controlled



Barrett Telescopic type portable elevator

Cheaper than building new warehouses

A BARRETT Portable Elevator will triple your warehouse space by piling all sizes and weights of cases and packages to the ceiling. Does its work easily, quickly, safely. Saves not only space, but reduces handling expense so sharply that its cost is made up in a short time.

The Barrett is the only elevator with governor control—which means safety to the operator and the product. The only elevator with cut steel gears entirely enclosed and running in oil. The only elevator with automobile type brake. Send for descriptive folder.

BARRETT-CRAVENS COMPANY—1334 West Monroe Street, Chicago, Ill.—Grand Central Palace, New York—Sole Licensee for Canada, Riley Engineering & Supply Co., Ltd., 360 Dufferin St., Toronto—Paris, Factory, Barrett-Cravens Co., 9 Rue de Rocroy. Distributors in all principal cities of the world.

Barrett Handling Equipment

Even Tony, recently here from Poland, has learned the word, "insurance," and knows that the insurance company, which pays the bills when he gets hurt, has to make certain queries about him, so it is not necessary to offer him any more explanations than the one word, "insurance," to obtain his coöperation. (It might be well to state here that this file is decidedly of value when insurance blanks for accidents have to be filled out.) While securing the necessary information from the employees, the service manager has a chance to reveal a spirit of friendliness, a feeling of comprehending sympathy, and a desire to help. Each interview should furnish him with a new friend, who unconsciously becomes a more steadfast supporter of that factory.

Before hiring is attempted, it is advisable for the service manager to call a meeting of foremen and explain to them the system that he is about to introduce. Each foreman is to keep him informed of the needs of that department and he will furnish workers as promptly as possible. The foreman is too valuable a man to have to waste his time in interviewing worthless applicants; it is better that he should see only those who have some recommendation for the job. This recommendation will be given by the service manager and will be made only when a careful study of the candidate shows that it is justified. The ultimate selection will be made by the foreman, who does not have to accept the man sent to him and can refer him back to the employment office if he considers him unsatisfactory. (Such a statement is a tactful way of providing that the foreman will accept nearly every worker sent him, for human nature is contrary and the foreman is more inclined to accept a man if he thinks that he has the privilege of refusing him.)

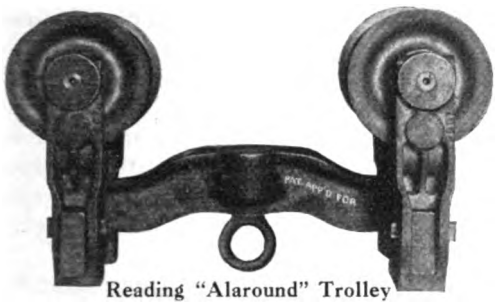
It is to be hoped that the service manager is a fluent speaker and can present his arguments forcibly. After this conference, the foremen should be ready to relinquish the office of hiring and should soon be enthusiastic supporters of the new method. If the service manager is not a good judge of character and sends into the factory undesirable applicants for the positions involved, he has only himself to blame if the system does not meet with approval.

With regard to other activities that the service manager may introduce, it is well for him to remember that indiscriminate charity produces paupers, that an abundance of assistance is often detrimental to initiative, and that the value of a thing is generally measured by its cost. In other words, charity should be dealt out wisely; constant receiving of aid produces a state of mind where effort loses its incentive, pride is annihilated, and striving lapses into begging. If an employee receives many nice presents for his children and a better Christmas dinner than his neighbor, who has bought his with the results of his labors, that employee soon may get the habit of looking for gifts and later may ask for them without pride or ambition. Furthermore, begging employees are not always truthful; their statements often need investigation. An employee once asked a service manager to find some way to secure a ton of coal for him, indirectly suggesting that the factory give it to him. Investigation revealed the fact that he did need coal, but it also revealed a Ford automobile that he had recently bought! When he stated that he could not raise any money, he doubtless did not intend to have the story of the automobile made public.

When we pay for a thing, we are apt to value it more

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Keep the Work Moving



Reading "Alaround" Trolley

NO tugging, pulling, straining at heavy objects, no employees compensation to pay for strains and physical injuries sustained in struggling with back breaking loads—IF READING TROLLEYS ARE on the job.

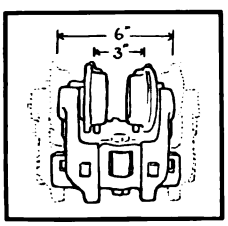
You have probably known trolleys that, when a load was swung from them, offered so much resistance that you thought they were skids instead of trolleys. But no user has ever experienced such a reaction with a loaded Reading Trolley.

Why?

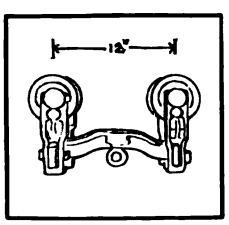
The answer is found in the double row of hardened ball bearings with which each wheel is equipped; in the 12 inch wheel base; in the easy adjustment of the wheels to fit any size I-Beam (6" to 18"); and in the overall design of this unusually flexible trolley which permits it to run freely around a 15 inch radius.

Used in combination with a Reading Mono-Rail System, and with either a Reading Chain Block or Electric Hoist, industrial users the country over have proved that this is a combination that "can't be beat."

We'd like to tell you what the other fellows—the users—think of Reading Material Handling Equipment. The data available is certainly convincing. Write today for full descriptions of Reading Products. You can surely use some of them as there is no limit to their usefulness.



Fits all 5-Beams from 6" to 18"



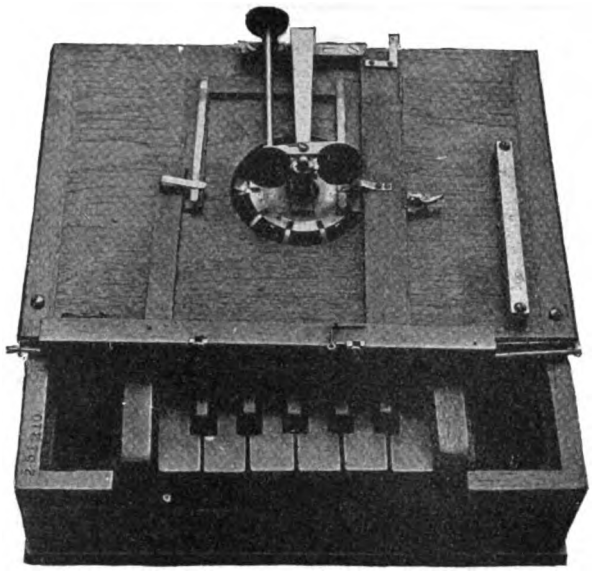
12" Wheelbase prevents rocking



Runs freely around 15" radius

READING C AND B READING

READING CHAIN & BLOCK CORP.
READING PENNA.



Do you know what it is?

OFF-HAND, you would never guess it was a typewriter—the first Sholes typewriter with a keyboard like a piano, patented back in 1868.

Compare it with the typewriter in the office of your plant, and you will get an idea of the high degree of perfection that has been attained in their manufacture.

Times have changed! Yet strange to say, there are concerns who are using strong alkalies like potash and lye, and inflammable and dangerous materials like gasoline, benzine and kerosene for cleaning their work.

Potash and lye for cleaning are as antiquated as the old-time typewriter. There is no need or reason to use them because modern cleaning materials turn out work *faster, better* and at *less cost!*

Somewhere near you is an Oakite service man ready to tell you all the advantages of Oakite materials and up-to-date methods of applying them. Ask to have him call, or write for interesting booklets bearing on your work. No obligation, of course.

Oakite Service Men, cleaning specialists, are located at

Albany, Allentown, Pa., *Atlanta, Ga., Baltimore, *Boston, Bridgeport, *Brooklyn, Buffalo, Camden, Charlotte, N. C., *Chicago, *Cincinnati, *Cleveland, *Columbus, O., *Dallas, *Davenport, *Dayton, *Denver, *Des Moines, *Detroit, Erie, Flint, Mich., *Grand Rapids, Harrisburg, Hartford, *Indianapolis, Jacksonville, Fla., *Kansas City, *Los Angeles, Louisville, Ky., *Milwaukee, *Minneapolis, *Montreal, Newark, Newburgh, N. Y., New Haven, *New York, *Oakland, Cal., Philadelphia, *Pittsburgh, Portland, Me., *Portland, Ore., Providence, Reading, *Rochester, Rockford, Rock Island, *San Francisco, *Seattle, *St. Louis, Springfield, Ill., Syracuse, *Toledo, *Toronto, *Tulsa, Okla., Utica, *Vancouver, B. C., Williamsport, Pa., Worcester.

*Stocks of Oakite materials are carried in these cities

OAKITE

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WITT OILY WASTE CANS

You are overlooking a vital factor in fire prevention, if your plant is not equipped with Guaranteed Witt Oily Waste Cans.

They are built in accordance with specifications of the Underwriters' Laboratories, Inc., and each Can bears their label of inspection and approval. They are also approved by the Associated Factory Mutual Fire Insurance Companies.

Fireproof, foolproof, the strongest and longest-lived line of oily waste cans ever built, there is nothing about Witt Oily Waste Cans to get out of order and their use permits a reduction in insurance premiums which quickly pays for the cans.

In addition, each genuine Witt Oily Waste Can carries the Witt guarantee tag wired to the handle, guaranteeing the can to outlast 3 to 5 of the ordinary kind and making it, from the standpoint of service, the most economical oily waste can on the market.

Try one! Your jobber can supply you, or write

THE WITT CORNICE COMPANY
2117 Winchell Avenue
Cincinnati, Ohio

Manufacturers of

WITT
CORRUGATED
CANS and PAILS

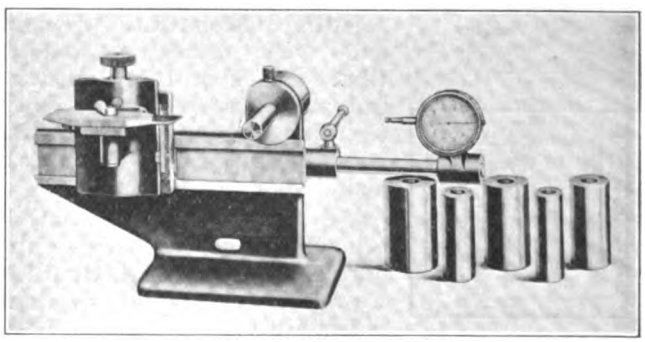
highly than if we had found it or if it were given to us (sentimental associations excluded). For the same reason, the employee will appreciate a thing more if he makes some payment for it than if it were a direct gift. The factory restaurant should sell food at cost, for nothing is gained by selling it under cost; the athletic club should have dues; the health insurance (covering sickness only) should be on a mutual benefit plan, whereby the employees make a small, regular payment. If a new phonograph is wanted for the women's rest room, the employees can raise the money needed by giving some entertainment and then the phonograph, bought through their efforts, means more to them.

While the service manager must concentrate his attention on performing practical duties, it is true that he helps at the same time to preserve the equilibrium of the factory. He interprets the management to the employees and the employees to the management. When he comes to the factory as the pioneer in that position, as the creator of that special service department, he has to combat more or less opposition and keep on struggling until he succeeds in standing on firm ground. Ultimately, he is recognized as a valued factor in the organization and no one in the factory has more friends than he. If he has learned to analyze character carefully and exercises moderation and tact, then he quickly receives coöperation and can serenely proceed to blaze his trail.

A New Design of Cutter Testing Fixture

THIS new Brown & Sharpe Cutter Testing Fixture is used conveniently when sharpening gear or other formed cutters or hobs. All sizes of cutters up to 10" in diameter are within its capacity.

The testing plate is carried on a vertical slide, which makes possible the testing of cutters whose cutting faces are either radial or undercut. The manufacturers point out that this is a very convenient feature, as it greatly broadens the use of the fixture. The position of the testing plate is indicated accurately by means of a scale



graduated in fiftieths of an inch. One end of the test plate is flat for testing straight gashed cutters and hobs, and the other end is made in the form of a knife-edge to permit the testing of spiral formed cutters or hobs having spiral gashes. The dial indicator may be furnished to read to thousandths of an inch English Measure or hundredths of a millimetre Metric Measure.

Five hardened and ground bushings are furnished in the following sizes: 7/8", 1", 1¼", 1½" and 1¾" diameter. A collar is also provided for use when testing thin cutters.

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THE improved Baker Hy Lift handles 6000 lbs. and lifts faster and with less current than the former 4000 lb. model.

Greater Capacity
Greater Strength
Greater Efficiency

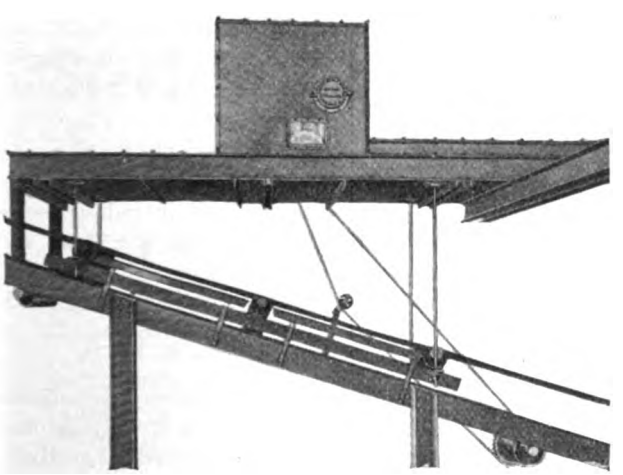
No Increase in Price



ELECTRIC TRACTORS AND TRUCKS
TRADE-MARK REG. U.S. PAT. OFF.
Baker

Write direct for complete information.

THE BAKER-RAULANG CO. CLEVELAND, OHIO



Make Your Conveyors Move and Weigh—

Do two things at once; combine two operations, and thus save time and money. By doing so you will give yourself a fair break on the materials you receive and ship. Know how much is being moved.

The Merrick Weightometer attached to your conveyors will accurately record the weights of loose and bulk materials, as they move along. You need not depend on the bills of lading or "guess" weights.

Write for "Merrick Circulars" now; stop relying on uncertainties—know how much you're handling.

MERRICK SCALE MFG. CO.
180 AUTUMN STREET PASSAIC, N. J.

PROTECTION AGAINST



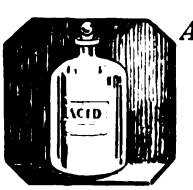
Heat

Nitrose Metal Coating will not blister crack or peel when applied to hot surfaces; that's why it's so widely used for piping, boiler fronts, smoke stacks and hot equipment.



Cold

Nitrose resists cold. Exposed Nitrose will not chip or flake off. It's ideal for surfaces hot and cold intermittently—good for refrigeration pipes, etc. Nothing its equal for this service.



Acid

Nitrose Metal Coating resists most acids and fumes. Widely used for insides of coal bunkers, for ammonia and brine piping, for enameling fume hoods, etc.



Corrosion

Nitrose conquers corrosion. This thick, black, glossy coating endures. Forces of deterioration meet their equal in Nitrose Metal Coating. Use Nitrose where corrosion has been hardest to fight.

NITROSE Metal Coating

Give Nitrose a trial. Order a trial drum. It comes ready for use without mixing. Apply it with a brush or spray, right over rusty, oily, hot, or wet surfaces. See how little surface preparation is necessary—how it outlasts other surfacing compounds.

THE NITROSE COMPANY
Peoria Life Building, Peoria, Illinois
See phone book for representatives in:
Chicago, Ill.; Cleveland, O.; Detroit, Mich.; Kansas City, Mo.; Los Angeles, Calif.; New York City; Rochester, N. Y.; Saginaw, Mich.; San Francisco, Calif.; Seattle, Wash. 116-Gray

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Manufacturers' Bulletins and Catalogs

Helpful new literature for the man who selects and directs industrial equipment

Precision Ball Bearings

Precision Ball Bearings for fractional horse-power motors are described in a small booklet which has been issued by the Norma-Hoffmann Bearings Corp., of Stamford, Conn.

"The Measurement of Materials"

is the title of a small booklet which describes the use of Toledo equipment to avoid losses by error in the measurement of industrial materials. This was issued by the Toledo Scale Co., of Toledo, Ohio.

Supplies for "Stable-Arc" Welder

An 8-page illustrated booklet which deals with supplies for the "Stable-Arc" Welder has been issued by the Lincoln Electric Co., Cleveland, Ohio. These supplies include cables, glass, shields, welding electrodes, aprons, gloves, etc.

Centrifugal Pumps

Circular No. 402, which describes and illustrates Double Suction Centrifugal Pumps has been issued by the Dean Hill Pump Co., of Anderson, Ind.

Adjustable Reamers

Catalog No. 26, containing 24 pages of illustrations and description of Wetmore Adjustable Reamers, has been issued by the Wetmore Reamer Co., of Milwaukee, Wis.

Blue Printing Machinery, Drafting Room Furniture, etc.

Catalog G, which contains 371 pages of illustrations and description of blue printing machinery, blue printing accessories, drafting room furniture and drawing materials, photographic lamps and engineering supplies, etc., has been issued by The C. F. Pease Co., 813-21 North Franklin St., Chicago, Ill. This book has been thumb indexed according to classification and includes Price List and Discount Sheet applying to products described in this catalog.

Tire Pumps

A 16-page booklet, No. 23, illustrating and describing Bridgeport Tire Pumps for grease guns, inflators, hub caps, etc., has been issued by the Bridgeport Brass Co., Bridgeport, Conn.

"Clark Theory of Labor Economy"

is the title of a booklet written by Eugene B. Clark, founder of the Clark Tructractor Co., Buchanan, Mich., which booklet has been issued by the company.

Heat Treatment

Heat Treatment and Applications of Nickel and Nickel-Chromium Steels is the title of a bulletin which has been issued by The International Nickel Co., 67 Wall St., New York.

Pneumatic Tools

A 64-page catalog, No. 15, which contains illustrations and description of Thor Pneumatic Tools, including core and rivet busters, drills, grinders, hammers, hoists, sand rammers, accessories, etc., has been issued by the Independent Pneumatic Tool Co., 600 W. Jackson Blvd., Chicago, Ill.

Irrigation

De Laval Pumps in Profitable Irrigation Plants is the subject of a 16-page illustrated booklet, which has been issued by the De Laval Steam Turbine Co., of Trenton, N. J.

Portable Blower

The "Marvel" Portable Blower with universal ball bearing air cooled motor is illustrated and described in a leaflet which has been issued by the Electric Blower Co., of 352 Atlantic Ave., Boston 9, Mass.

Pyrometers

Catalog No. 15, containing 80 pages of illustrations and description of Brown Pyrometers for the accurate and efficient measurement of high temperatures, has been issued by The Brown Instrument Co., Philadelphia, Pa.

Rolling Wood Doors

Wilson Rolling Wood Doors for warehouses, factories, etc., are illustrated and described in a booklet which has been issued by The J. G. Wilson Corp., 11 East 38th St., New York.

Air Filters

The Phoenix Constant-Effect Air Filter is described in an illustrated folder, which has been issued by Drying Systems, Inc., 1800 Foster Ave., Chicago, Ill.

Portable Machines

Brown Portable Pilers and Portable Tiering Machines are illustrated and described in a 24-page booklet issued by the Standard Conveyor Co., North St. Paul, Minn. Included in the booklet is a detailed sheet showing construction and limits of operation of the Portable Incline Elevator.

Valves

Catalog No. 33, containing 51 pages of illustrations and description of Homestead Valves, including the new full round opening valve, the protected seat globe valve, the protected seat hydraulic operating valve, and the Homestead lubricated type valve, etc., has been issued by the Homestead Valve Mfg. Co., of Homestead, Pa.

Pneumatic Conveying Systems

"Dracco" Pneumatic Conveying Systems tor unloading and conveying soda ash and sand in a large soap manufacturing plant are illustrated and described in Bulletin No. 514 issued by The Dust Recovering & Conveying Co., Harvard Ave. and 116th St., Cleveland, Ohio.

Watthour Meters

Sangamo Meters are illustrated and described in Bulletin No. 71, which also contains instructions for Sangamo D-5 Watthour Meters. This booklet has been issued by the Sangamo Electric Co., Springfield, Ill.

Oil Engines

Direct-Injection Oil Engines for all purposes are illustrated and described in a 32-page booklet which has been issued by the Ingersoll-Rand Co., 11 Broadway, New York.

Motors

Master Motors are illustrated and described in Folder No. 323, which has been issued by The Master Electric Co., Linden and Master Aves., Dayton, Ohio.

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Stronger Benches and they cost less!



Patented and Patents Pending

The NEW "Hallowell" Home Work Bench (shipped knocked down in 3 packages) is the thing you've been wanting for your own home.

"HALLOWELL" Steel Bench Legs and Steel Bench Drawers

"HALLOWELL" Steel-legged Benches actually cost less to build than wooden benches, yet the "Hallowell" lasts much longer without becoming wobbly.

A "Hallowell"-legged bench can thus be pried loose and shifted about and put up somewhere else and be as good as before. Do this with a wooden bench and it is only fit for kindling wood.

"Hallowell" Steel Bench Legs can be picked up from stock, just when needed and exactly as wanted, while wooden benches must be built to order. Obviously, therefore, buy "Hallowell" Steel Bench Legs.

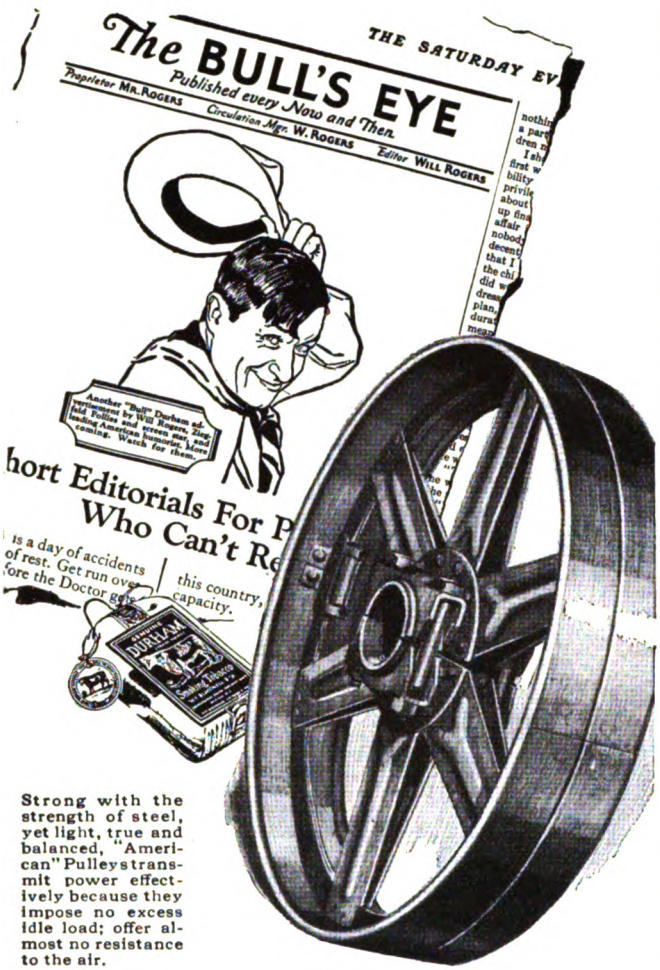
Every workman will appreciate a "Hallowell" Steel Bench Drawer. It is dust-proof and comes equipped with lock and a special sliding tray that is most convenient for the smaller tools.

Write for free illustrated folders, today.

Standard Pressed Steel Co.

Box 8 Jenkintown, Pennsylvania

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Strong with the strength of steel, yet light, true and balanced, "American" Pulleys transmit power effectively because they impose no excess idle load; offer almost no resistance to the air.

American Tobacco and American Pulleys

"BULL" DURHAM, celebrating its sixty-fifth birthday in the prime vigor of youth and perennial popularity.



PATENTED

American Pressed Steel Shaft Hangers have the same desirable attributes and their strong tubular design adds to the good appearance of any shop.

Tuxedo, always fresh for the pipe smoker; Lucky Strike, with the fragrance of its "toasted" Burley; Omar, famed for aroma—these and a dozen more favorite brands have made the names of the American Tobacco Company's products part of the family vocabulary. "Ask Dad, he knows."

Down South, where the "smokes" begin, the American Tobacco Company long has used American Steel Split Pulleys to transmit the power from line shafts to the various machines that make the tobacco ready for the market.

For nearest distributor, see MacRae's Blue Book

The American Pulley Company

Manufacturers of Steel Split Transmission Pulleys, Pressed Steel Shaft Hangers, and Pressed Steel Shapes

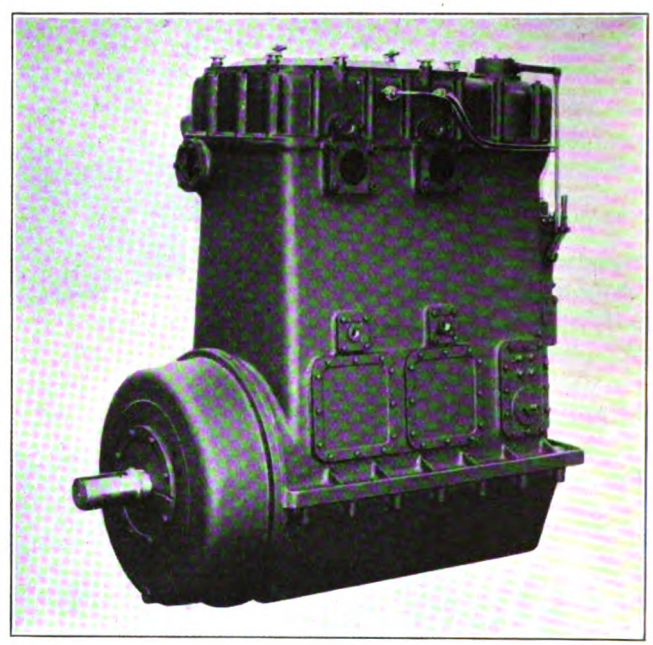
4200 Wissahickon Ave. Philadelphia

AMERICAN
PRESSED STEEL HANGERS PATENTED
STEEL SPLIT PULLEYS PATENTED

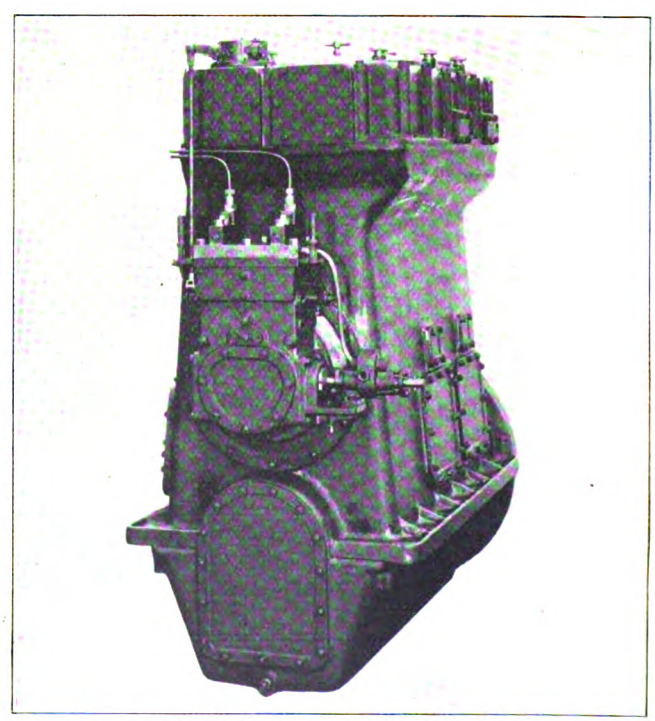
A Diesel Engine for Industrial Service

THE Foos Gas Engine Co., of Springfield, Ohio, manufacturers of internal combustion engines, are now building the Foos Industrial Diesel. An exterior inspection of the engine shows it to be completely enclosed with no moving parts visible.

Although completely enclosed, the new engine is yet said to be easily accessible. Large cover plates are provided on both sides opposite the crank throw, which gives access to the lower part of the main cylinder frame. The top of the engine is provided with cover plates that may be lifted up for inspection of the heads, the valves, or valve mechanism. Even the flywheel is enclosed.



A central lubricating oil system furnishes oil to every bearing in the engine under pressure. In the lower part of the bed plates a triangle is provided, where the lubri-



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The First 15 Sold 50 More

AN original installation of 15 Valley Motors was placed in the factory of the Lampe Shoe Company the middle of 1922.

The work which these motors have to do consists of the pulling of line shafts, floors, and individual type shoe machine units. They run continuously all day long, and they are subject to frequent considerable overloads.

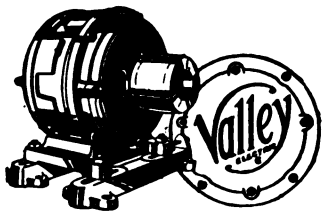
Since these motors were installed their performance has been so completely satisfactory that the management of this factory has installed more than 50 additional motors and assures us that future motors will be Valley Motors.

This is only another illustration of the service and satisfaction which buyers regularly get from Valley Ball Bearing Motors.

The delivery of continuous power with unusual operating economy and complete operating satisfaction is all in the day's work for Valley motors.

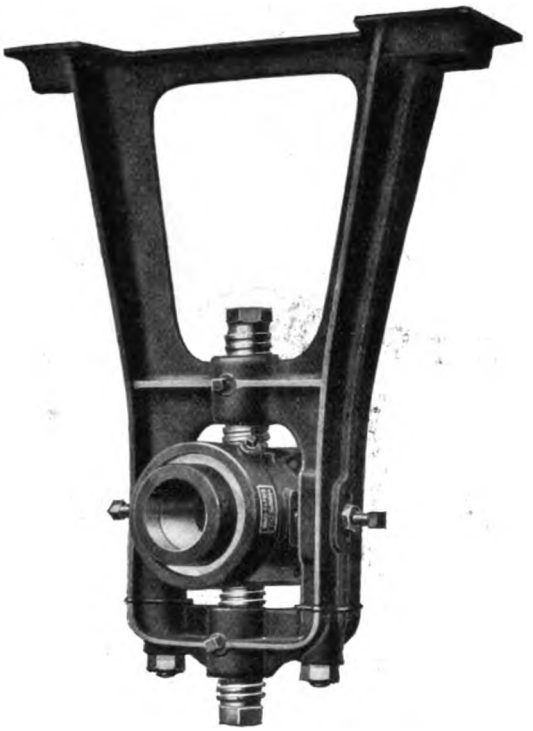
Before you buy or recommend another installation of motors, it will pay you to get all the facts about Valley Ball Bearing Motors. Write for descriptive booklet.

Motor Division
VALLEY ELECTRIC CO., ST. LOUIS, U S. A.
Branches in Principal Cities



Valley Electric

Where Durability and Economy Combine



WOOD-FAFNIR

DURABILITY and economy that are continuous can now be had by installing power transmission machinery equipped with the new WOOD-FAFNIR Ball Bearing Hanger Boxes, Pillow Blocks and Post Boxes, Ball Bearing Loose Pulleys and Ball Bearing Equipped Friction Clutches.

Here is the ideal combination—life-long sturdiness and dependability of the Universal Giant Line of Power Transmission Machinery with the smooth running, power saving Fafnir Ball Bearing.

There are sixty-nine years of experience in the manufacture of power transmission machinery behind the new WOOD-FAFNIR Products. Associated with it is an Engineering Service which will help you solve your power transmission problems.

There is a dealer near you who carries these new WOOD-FAFNIR Products in stock. He's a good man to do business with, and he'll be glad to tell you of the many advantages of the time, money and labor saving U. G. Line.

T. B. Wood Sons Co.
Chambersburg, Pa.

NEW ENGLAND BRANCH: **Cambridge, Mass.**
SOUTHERN BRANCH: **Greenville, S.C.**

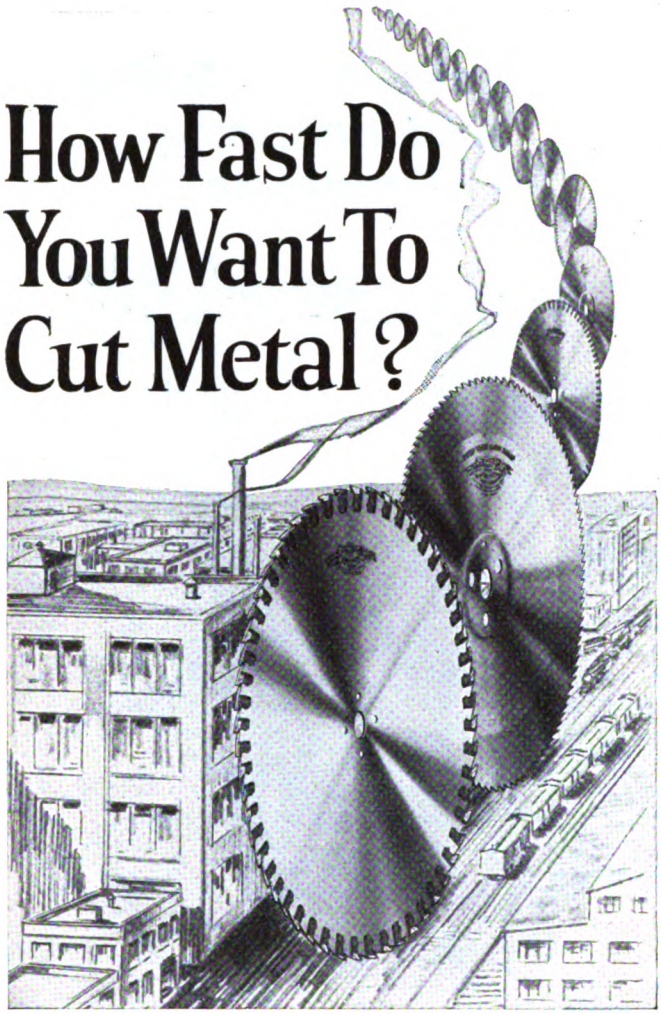
Makers of Power Transmission Machinery Since 1857

Shafting, Hangers, Pulleys, Flexible Couplings, Friction Clutches and the U. G. Short Center Belt Contactor.

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How Fast Do You Want To Cut Metal?



This is a problem yet in many shops where production lags. In other shops it has been solved by the use of Simonds Inserted Tooth and high grade Solid Metal Saws. Because of the wear-resisting steel, perfect mechanical construction and expert heat-treating, Simonds Metal Saws give longer service and require less frequent grinding. Simonds Metal Saws—Solid or Inserted Tooth—are of Simonds special steel, made in Simonds Steel Mill.

For information on metal cutting write for our free book, "Methods of Cutting Metal."

SIMONDS SAW AND STEEL CO.

FITCHBURG, MASS · NEW YORK CITY · LONDON, ENGLAND
CHICAGO, ILL. · LOCKPORT, N.Y. · PORTLAND, ORE.
BOSTON, MASS · MEMPHIS, TENN. · SAN FRANCISCO, CAL.
DETROIT, MICH · NEW ORLEANS, LA. · SEATTLE, WASH.

SIMONDS CANADA SAW COMPANY, LTD.
MONTREAL, QUE. · ST. JOHN, N.B. · TORONTO, ONT. · VANCOUVER, B.C.

Makers of

Hack Saws, Metal Band Saws, Inserted Tooth Metal Saws, Solid Tooth Metal Saws, Slitting and Slotting Saws, Files, Tool Bits.

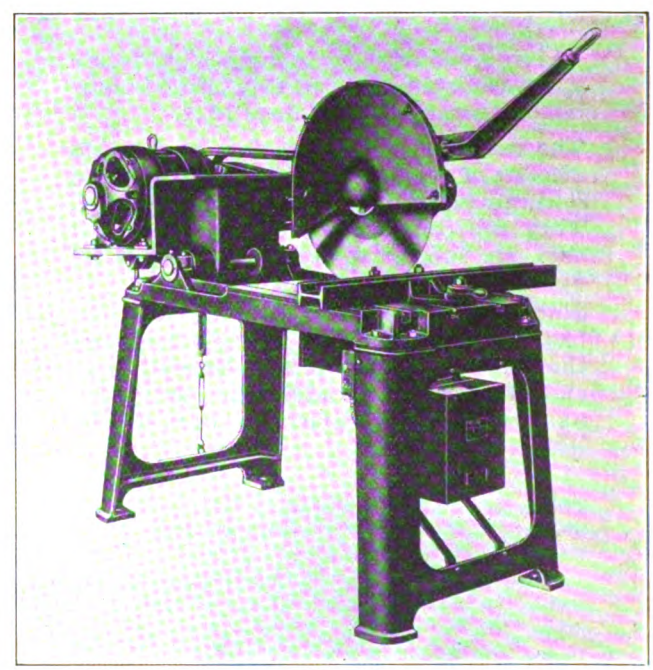
cating oil is collected. An oil pump picks up the lubricant, puts it under pressure and distributes it to all the bearings of the engine. No oil or grease cup is found on the unit.

The Foos industrial Diesel has an operating speed variation from 400 to 900 r.p.m. with a horsepower rating of 45 to 450.

A New Design of Metal Cut-Off Saw

AN electrically driven, high speed, cut-off saw has been designed by the Hunter Saw and Machine Company of Pittsburgh, Pa., with a circular-toothed saw designed to cut cold metal quickly. This machine, model No. 1-A, is an improvement over former designs, and is said to be particularly useful in cutting such metals as smaller light section beams, channels, angles, brass, copper, structural and welded tubing, pipe, fence, and fire escape materials, metal mouldings, light steel section, pressed and drawn steel shapes, etc.

The motor and saw blade are mounted on opposite ends of a tilting frame in this machine. When a piece of material is brought in to be cut, it is placed in the machine



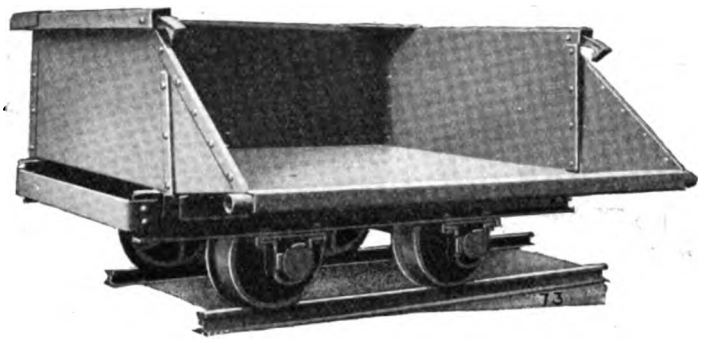
and held firmly by means of a double-jaw, quick acting, eccentric vise. The machine is then started by means of a push-button-controlled magnetic starter, and the saw, driven by an endless belt from a Westinghouse motor, is fed down through the material. A pan, attached to the under side of the table, catches the cuttings. The table of the machine is provided with a quadrant stop that can be set to any angle within the sweep of the saw blade used.

The proper alignment of the pulleys obtained by having the motor keyed to the base, the handwheel providing for the convenient belt adjustment, and the lower belt tension provided through a wider belt are other features of the design of this machine stressed by the manufacturer.

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EASTON
COAL CHARGING

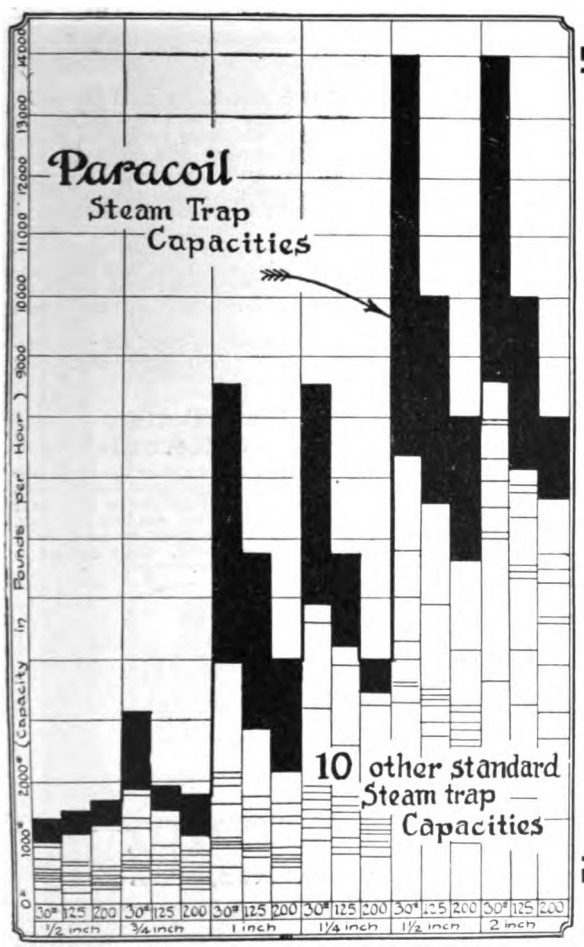


Standard Cars are 20 and 40 cu. ft. capacity for track gauges from 24″ to 36″.

Usually hand pushed but can be hauled in trains. This car with its drop door, flush bottom for firing coal directly into the boiler is the cleanest, cheapest and most convenient of all coal handling equipment.

EASTON CAR & CONSTRUCTION COMPANY
211 Scarritt Arcade, Kansas City, Mo. Hilton St., Easton, Pa.

FOR EVERY INDUSTRIAL PURPOSE



Should a Trap be bought for Capacity or for Size?

Just because you have a 3″ steam line, why should you pay for and use a 3″ steam trap when a 1½″ Paracoil will fill your needs —*and cost half as much.*

Too many traps are bought by size and not by *capacity*. Note the graphs at the left of this advertisement. See how the capacity curve of the Paracoil compares with that of other traps. Note how much bigger the Paracoil capacities are and therefore how much smaller size Paracoil traps you can buy for your needs.

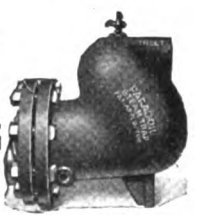
Many engineers have been able to replace 3″ traps with 1½″ Paracoils, and 1½″ traps of other makes with ¾″ Paracoils. The saving in actual dollars has been tremendous.

The Paracoil positively ends maintenance troubles—is *guaranteed* against repairs *for two years.* Many of industry's largest and most discriminating buyers have switched to Paracoil Traps and boast of the money they are saving in doing it. The Paracoil is simplicity itself. It has only one moving part, can't get out of order, and *lasts.*

A trial Paracoil in your plant will make you a regular Paracoil user. Write for Catalog A-12.

DAVIS ENGINEERING CORP.
90 West Street New York City
Factory: Elizabeth, N. J.

Paracoil
STEAM TRAPS



SALES ENGINEERS NOTE:
Attractive territory open for exclusive agency representation. Write for information.

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Keeps Perpetual Inventory on 2,800 Items

McCaskey—"One Writing—Visible Filing" Methods have been applied to phases of Industrial Control of which the following are some:

—Perpetual Inventory
—Single & Dual Control
—Process Inventory
—Cost & Payroll Records
—Production Control
—Machine Control
—Order Control
—Planning—Routing & Dispatching
—Tool Check & Tool Investment Control

Some of the lines using McCaskey Industrial Control Methods:

—Steel Plants
—Metal Products Plants
—Wood Products Plants
—Automotive Plants
—Paper Plants
—Clothing Plants
—Boards of Education
—Shoe Manufacturers.

IF you could visit the Mansfield Sheet & Tin Plate Company, Mansfield, Ohio, you would find a perpetual inventory system that tells at a glance the up-to-the-minute record of 2,800 items in stock—the present inventory, purchase and cost records, charge-outs, etc. So complete and accurate are these records, that hundreds of dollars are being saved every year. The McCaskey One Writing System enables them to keep this simple, yet accurate record. Read what Mr. F. E. Werner, Cost Accountant, The Mansfield Sheet & Tin Plate Company, says about the McCaskey System.

"For keeping inventory and cost records on all material and supplies we have used the McCaskey Register system for 4 or 5 years. Three McCaskey Registers in the storeroom and 3 duplicate units in the cost accounting department accommodate 2800 items of stock. Each number on the clips represents a storage bin number.

"Three colors of McCaskey slips are used—yellow for purchases, white for requisitions, and pink for physical inventory. Each McCaskey form gives description, size, and kind of stock, and also shows former balance and units charged out or received. Price and value extensions are also added by the accounting department.

"Only one slip appears in each clip in the McCaskey Register. The preceding slip is filed by commodity and cost symbol.

"At the end of each month, the total inventory, purchase record, and charge-outs are recapitulated by adding machine, and by the third or fourth of the following month all recapitulations have been completed. Two young men file in the McCaskey Register and draw off the monthly recapitulation, and have time for other accounting work.

"Our McCaskey One Writing system is much speedier, more visible and accurate than any loose-leaf or blind card system would be, and is maintained at a substantial saving over such methods. Having a double check on inventories, errors are minimized.

"McCaskey forms to meet our particular requirements can be purchased much cheaper than local printers could furnish them."

Do You Want Better, More Accurate Records?

Let us send you complete information about the McCaskey System—how it simplifies shop orders, saves time, insures accuracy, speeds up production, enables you to plan your work better, eliminates stock shortage and loss of tools, provides instant facts and figures of stock on hand—with tremendous savings in time and money. Costs nothing to investigate. So mail the coupon now.

The McCaskey Register Co.,
Industrial Division 266,
Alliance, Ohio

Please send more information about the McCaskey System showing how firms have applied your methods.

NAME .....

TITLE .....

FIRM .....

ADDRESS .....

McCASKEY ONE WRITING SYSTEMS

THE McCASKEY REGISTER CO.
INDUSTRIAL DIVISION 266 · ALLIANCE, OHIO.
GALT, CANADA

For products not advertised in this issue write Industry Illustrated

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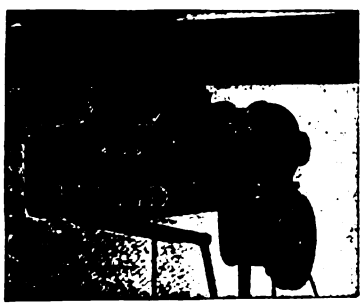
EUCLID
CRANES & HOISTS
"RAISE PROFITS"

In Breakdown Tests They Beat Them All!

"Before standardizing on Euclid Hoists we made an exhaustive study and test of practically every electric hoist on the market. One of the tests consisted of operating the hoists three times per minute until failure. On this and other tests Euclid Hoists proved superior."

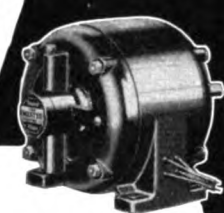
This company, one of the largest manufacturers of automobiles in the world, now employs more than 100 Euclid Cranes and Hoists. They standardized on Euclids, not because of personal opinion, friendship or good salesmanship but because Euclids made good, in the severest tests, against all competition.

Whether your lifting problem be large or small you can capitalize on the experience of this company (name on request) and be assured the highest quality of efficient equipment at the lowest consistent cost. Write us today for catalog. Tell us your problem and let our engineers assist you.



THE EUCLID CRANE & HOIST CO.
102 Chardon Rd., Cleveland, O.
Sales Offices in All Principal Cities

Proof!





There's only one real test of quality in a motor — the *service* it gives. That MASTER MOTORS meet this test is evidenced by the fact that an ever increasing number of prominent manufacturers and jobbers are adopting them and that our customers continue to use and recommend them. Write for complete details.

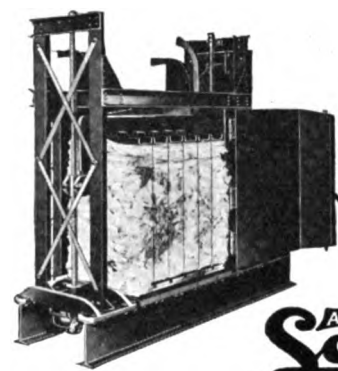
THE MASTER ELECTRIC CO.
Linden and Master Aves.
Dayton, Ohio







STOCKS CARRIED IN PRINCIPAL CITIES
MASTER GUARANTEED MOTORS
⅛ TO 7½ H.P. — Dayton THE MASTER ELECTRIC CO. Ohio — Less than 40°



ALL STEEL Schick FIREPROOF

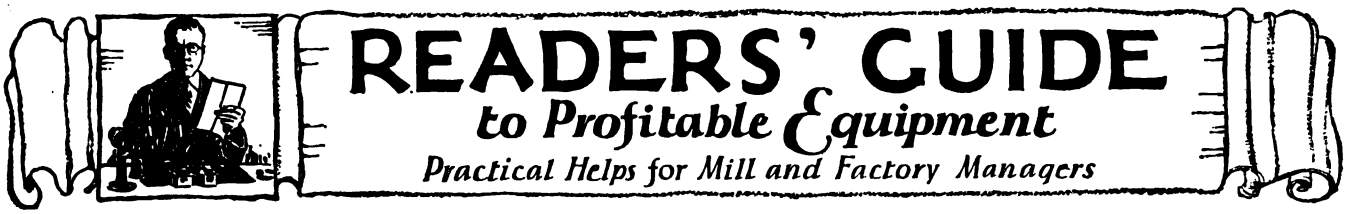
The Power Baler That Eliminates Storage Space for Waste

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Electric Fuses that stay in service longer. See pages 49-50. Chicago Fuse Mfg. Co.

Illustrated Catalog Describing a Compact, Sturdy, Steam Engine for many industrial purposes is offered by the Troy Engine & Machine Co. See page 67.

Fifty Years of Conveyor Service, the record of the Logan Company. Details on page 1.

Bulletins on Jennings Heating Pumps, containing valuable information on heating system installations, are offered by the Nash Engineering Co. on page 16.

Man Cooling Fans that prevent delays caused by excessive heat. See page 93. American Blower Company.

A Catalog on Expansion Joints that save pipe lines from fatigue is offered by United States Rubber Company. See page 92.

Anti-Friction Bearings, that permit higher speed at the lowest friction loss. See page 41, The New Departure Mfg. Co.

Long Wearing Brushes for every industrial purpose are described on page 11. The Osborn Mfg. Co.

Information on Portable Electric Lighting that aids in better work. See page 71. Appleton Electric Company.

Tap Drill Chart Cards useful for designers and builders of machinery are being issued by Wisconsin Electric Co. See page 59.

Catalogs on Steel Windows that are approved by leading industries, are offered by Truscon Steel Company. See page 3.

Information on a New Model Electric Hoist. See page 8. The Yale & Towne Manufacturing Co.

Catalog No. 24 describes an improved oven for cores. See page 99. Young Brothers Company.

The Proper Handling and Storage of Lubricating Oils. See page 51. S. F. Bowser & Co., Inc.

Rex 210 Engineering Handbook contains a wealth of information on handling materials. See page 63. Chain Belt Company.

Information on Overhead Materials Handling Equipment is offered by The Chisholm-Moore Mfg. Company, on page 53.

Two New Booklets, "Reducing Storage Costs with G-W Steel Shelving" and "New G-W Steel Office Equipment Catalog" should prove valuable in every executive's file. For copies, see page 75. The Globe-Wernecke Co.

The New Bonney Catalog showing the complete line of Chrome-Vanadium Wrenches can be obtained from the Bonney Forge & Tool Works. See Inside Front Cover.

A Factor in Preventing Shut Downs, Depreciations, and Power Losses in Machinery. See page 5. Timken Roller Bearing Co.

Motorized Power That Is Increasing the productive ability of man power. This interesting subject is described on pages 60-61 by the General Electric Company.

Electric Heat and Its Application to Soldering is shown on page 85 by the General Electric Company.

A Silent Gear Material that has stood the most exacting tests. See page 45. General Electric Company.

Information on Stopping the Losses Resulting from Human and Mechanical Errors in the measurement of material is offered by The Toledo Scale Co. See page 81.

An Average Power Saving of 15 per cent. is shown on page 6 by Hyatt Roller Bearing Co.

A Paper Pulley for Every Industrial Service, ready to use, is described on page 14. The Rockwood Mfg. Co.

Handling Methods that Cut Production Costs are shown on page 130 by the Link-Belt Company.

Catalog "E" very interestingly describes an adjustable speed grinder that saves its cost in one year. See page 119. The U. S. Electrical Tool Co.

150 Practical Ideas is shown in the new 1926 catalog, describing materials handling methods. Lewis-Shepard Company. See page 37.

A Service to Industry that Aids in the selection of the right doors for every purpose. See page 33. Richards-Wilcox Mfg. Co.

Catalog 26 Shows the Complete Line of Adjustable Reamers. Issued by Wetmore Reamer Company. For a copy see page 129.

Cutting 53.04 H.P. off the Power Load is one of the results of the Survey shown on page 4 by The SKAYEF Ball Bearing Company.

An Illustrated Booklet, "More Light" on the use of factory paint is offered by the U. S. Gutta Percha Paint Co. See page 9.

A Catalog of Information on Blue Printing can be obtained from the C. F. Pease Co. Page 47.

Catalog L-66 gives information on variable speed control. For a copy see page 97. Reeves Pulley Co.

Factory Trucks That Are Built for Severe Service. These are described on page 65 by the Lansing Company.

A Free Trial Offer on an exceptionally efficient Portable Saw for various purposes. For complete information see page 43. D. W. Onan & Sons.

Belt Lacers that result in greater transmission efficiency. See pages 78-79. Clipper Belt Lacer Co.

A Booklet Describing Steel Bound Hand Trucks. See page 105. Fairbanks Co.

Booklets Describing Temperature Control are offered by Taylor Instrument Companies. See page 13.

Descriptive Booklet, describing Ball Bearing Motors can be obtained from The Valley Electric Co. Page 113.

Hundreds of Executives Now Realize the Economy of the "tractor-trailer method." See page 88. Mercury Manufacturing Co.

The New Wood-Fafnir Line of Power Transmission Appliances has many time, money and labor-saving advantages. They are described on page 113 by T. B. Wood Sons Co.

Booklet describing savings in materials handling is offered on page 106. Barrett-Cravens Co.

A Catalog Showing some Valuable Suggestions for Steel Lockers, Bins, Racks and Shelving. See page 86. Durand Steel Locker Co.

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A Sample of FROSTINE that kills Glare of the Sun's rays is also offered by the same company on pages 62-121.

A Booklet Entitled, "Saving Slippage and Space," contains facts on the use of short center drive. For a copy see page 127. F. L. Smidth & Co.

A New Ferry Product—Brass and Nickel-Silvered Acorn Nut, non-corrosive and strong is shown on page 84 by The Ferry Cap & Set Screw Co.

"Methods of Cutting Metal" is a booklet offered free by the Simonds Saw and Steel Co., and contains valuable information on the selection and care of saws. See page 114.

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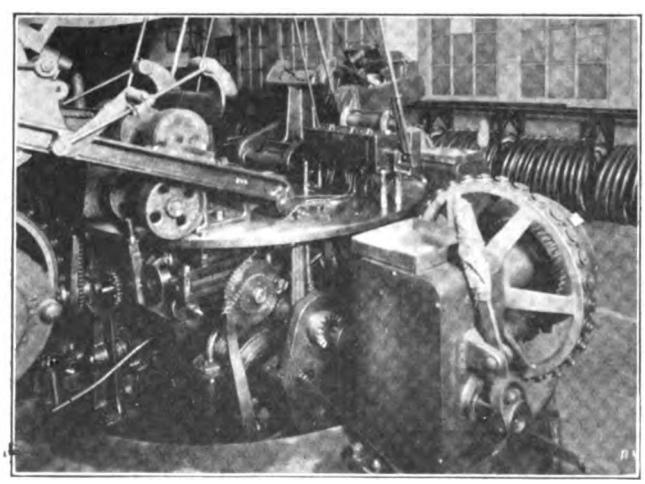
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An Oily Waste Can that outwears 3 to 5 of the ordinary kind is described on page 108 by The Witt Cornice Company.

Catalog 43 Issued by the Medart Company affords a simple method of concentrating transmission machinery purchases. See page 105.

Catalog No. 23 contains information on valve reseating machines, useful in any power plant and factory. The Leavitt Machine Co., page 102.

Unit Drives for All Types of Agitators and Stirrers. See page 122. New England Tank & Tower Co.

Booklet on Pulleys, Gears and Sheaves is being offered by the Pyott Foundry Company, makers of Pyott Red Face Pulleys. Look on page 101.

A Steam Trap on a 90 Day Trial also catalog. Offered by the Armstrong Machine Wks. See page 124.

A Clutch that Can Tackle the Harder Jobs is shown on page 66 by the Conway Clutch Co.

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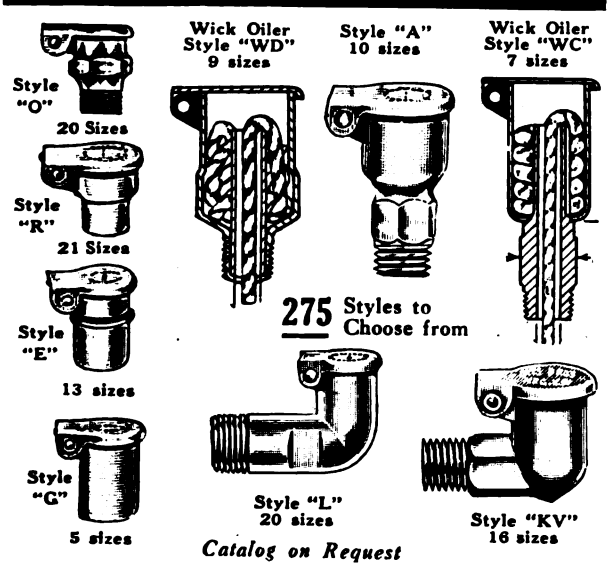
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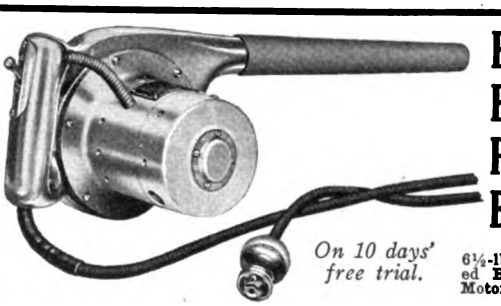


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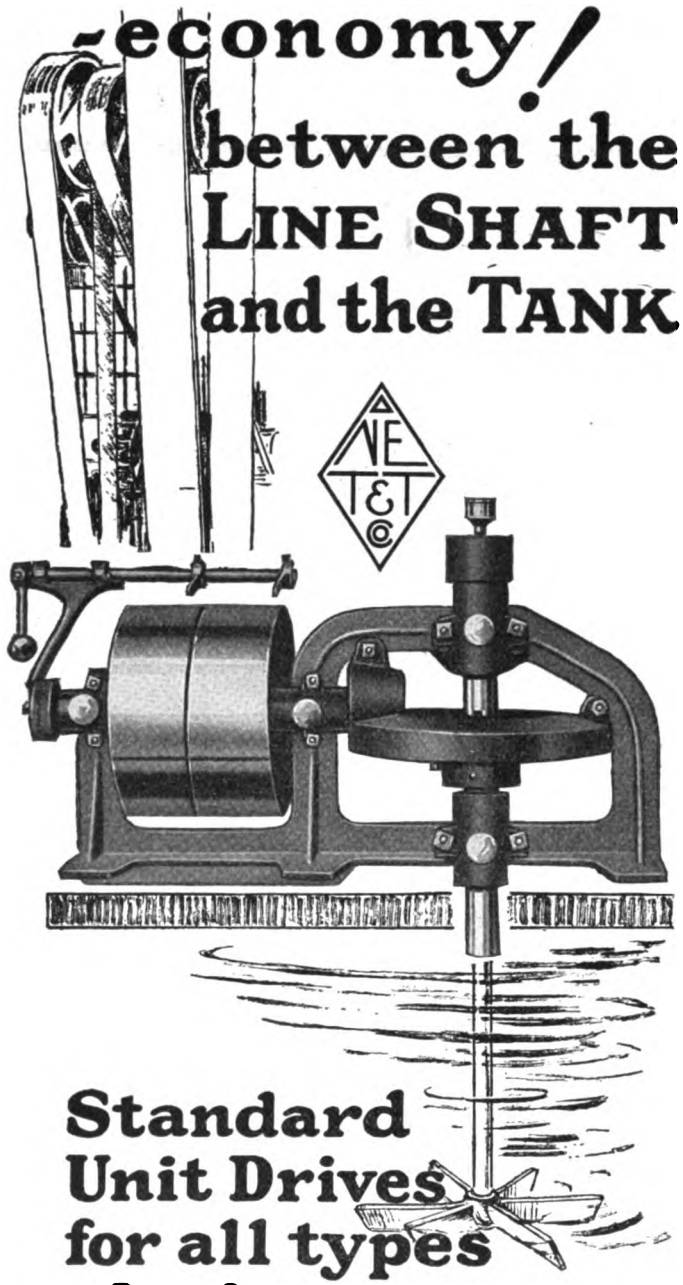
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A 62-Page Catalog Describing the Various Types of Scales, that indicate weights, while material is on the move, is offered by The American Kron Scale Co. See page 123.

Over Forty Years Experience in Materials Handling Systems, is available to industrial executives through The Lamson Co. See page 12.

Illustrations Describing the Economical Handling of Materials are shown on page 83. The Jeffrey Manufacturing Co.

Bulletins on Alternating Current Motors in sizes from 1/100 horsepower to 50 horsepower can be obtained from the Diehl Mfg. Company. See page 65.

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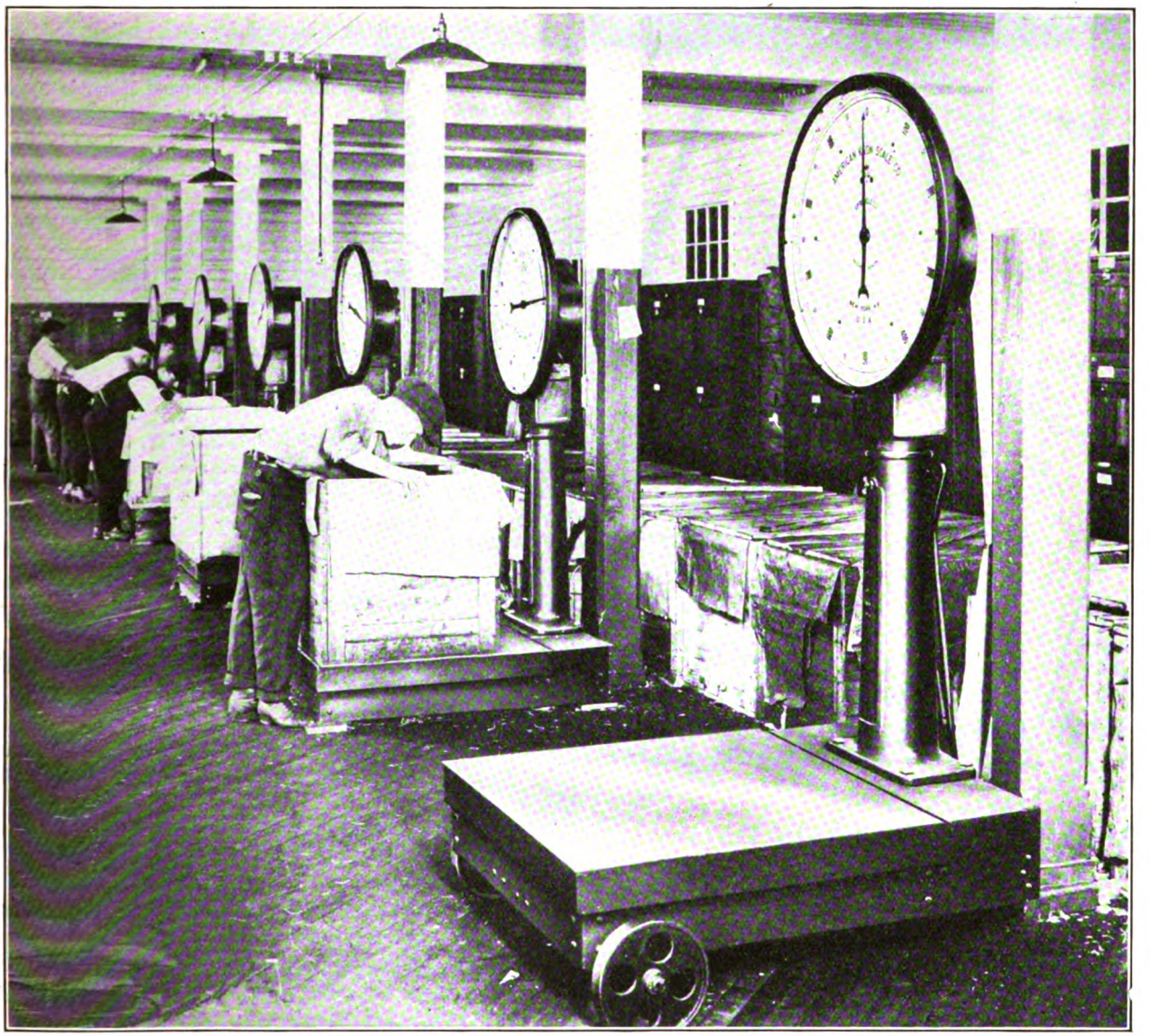
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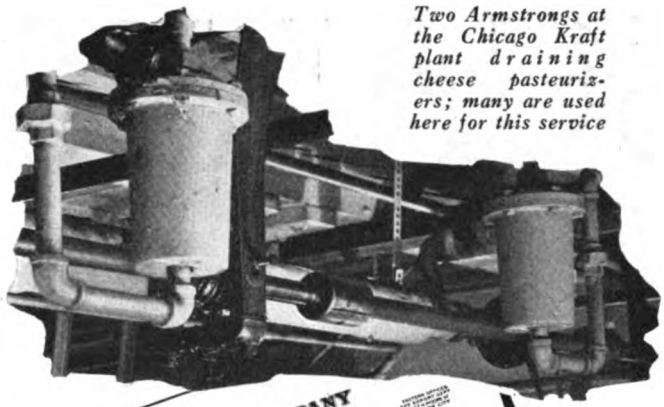
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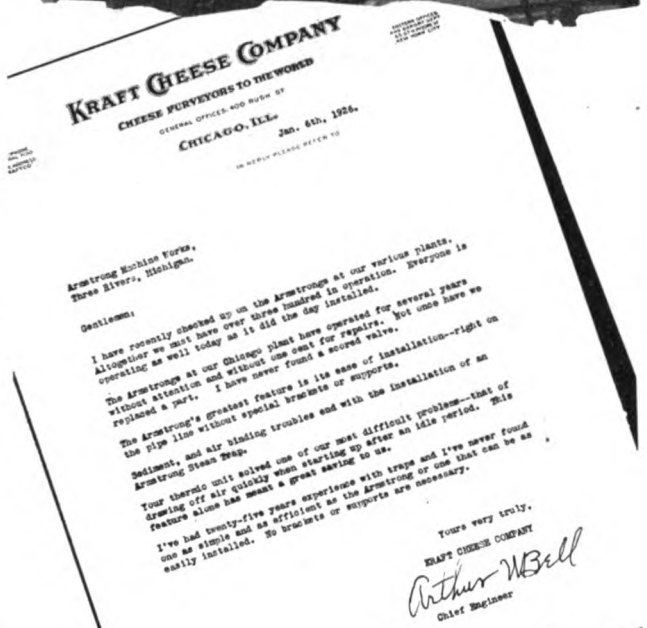
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Two Armstrongs at the Chicago Kraft plant draining cheese pasteurizers; many are used here for this service


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Jan. 6th, 1926.

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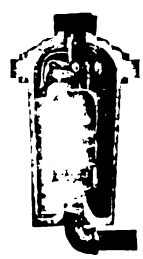
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executive. See page 111. Standard Pressed Steel Company.

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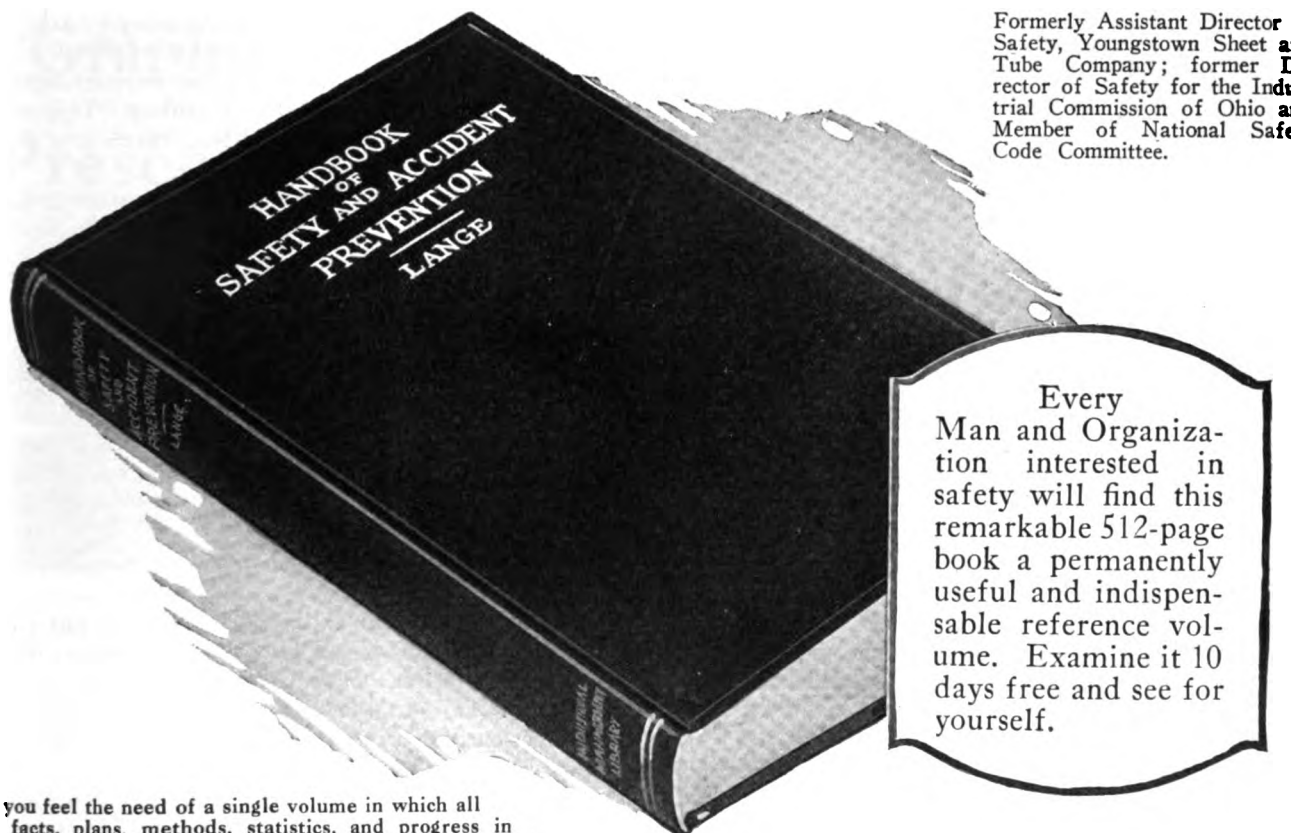
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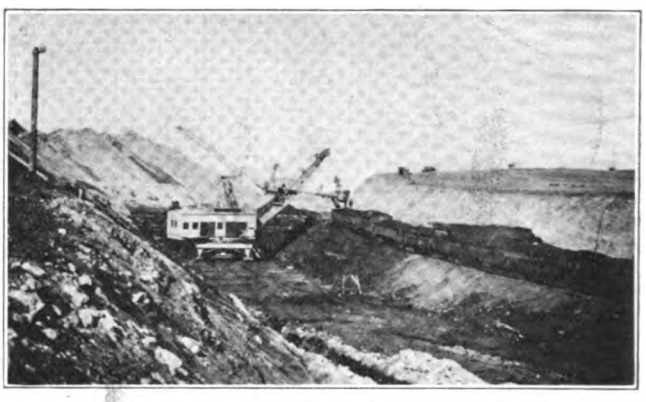
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During the time spent at the shovel while the cars are being loaded, a flexible cable, running from a bank of transformers on the shovel, is plugged into the locomotive for charging. While coal is being mined from one strip, the overburden is being removed from the next and is cast into the excavation resulting from the removal of the coal.



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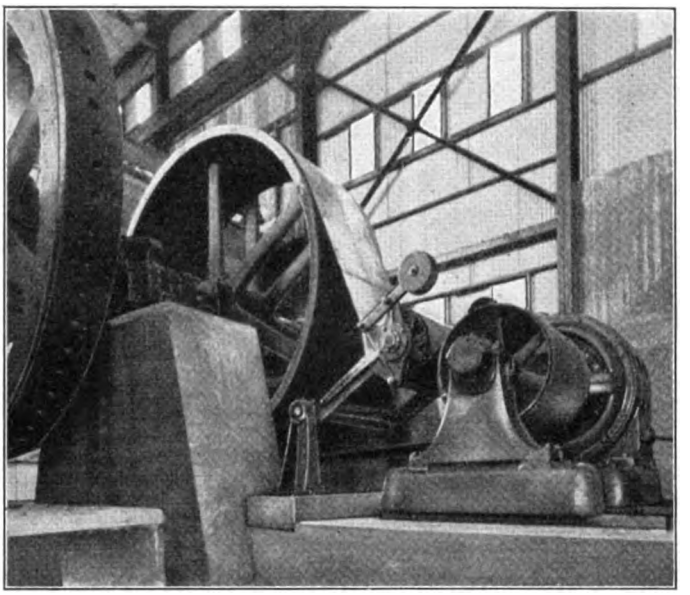
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Type No. 11 Blade for Wetmore Adjustable Heavy-duty Reamer.

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4 *No grinding arbor required for regrinding. Wetmore Reamers can be reground on their original centers.*

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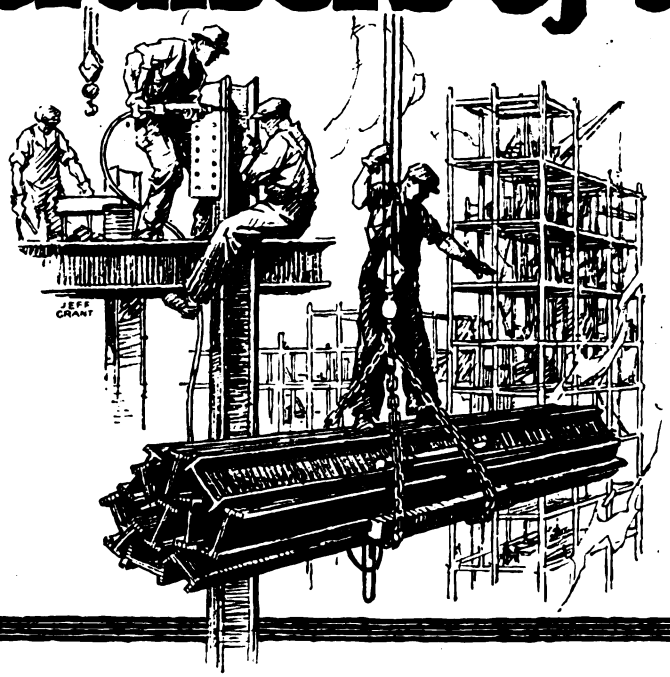
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"THE BETTER REAMER"

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Cruisers of the Sky Line



TODAY a vacant lot, strewn with the city's untidiness—tomorrow a tower of steel, its sides studded with ten thousand glass eyes.

"Cruisers of the sky line" dangling from dizzy perches—while less brave souls marvel from safer earth—the staccato machine gun fire of a battery of riveters—swinging beams and coughing trucks.

Yet you must look back of these spectacular scenes, far removed from the actual firing line of construction—to find the real answer to all of this striking efficiency and speed.

Mass production—efficient manufacturing—no lost motion—those factors are famous in the record of the Steel Industry for amazing output.

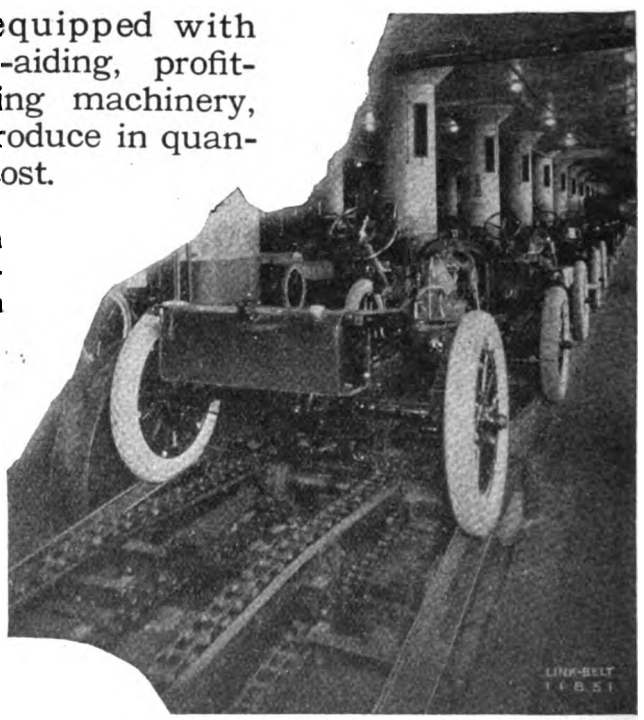
Before the skyscraper—planned production of the building's "ribs" and "spine" and "head". The rest is simple indeed.

YOUR plant or factory, if equipped with Link-Belt cost-cutting, labor-aiding, profit-producing elevating and conveying machinery, will enable you to standardize; produce in quantity; manufacture at the lowest cost.

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Let us suggest an effective plan for cutting your production costs through Link-Belt handling methods.

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JUL 27 1926

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...ant Machinery ...nd Equipment for Low-Cost Production
...Presented in Pictures

What Do You Know About Hammers?

A hammer is probably the most common and universally used tool of all; and the most abused. There are many kinds of hammers, and many ways of using them.

In this issue, a man who knows hammers from A to Z tells you—and shows you—some things about them worth knowing.

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Two New BONNEY
*C.V. Chrome Vanadium Wrench Kits



MILLWRIGHT'S POCKET KIT

$3.25

Three Bonney *CV Chrome Vanadium S Wrenches (six different openings of most used sizes). These are special wrenches developed for Millwrights. They are the long, thin type preferred by Millwrights and, because they are forged from Chrome Vanadium steel, they are unusually light in weight, thin in section but much stronger than the ordinary wrench of this type. Price includes attractive leatherette kit, as illustrated at right.

LOOMFIXER'S POCKET KIT

$2.75

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Chrome Vanadium registered August 11, 1925.

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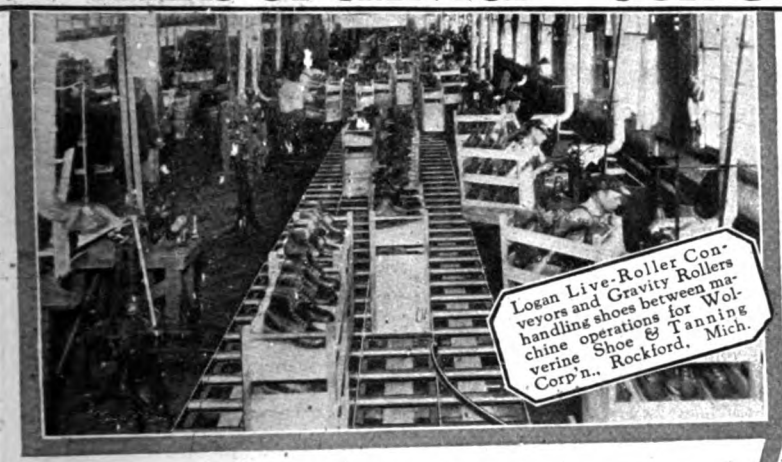
BONNEY Chrome-"CV"-Vanadium WRENCHES

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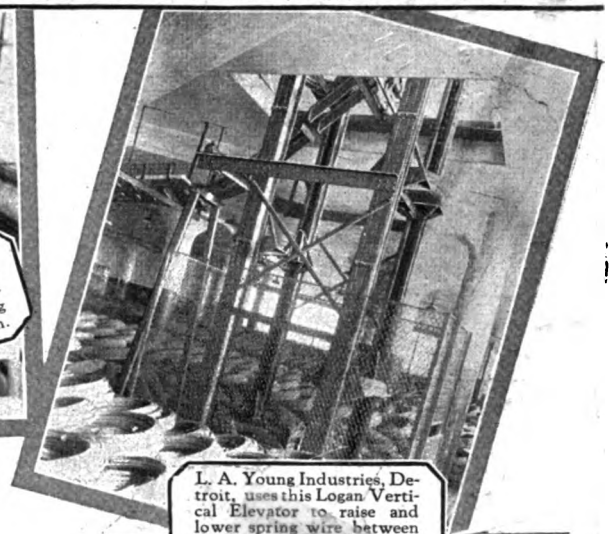
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Logan Live-Roller Conveyors and Gravity Rollers handling shoes between machine operations for Wolverine Shoe & Tanning Corp'n., Rockford, Mich.



L. A. Young Industries, Detroit, uses this Logan Vertical Elevator to raise and lower spring wire between several floors at large savings of labor.

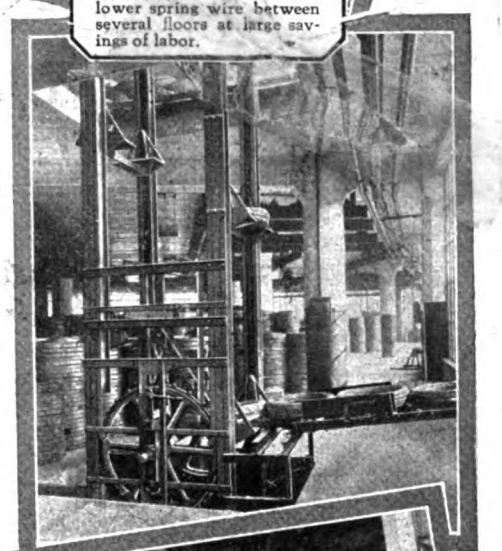
1 Cut Your Labor Costs permanently

GETTING THERE FIRST with the most men is the fundamental principle in successful warfare. But getting there first *with the least men* is made absolutely necessary in present-day manufacture by mounting labor costs and growing competition.

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The accompanying illustrations show in part a few representative Logan labor-saving installations. Use the coupon for convenience in obtaining specific information as to the economy of Logan Conveyors for *your* business.

THIS IS THE FIRST *of a series of seven announcements pointing out seven distinct savings made possible by Logan Conveyors any one of which may pay for an installation in your plant. The remaining six announcements will follow in consecutive issues.*





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The Publisher's Column

Another Milestone

ON June 16 we announced an increase in the subscription price of INDUSTRY ILLUSTRATED, from $2.00 a year to $3.00 for domestic subscriptions, and from $3.00 a year to $4.00 for foreign subscribers; marking another milestone in the successful career of this magazine.

Birthday anniversaries are a matter for congratulation on sentimental grounds; they arrive as a matter of course with the passing of each twelvemonth. Milestones, on the other hand, are the result and the evidence of practical accomplishment; and this is the second such milestone marking the progress of INDUSTRY ILLUSTRATED.

We should not have been justified in taking such a step, if we had not had ample assurance that the magazine is rendering a service worth while. And the response of subscribers is proof not only of their appreciation, but of their understanding that the increased subscription price is only a fraction of the increased cost involved in producing INDUSTRY ILLUSTRATED.

The value of a magazine's service to its readers depends upon many factors—most of all, upon the use to which it is put. Our editors scour the industrial world for practical ideas, for pictures which will make these ideas clear; we use every effort to present these ideas in such fashion as to save *your* time. Beyond that point, the practical value you receive from the magazine, lies with you.

Study the pages of INDUSTRY ILLUSTRATED each month—both editorial and advertising pages—for the practical, useful ideas that will help you in your work. It will take only a minimum of your time, and it is a sure way to make your investment yield dividends.

Industry Illustrated

Published Monthly by

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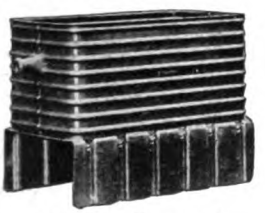
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TRUSCON Steel BOXES and PLATFORMS Lower Production Cost



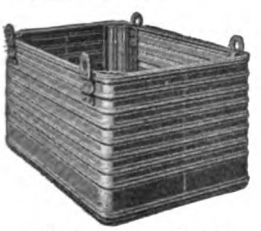
Truscon Platform — note the deep rib reinforcement.



Standard Box and Platform combination.



Truscon Boxes and Platforms in sizes to meet all needs.



Truscon Box equipped with lugs for crane handling.

YOU can eliminate waste labor and save valuable storage space by using Truscon Boxes and Platforms. They are constructed for efficient handling—allow you to keep raw materials at the production line without costly delays—and possess extraordinary strength that permits roof-high stacking with positive safety. Hundreds of manufacturers throughout the country verify their lasting qualities and economies.

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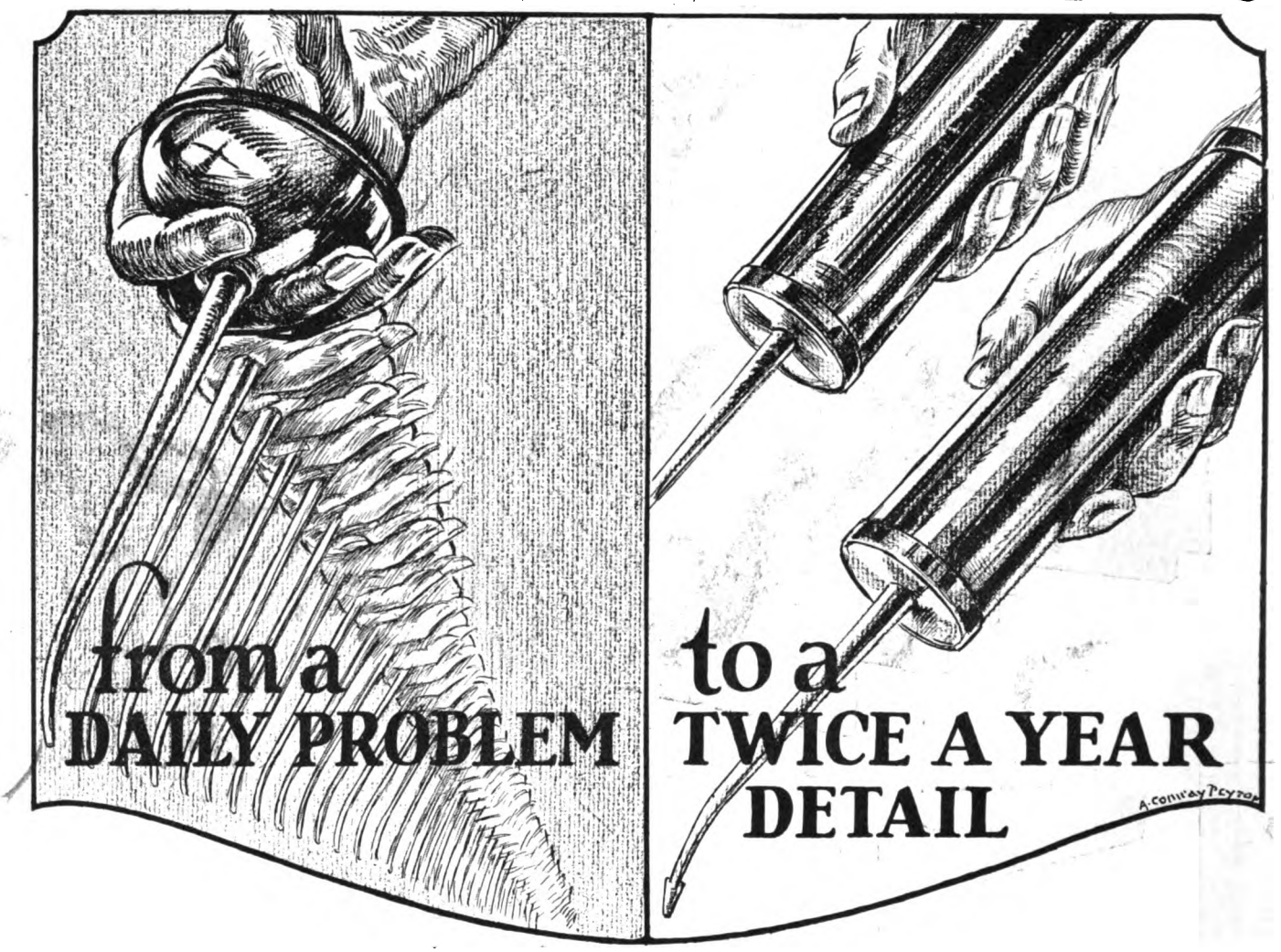
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The other way is to fight it with BEARING DESIGN — to use Skayef Self-Aligning Ball Bearing Hangers and reduce oiling from a daily or weekly problem to a mere twice-a-year detail.

A mid-west milling company installed Skayef Self-Aligning Ball Bearings Hangers after years of operating under the handicap of plain bearing hangers. The result was that oiling time was reduced from one hour a day 300 days a year to 18½ hours a year.

Skayef Self-Aligning Ball Bearing Hangers not only reduce oiling costs. They cut down power costs and eliminate expensive time-consuming repairs.

Why not allow Skayef Engineers to demonstrate how Skayef Self-Aligning Ball Bearing Hangers will pay for themselves, in *your* plant, in less than two years' time?

SKF INDUSTRIES, INC., 165 Broadway, New York City

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Self-Aligning **HANGERS** *Ball Bearing*

SKF INDUSTRIES, INCORPORATED — 165 BROADWAY — NEW YORK CITY

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Reliability for Elevators

Absolute reliability, so essential in elevator operation, might alone account for the adoption of Timken Bearings by the Wheeler Elevator Company, Chicago.

In addition Timkens give Wheeler installations the economy of minimized friction, improved starting characteristics, freedom from constant lubrication or inspection, and extreme resistance to wear.

Timken load area, inherently greater, provides the safeguard of rigid alignment and ample capacity. Timken thrust characteristics are essential in such locations as the Wheeler worm mounting. And supremely enduring Timken steel, made only in Timken electric furnaces, keeps the fundamental advantages of Timken design always at their best.

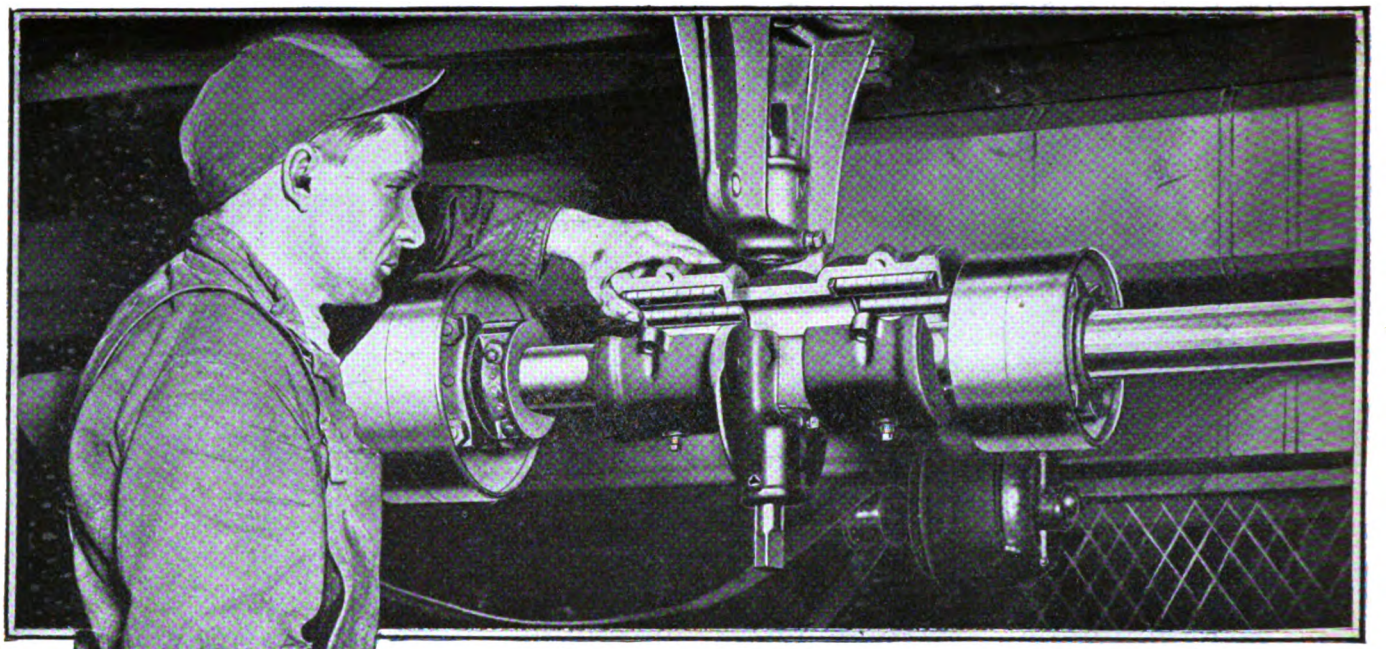
In elevator plants, as in every other field of engineering, still more Timken success is being registered. Whatever the type of machinery you use or make, universal Timken Bearing experience may be of profit to you. A Timken Industrial engineer is ready to work with you. Write for an appointment—without obligation.

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TIMKEN *Tapered Roller* **BEARINGS**

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Modernize Your Plant

—without dismantling your present transmission line

Do you know that you can decrease friction and increase efficiency in your plant, without tearing shafting, pulleys or hangers down—without even stopping the line shafts—by installing Hyatt Roller Bearings?

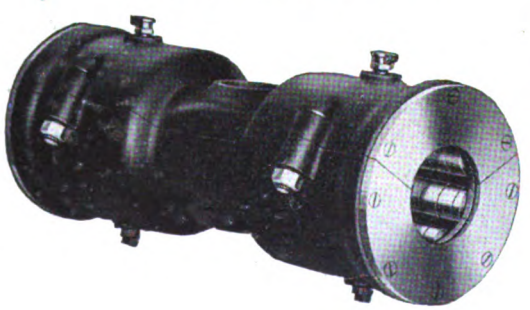
Hyatt bearings, and their boxes, are furnished split, to fit any hanger.

They can be applied in a few minutes without disturbing pulleys, collars, or couplings. Just knock off the old bearings, open the split Hyatt bearings and boxes, apply them around the shafts, and bolt them securely together.

Hyatt Roller Bearings are easy, and economical, to maintain. The left and right hand helically wound rollers are practically self-lubricating. They require only three or four lubrications a year. This reduces grease and labor costs 85%.

Manufacturers in widely diversified industries are speeding up production on Hyatt bearings. They are cutting bearing friction 50 to 75%, and saving 15% on their power bills.

Hyatt Roller Bearings give a lifetime of dependable, friction-less, low cost service. Why not profit by Hyatt efficiency now?



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"Git a Job as Oiler in a Dump where dey used ARGUTOS"

There may be several reasons why you should use ordinary bearings that require both oil and attention instead of Arguto Oilless Bearings that require neither. Possibly you have an interest in an oil well. Or maybe you don't believe that oil increases your fire hazard. Or perhaps you like the smell of oil.

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Arguto OILLESS BEARINGS

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This plant of the Atwater Kent Mfg. Co., at Philadelphia, famous makers of Radio and other electrical apparatus, covers a ground area of more than 20 acres.



Interior view of the huge Atwater Kent plant. Walls and ceilings have been given long-lasting, lustrous whiteness by painting with Barreled Sunlight—washable as tile.

World-famous Radio Manufacturer paints with Barreled Sunlight

Atwater Kent joins the thousands of industrials that use this lustrous, washable white paint for ceilings and walls • • •

THE Atwater Kent reputation has been built up—and broadcast—by the efficiency of Atwater Kent products. A reputation for the skilled application of science to practical use.

Barreled Sunlight was used for painting ceilings and walls in this manufacturer's great plant, shown above—a plant covering more acreage than 10 football fields! What determined this choice—here and in thousands of other plants in every line?

First—There is a saving in application—for Barreled Sunlight flows on freely with brush or spray, at the lowest cost per square foot of surface covered, making the finished job cost less.

Second—Barreled Sunlight is *washable*. Its satin-smooth surface has no pores to hold dirt—and no roughness to wear away under repeated washings.

Third—The lustrous surface of Barreled Sunlight reflects just the right quality of working light—free from glare.

Fourth—Made by the exclusive Rice Process, Barreled Sunlight is guaranteed to remain white longer than any gloss paint or enamel, domestic or foreign, applied under the same conditions—also, not to flake or scale if properly applied.

Sold in 55- and 30-gallon churn-equipped steel drums, and in cans from ½ pint to 5 gallons. Where more than one coat is required, use Barreled Sunlight Undercoat first. Note coupon below.

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Barreled Sunlight
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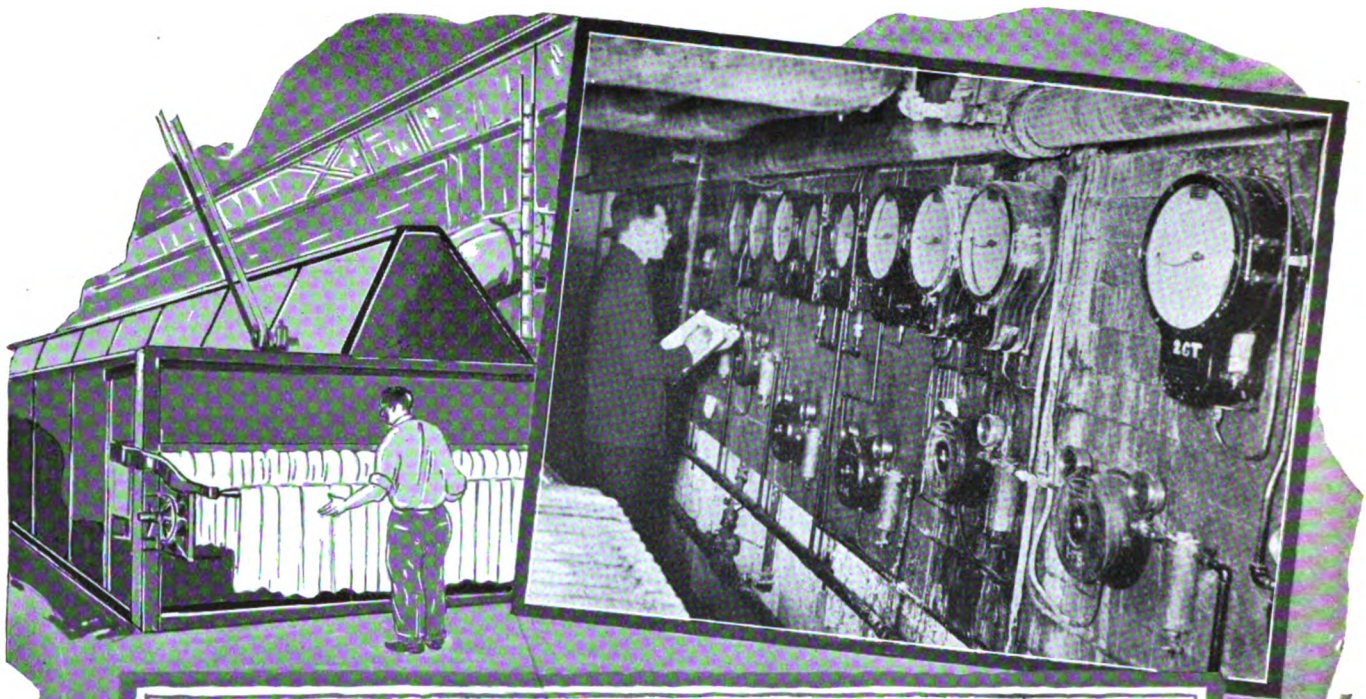
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$22,000 Additional Labor Costs could not give the Equal Control of these *Tycos* Instruments

At the plant of Cupra, Inc., Athenia, New Jersey, where the manufacture of silk by the cupra-ammonia process requires very delicate and very accurate pressure and temperature control through every step, about 100 *Tycos* Instruments are used.

O. G. Pratt, Vice-president of this concern, writes us as follows:

"The successful operation of the entire plant, which is the only successful cupra plant in the country, is absolutely dependent upon the accurate and regular operation of *Taylor* Instruments ..... There are 52 *Taylor* instruments on one panel alone.

"For the year they have been in use, these instruments have proved eminently satisfactory. They eliminate the human factor because they do their job automatically. Without such instruments, men would have to be employed to constantly watch and control all valves. And at its best, the human element introduces inaccuracy.

"The labor which would be required in this case would amount to at least 20 men. This would mean a tremendous additional payroll of about $22,000 a year. In all respects, therefore, the instruments are the only satisfactory method of securing temperature control."

In every industry *Tycos* Instruments have helped to maintain the quality of products and have resulted in lower labor costs.

The *Tycos* Catalog explains the advantages of accurate temperature control. Write for a copy.

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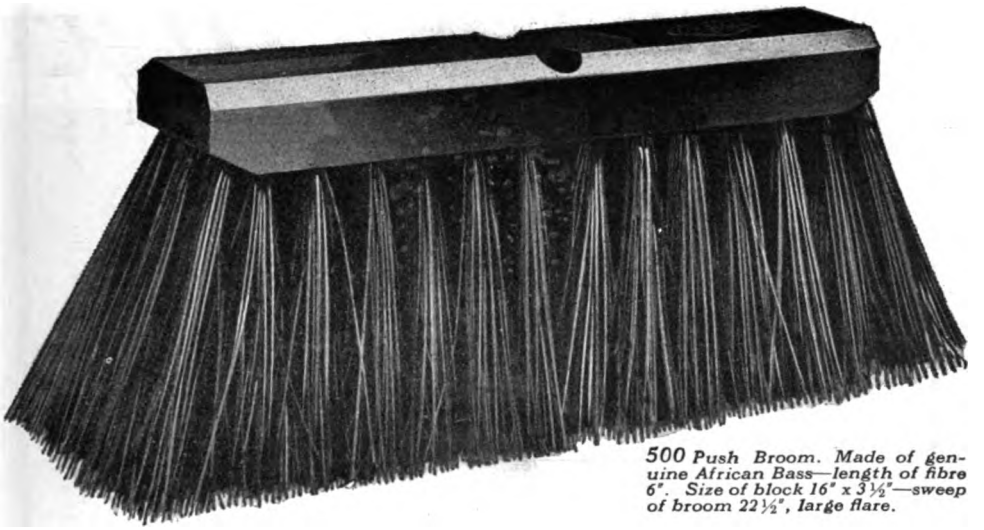
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500 Push Broom. Made of genuine African Bass—length of fibre 6". Size of block 16" x 3½"—sweep of broom 22½", large flare.

Efficiency and Economy Combined in Osborn Push Brooms

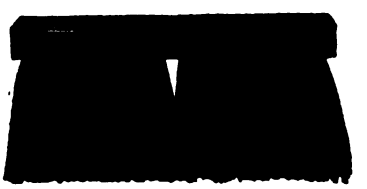
Osborn Push Brooms are made specifically for the job to be done. This is the reason for their marked efficiency, economy and widespread popularity.

Whether the work requires a fine, close sweeping material or a coarse, heavy-duty bamboo or rattan, Osborn has a better-wearing broom to fit the need.

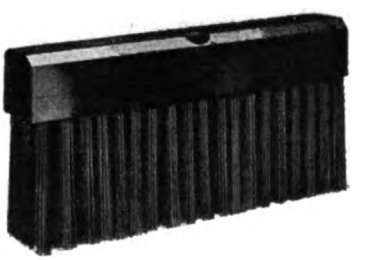
Osborn Push Brooms are accepted as the best for mills, factories, municipalities, railroad shops and yards, street cleaning and everywhere that economy and efficiency are carefully considered.



0277 Bamboo Push Broom. Made of Split Bamboo. Length of Fibre 7". block size 16" x 3½". A heavy duty push Broom at a low price.



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There is a very logical reason why Star Electric Motors render star service in thousands of industrial applications throughout the world. They are built to live up to their name.

From the selection of the raw material to the shipment of the finished motor, a degree of care surrounds their building that is not exceeded by any motor manufacturer.

Tests of extreme severity are held at every step of the way, so that only fit parts may be turned out; and the completed motor is finally subjected to tests more severe than any that may be met in actual service.

And through the entire process of building, you will find the Star workmen taking pride in their product. Every man in the Star plant honestly feels that he is contributing something of himself to make Star motors better. And Star workmen are better paid for better work!

Under these conditions it is not surprising that Star motors are star performers wherever they may be used. They are built for direct current and for alternating current use, for all applications, in sizes from fractional horsepowers to 100 h.p.

In our many years of experience in the manufacture and application of motors to all forms of equipment, much valuable data has been compiled. This data and our staff of engineers are at your service. Submit your problems to us.







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712 Ferguson Bldg.

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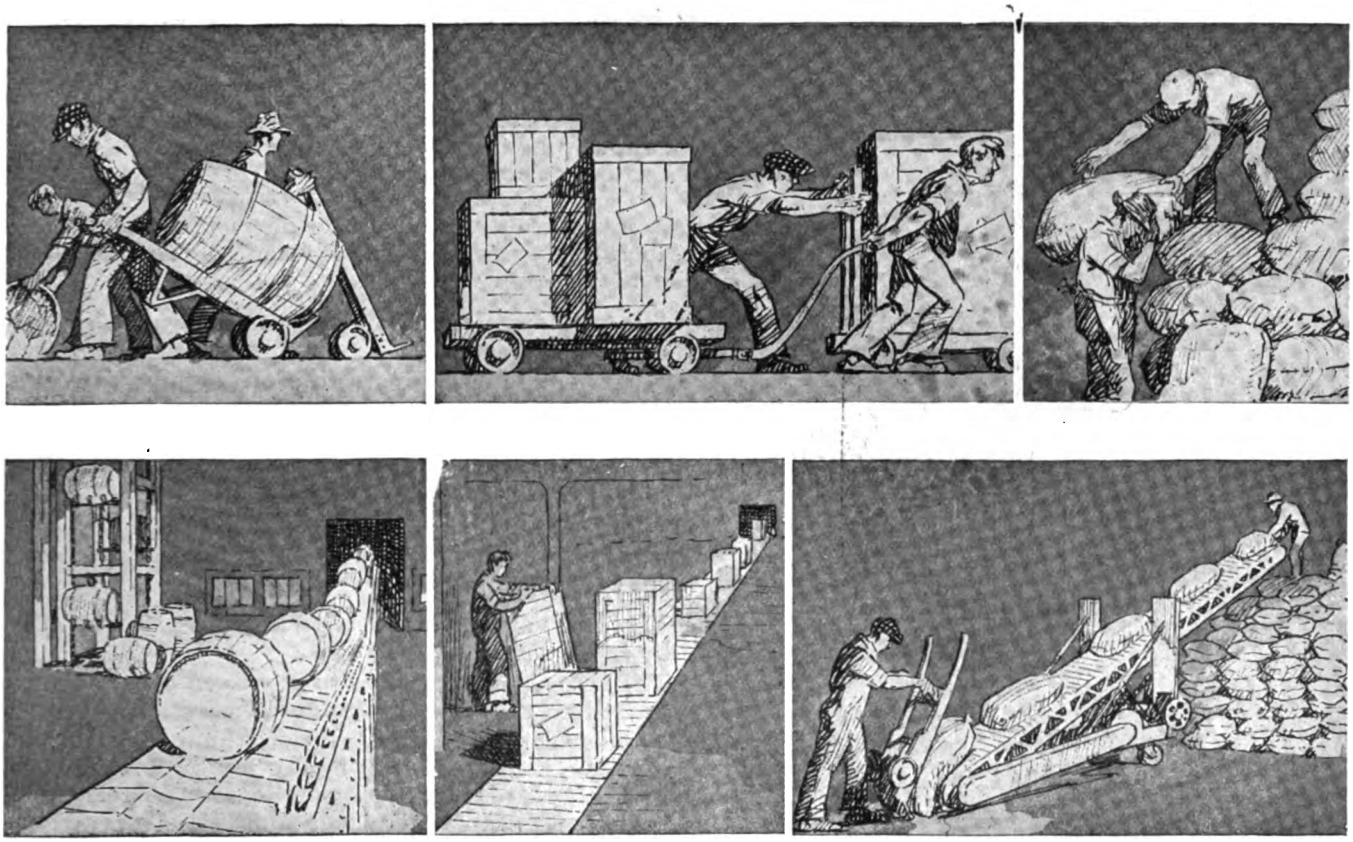
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Every Way You Figure It—



Handling Materials by Man-Power Is Waste

A Waste of Time, Energy, and Money

MEN should be relieved of the drudgery of Lifting, Pulling, Hauling, and Piling materials—and given worthwhile jobs on more productive work, where they can earn more for themselves and their employer.

Mechanical Handling does the work faster, increases output, and reduces cost of manufacture, resulting in lower selling costs.

Since labor itself constitutes the greatest market for goods of all kinds, it is the first to gain by industry's adoption of cost-reducing and drudgery-eliminating methods.

For every industry Jeffrey Conveyors and Elevators, Portable Loaders, etc., represent nearly 50 years of study and development of dependable equipment to save and aid labor, and to help to maintain America's living standards.

The Jeffrey organization's wide experience is at your service. Consult the nearest Sales office.

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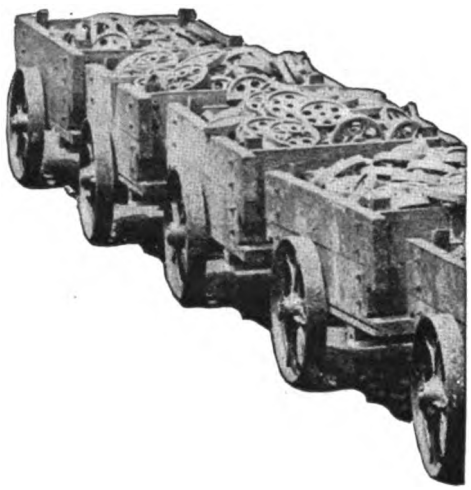
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MATERIAL HANDLING EQUIPMENT

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Elevators—Conveyors
Portable Loaders
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Mercury



Why is it that the electric tractor (and its complement—the trailer) is rapidly being accorded recognition *as the greatest money saver* of the entire industrial vehicle group?

Doubtless it is because the application is founded on the basic principles of efficient transportation. Briefly these principles are:——

1—The motive unit entirely separate from the burden-carrying vehicles.

2—*permitting*—Maximum utilization of the available power by *pulling* instead of *carrying*.

3—*and resulting in*—Greatest work efficiency because the motive unit can work continuously—never standing idle to be loaded or unloaded.

Major operating advantages, appealing to the keen student of material movement, follow:——

A—The loads are always on wheels and readily movable by hand for short distances.

B—The train is not confined to any fixed path—can go anywhere that the movement necessitates.

C—Trailers can be exactly suited to the materials to be moved—*i. e.* side dump bodies for bulk stuff—box bodies for small parts—low dolleys for barrels—platform trucks for general commodities.

D—Material movement can be systemitized and tied into production schedules by planning regular routes—dispatching trains at stated intervals—and centralizing control.

For the past twelve years Mercury has been building and installing tractors and trailers. Our line embraces a tractor for every purpose. Standard trailers in many types are offered. We also design special trailers for the unusual requirements. A fund of valuable information relative to handling all kinds of material has been accumulated. This information is yours without obligation. Offices, with tractor-trailer experts in charge, are maintained in the principal industrial centers.

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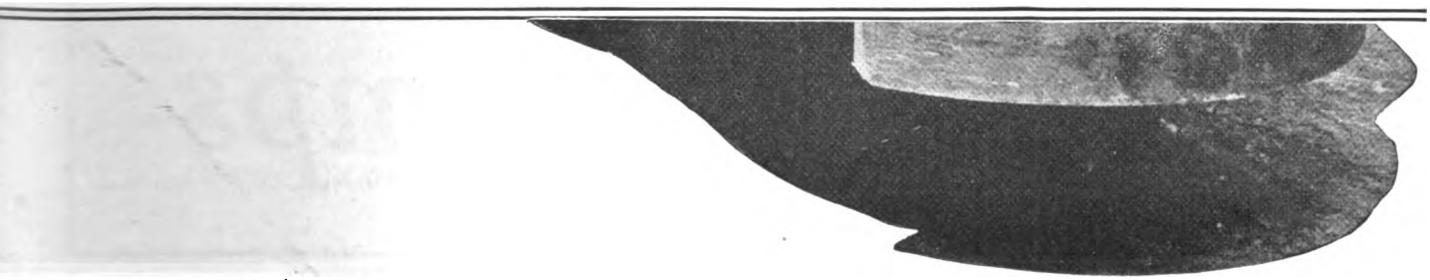


The Mercury A-310
—one of the Mercury standard trailer types. An *all steel* castor vehicle of universal utility. It is built in a wide range of platform widths and lengths and can be fitted with box bodies, dump bodies, stake bodies, etc.
Ask for Bulletin A-100.

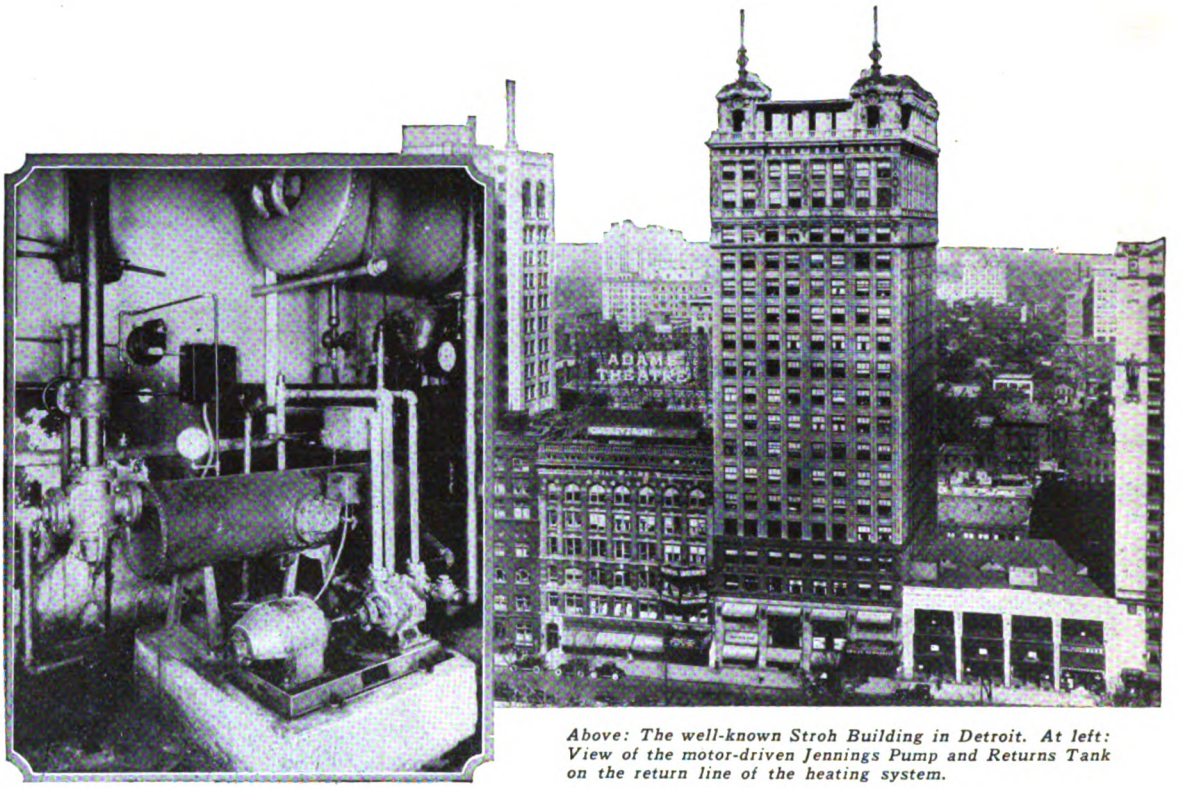
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The Trackless Train



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Above: The well-known Stroh Building in Detroit. At left: View of the motor-driven Jennings Pump and Returns Tank on the return line of the heating system.

Jennings in Stroh Building, Detroit

In the Stroh Building, Detroit, as in most other fine office buildings in the country, a Jennings Vacuum Heating Pump is depended on for removing the condensation and air from the return line heating system.

For the exacting service customarily encountered in buildings of this character, Jennings Pumps are a logical choice. They give to the heating system a flexibility which makes it capable of delivering the heat where and when it is wanted. Jennings-equipped systems start up quickly in the morning. They can supply heat to the farthest radiator as easily as to the one nearest the boiler.

Bulletins, prices and recommendations on request.

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Jennings Pumps

RETURN LINE AND AIR LINE VACUUM PUMPS **CONDENSATION AND CIRCULATING PUMPS**

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Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures

JOHN H. VAN DEVENTER, *EDITOR*

W. THOMSON LEES
Associate Editor

ADOLF SCHILDKRAUT
Art Director

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Nine Years Plus, Is the Average Length of Service Here

One of a Series of Pictorial Visits to Noted Plants

WHEN a man gets a job in the American Pulley Company's plant at Nicetown, Pa., six miles from the center of Philadelphia—the probabilities are that he will stay with the company more than nine years. For the *average* length of service of all employees of this company is nine years and three months.

Such a splendid record as this—(we have seldom if ever heard of a better one)—must mean two things at least—an attractive plant and exceptional management. We believe the pictures that are presented herewith demonstrate both of these conditions.

The American Pulley Company received its charter in 1895 and is one of the pioneers in the field of pressed metal stamping. The "American" steel split pulley was the first of its kind ever manufactured. In addition to this, its principal products are pressed steel shaft hangers, pressed steel two-wheel hand trucks, reels, spools, beams and miscellaneous steel stampings.

Many of the company's employees are stockholders, all of them are given life insurance and opportunities to save at high interest rates. An employee's building is located in the center of the plant, and here each employee has a locker and toilet facilities. In this building also is the plant dispensary and dental clinic. Recreation facilities are supplied by a baseball field, tennis courts and quoit grounds.

The office and factory buildings occupy an area of ground approximately thirteen acres. Most of the manufacturing buildings are of one and one-half story construction, incorporating modern ideas in lighting, heating and ventilation. A great deal of the machinery is of special design, as will be noted.

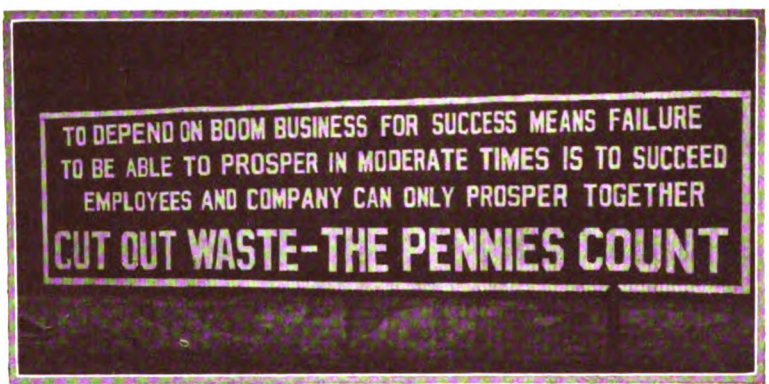


Fig. 1. A feature that appeals to the thoughful visitor is the use made of blank wall space to impart sound economic advice to the personnel.

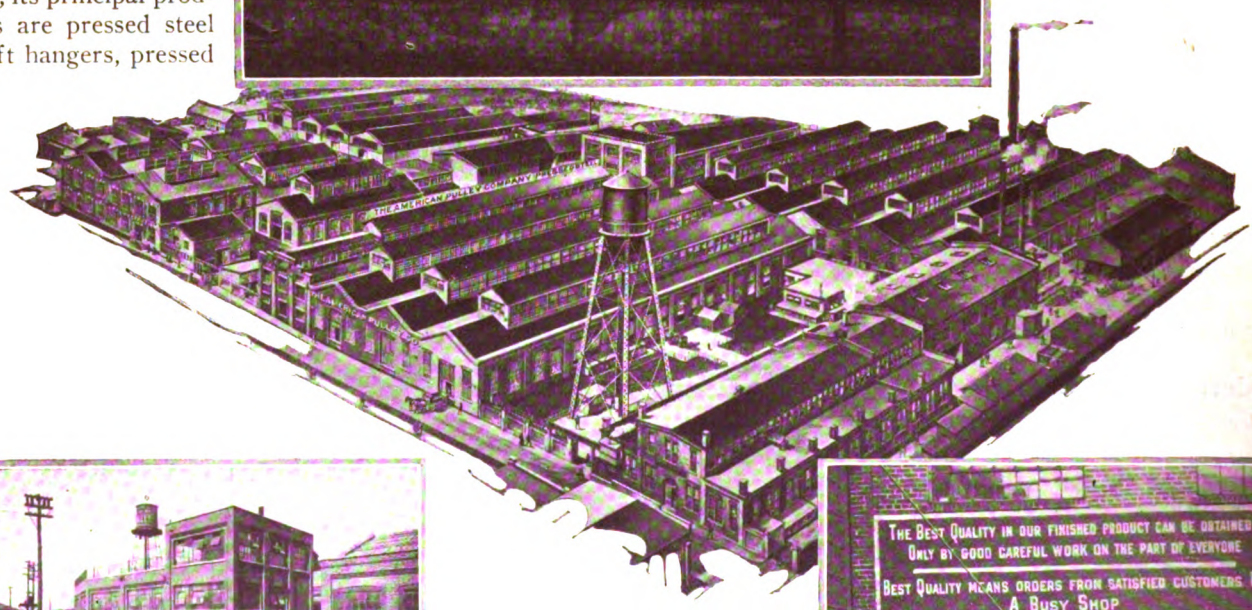


Fig. 2. The American Pulley Company owns about 13 acres of land on which are situated the factory and office buildings.

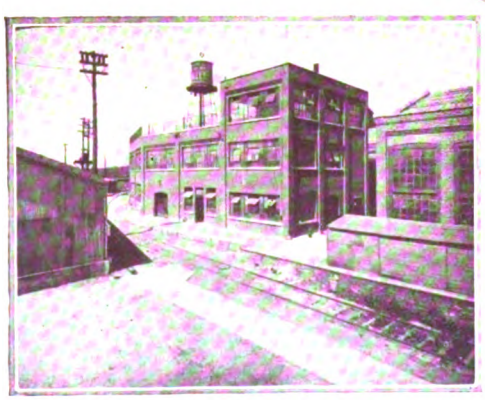


Fig. 3. Employees' Service Building, which affords ample accommodations for all employees.

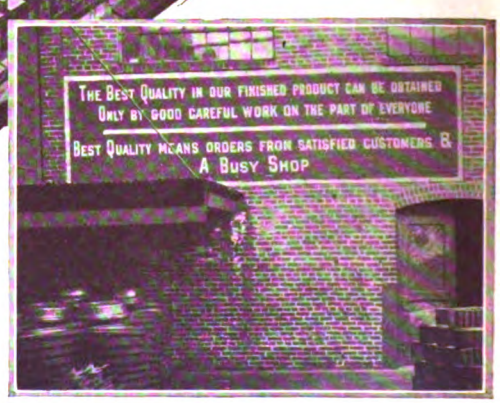


Fig. 4. At the end of a passage, this printed message is a link in the chain of coöperation all the way from men and management to customer.

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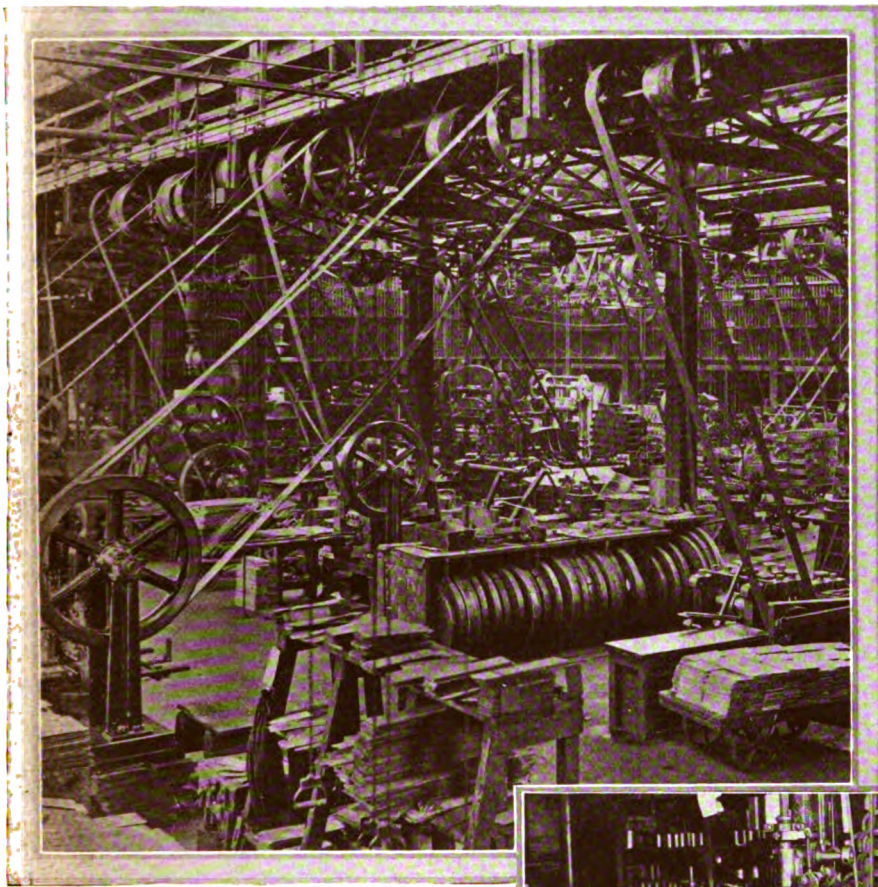


Fig. 5. It is here in the press room that the raw material begins its conversion from flat steel into finished pulley parts. Stamping, forming and corrugating add structure and refinement as the work moves onward to completion.

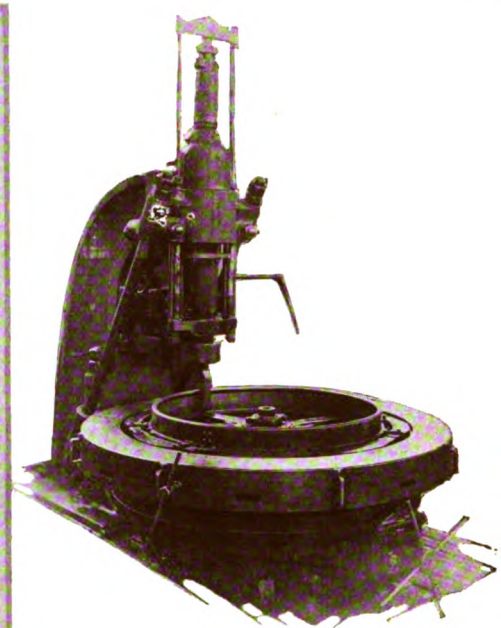


Fig. 6. Pulley arms are riveted to the internal rim flange by this hydraulic riveter which is one of many types and sizes for this work.

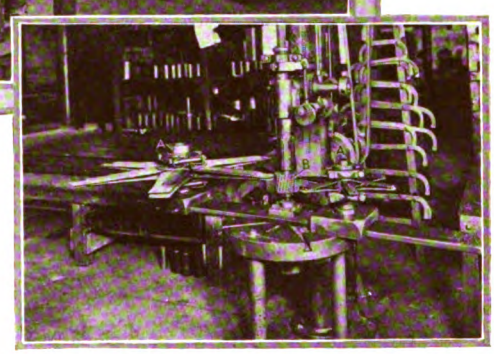


Fig. 7. The comparatively simple method of milling spider arms to equal lengths is yet one of the main constructional features assuring roundness and true running characteristics.

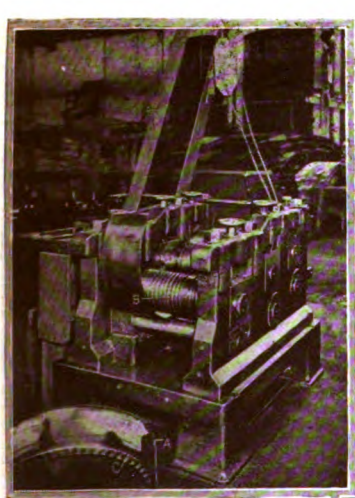


Fig. 8. Rolling the pulley rim sections. "A" shows the bead partly formed by rings "B" on the rolls. "C" is the flange, corrugated in rolling.

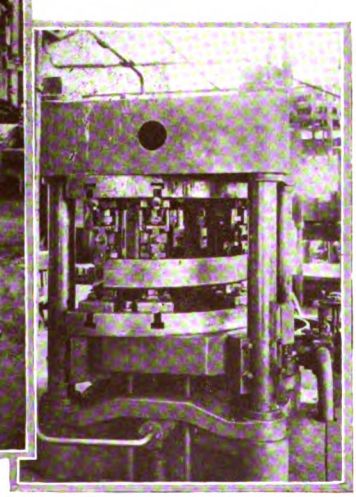


Fig. 9. The multiple piercing of rims of pulleys of 44 to 60 inches diameter requires more power than feasible by power drive, so this one is operated by hydraulic pressure.

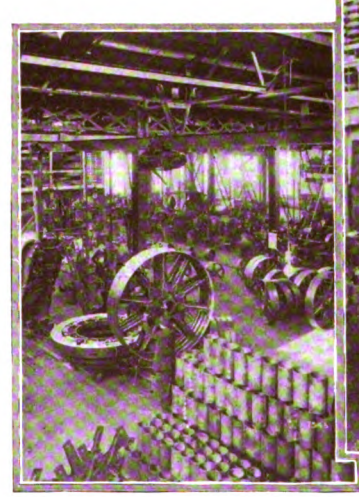


Fig. 10. A view of the Assembling Department showing pulleys in the making.

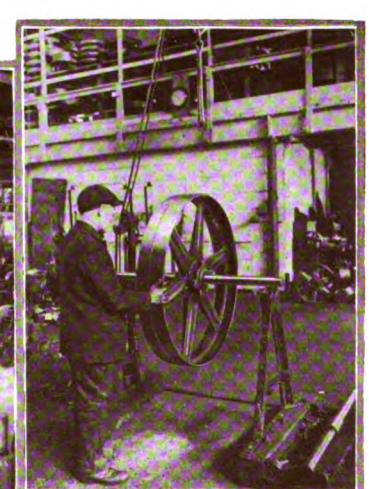


Fig. 11. Because pulleys must be safe at a high peripheral speed, and since balance is a requisite of high speed, all American pulleys above 24" are regularly balanced as here illustrated.

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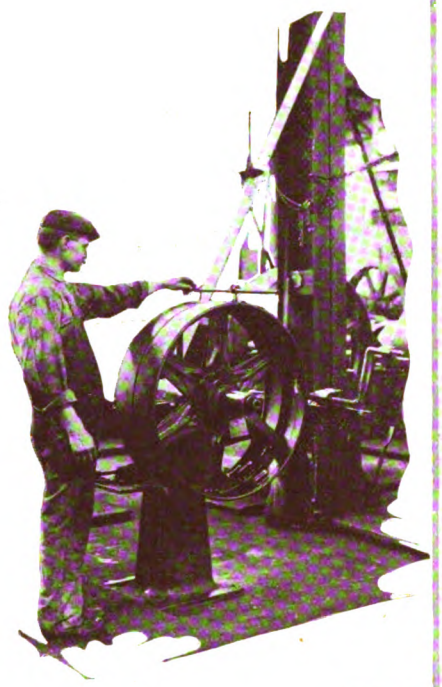


Fig. 13. Close-up of a testing machine. Roundness and truth in the plane of rotation are important characteristics.

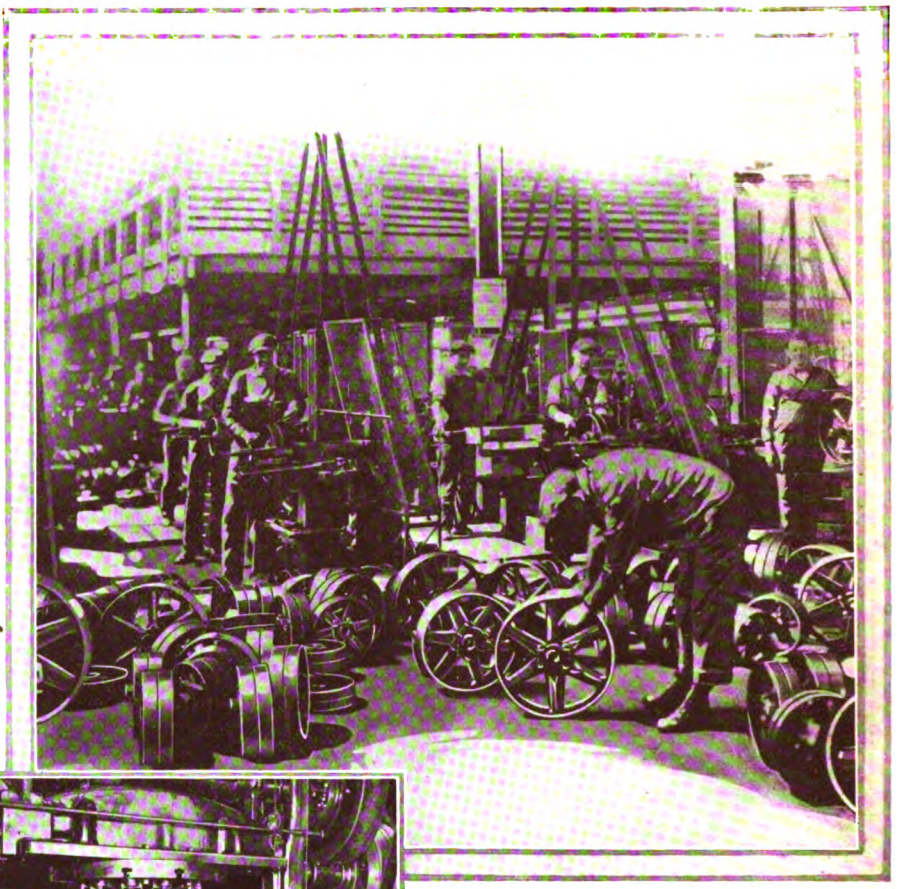


Fig. 12. Testing machines here either approve or condemn the finished pulleys before they are painted. Well defined tolerances are adhered to, thus assuring a product beyond criticism.

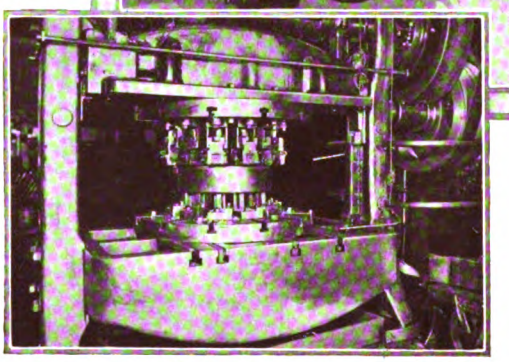


Fig. 14. The manufacture of pressed steel pulleys in quantity production requires the use of specialized machinery represented for example, by the piercing equipment and elaborate multiple die here illustrated. This machine is belt driven.

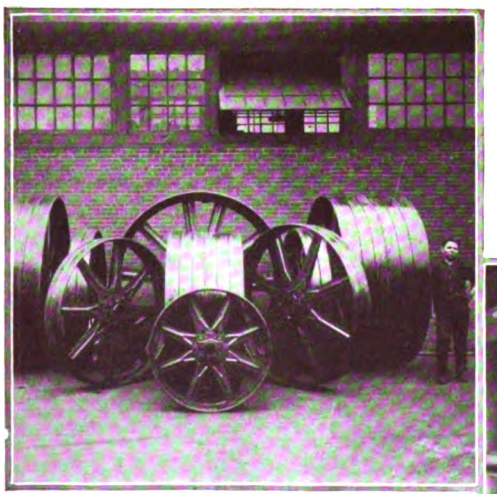
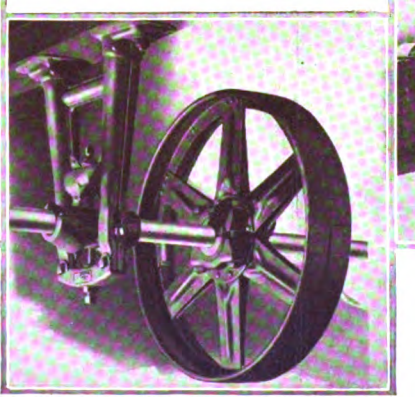


Fig. 15. Whether large or small, pulleys must show strength and finish when completed.

Fig. 16. The pressed steel hanger is another of the products of this company; products which today include several things beside pulleys.



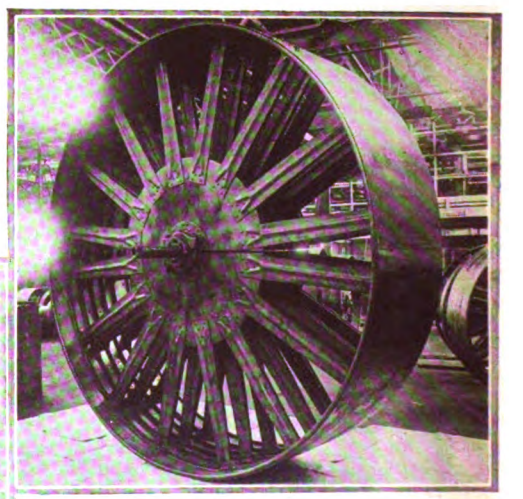


Fig. 17. How large? 128 x 36 inches.

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Fig. 18. Not only the mechanical difficulties to be solved in producing a pressed steel hanger make this photograph of interest but the art displayed in making a graceful piece of workmanship is just as noteworthy.

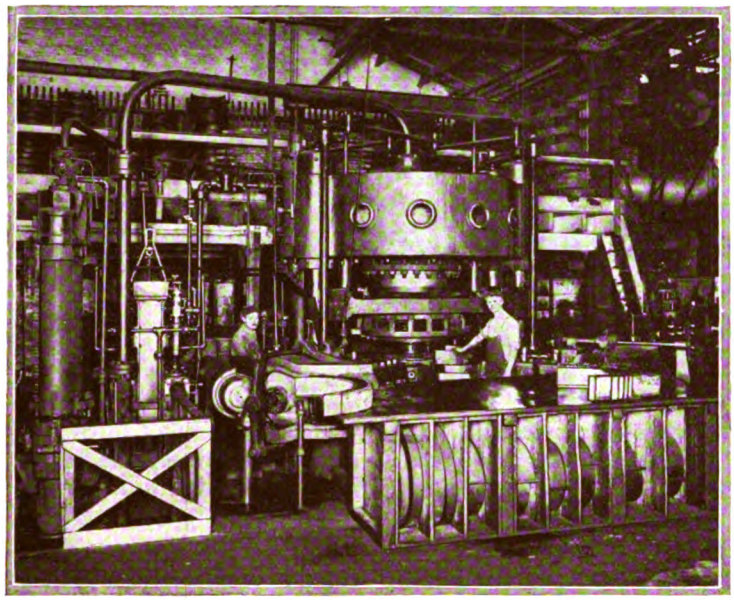


Fig. 19. This is one of several rim presses built especially for "American" pulley rims. The moving parts are actuated by 2 vertical and 4 horizontal cylinders capable of exerting 1,500 tons pressure. There is almost as much machine below the floor as above it.



Fig. 20. A product which lends itself advantageously to fabrication in pressed steel is here illustrated by a two-wheel hand truck now being introduced by The American Pulley Company.

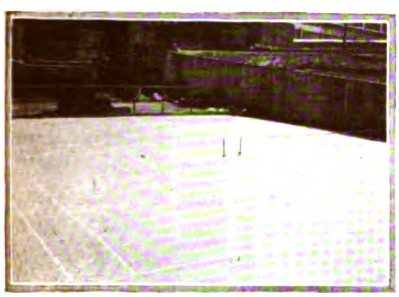


Fig. 22. The absence of devotees on these two excellent courts is explained by the hour at which the photograph was taken.



Fig. 23. The Dispensary, located in Employees' Service Building.



Fig. 24. In the background of this view of the washrooms are seen the shower baths and lockers. An interior of Employees' Service Building.

Fig. 21. Reels of pressed steel for wire and textile workers are made in a variety of sizes—here are some of the big fellows.

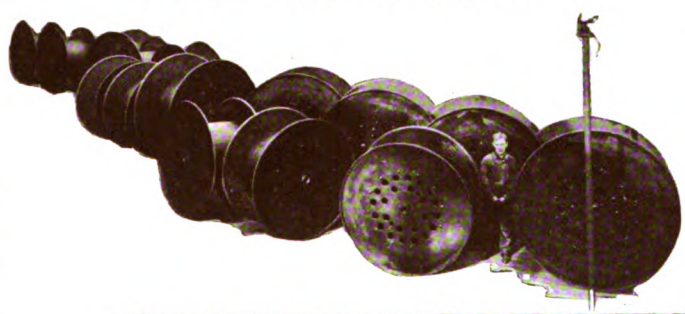
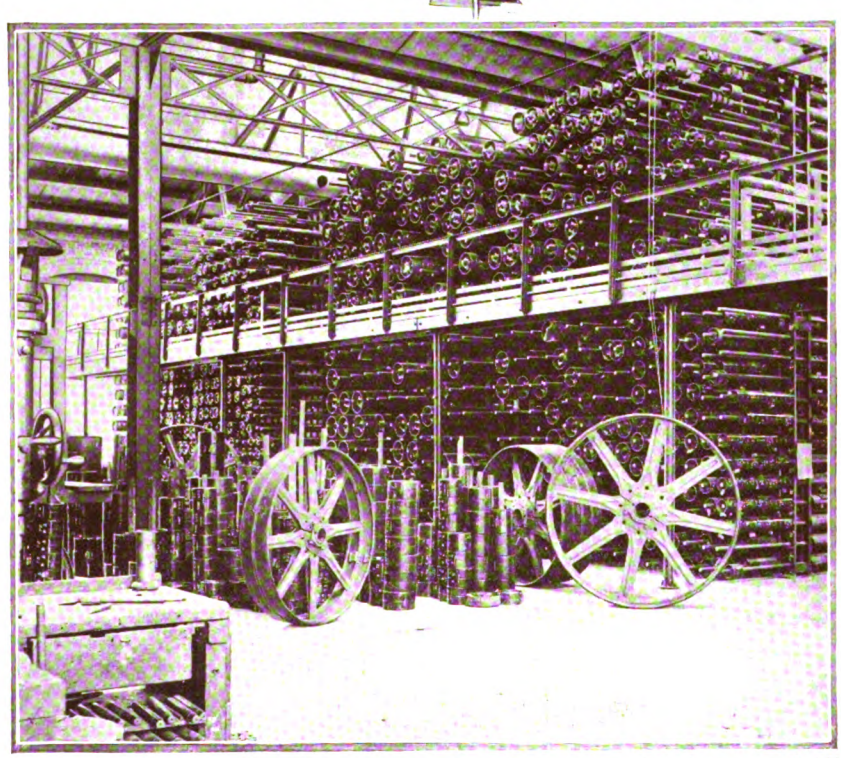


Fig. 25. When it is realized that the factory warehouse stocks over 60,000 pulleys in about 3,000 sizes, it is evident that the photograph shows but a small portion of the supply kept on hand for prompt shipment.



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What Do You Know About Hammers?

The Right Hammer for the Job—and the Right Way to Use It

By Girard H. Story

The Stanley Rule & Level Plant

THE most essential tool in the kit of the mechanic is the hammer. Therefore, it is wise economy for him to have a hammer of the proper size and pattern for the particular job. The leading hammer manufacturers have studied the needs of practically every trade and have developed the correct hammer for each one, so it is now possible for the carpenter, blacksmith, engineer, cooper, tinsmith, riveter, brick mason, automobile body builder, in fact every artisan, to obtain exactly the type suited for his work.

The nail hammer is the one in most common use. It is made in a variety of patterns and in sizes ranging from a 5-ounce head for light finishing work, up to 28 ounces for heavy construction work. The ball pein machinists' hammer undoubtedly comes next. It is made in a wide range of sizes from a 4-ounce head up to 3½ pounds, each suited to its own range of work.

A good hammer must be properly shaped to provide the correct balance and an easy swing. The striking face should be tough and should be beveled or champfered to prevent chipping, which is very dangerous to nearby workman in addition to damaging the tool. The handle should be of sound, young, straight grained hickory that has been thoroughly seasoned in the air, exactly fitted to the eye of the hammer, and securely held with wedges to prevent the head flying off the handle.

Do not abuse your hammers by striking them on hardened surfaces. Provide a brass or copper strike if possible whenever driving a hardened piece of steel. Use the right type of hammer and in the correct way and it will give long and satisfactory service. The three-pound ball pein hammer is no more suited to driving tacks than the tack hammer is to driving spikes.



Fig. 1. Below—Tinners' hammers in the tinsmith's shop.

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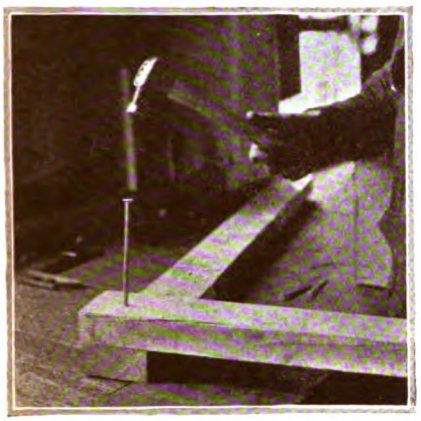


Fig. 2. The hammer is too small to properly drive a nail of this size. It is apt to result in breaking the hammer across the eye or on the face. The effect is similar to that of striking an unyielding metal surface—and, in hard wood, for example, the nail simply vibrates, instead of being driven.



Fig. 3. This hammer is too small to pull a large nail. The excessive strain will break the handle or the claws.

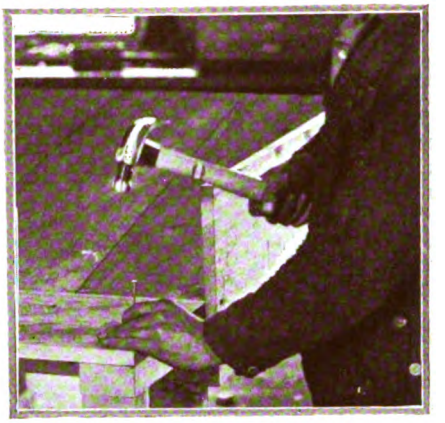


Fig. 4. A forceful blow can only be delivered by the right size hammer, properly held. Here is an example of it. To use too heavy a hammer is almost as bad as using one that is too small. Excess weight in the hammer tends to bend the nail, and imposes unnecessary strain on the arm.





Figs. 6 and 7. Above—the work is properly placed on the anvil to protect the face of the hammer. At the left—With the work held in the wrong position on the anvil, the edge of the hammer will spawl off from striking the hardened face of the anvil.



Fig. 5. Here is shown a brick mason's hammer which is used in industrial plants for cutting brick to shape when relining kilns or furnaces.

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Fig. 8. A bumping hammer and dolly block for ironing out the dents in automobile fenders. It is surprising what a good mechanic can do to a seemingly ruined fender, when he has the right size and style hammer for the job.



Fig. 9. A magnetic upholsterer's hammer with a claw in the end of the hammer, used for upholstery work on automobiles or furniture.

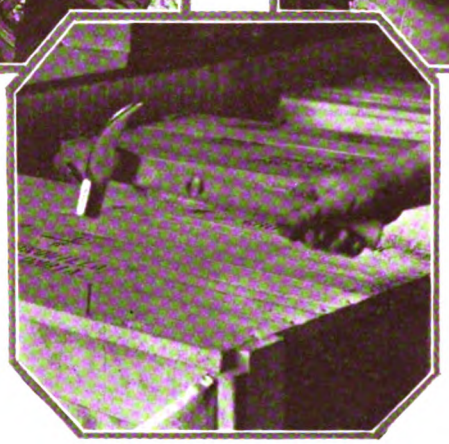
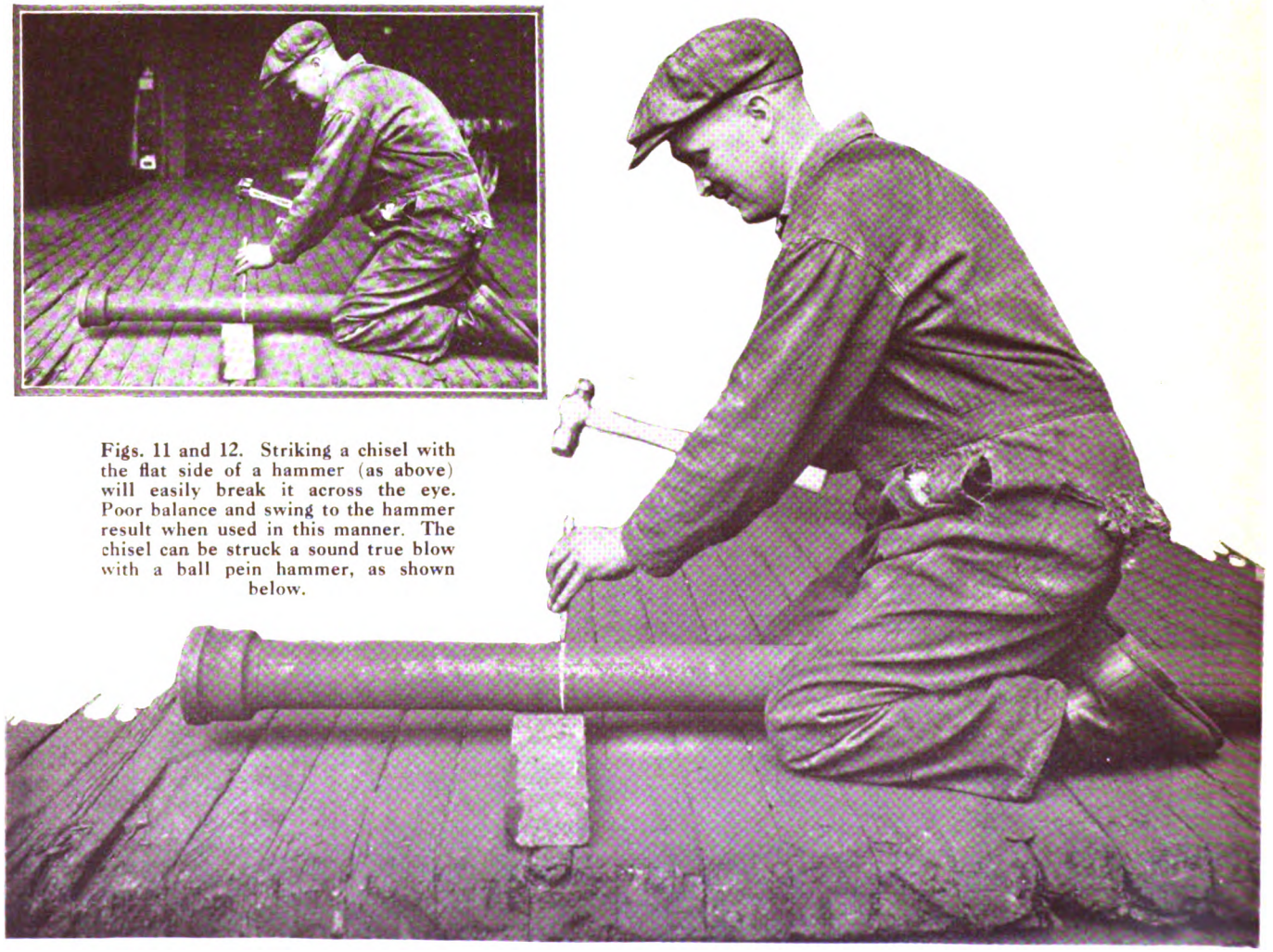


Fig. 10. For use in the packing room, nail hammers with checkered faces are recommended.



Figs. 11 and 12. Striking a chisel with the flat side of a hammer (as above) will easily break it across the eye. Poor balance and swing to the hammer result when used in this manner. The chisel can be struck a sound true blow with a ball pein hammer, as shown below.

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The New Chairman of the National Industrial Conference Board

LOYALL A. OSBORNE, president of the Westinghouse Electric International Company, was signally honored recently when he was elected chairman of the National Industrial Conference Board at the 10th annual meeting of that organization in New York City.

In accepting this office, Mr. Osborne assumes the chairmanship of a body whose members are the delegates of 27 national and state industrial organizations and four government departments, comprising more than 50,000 manufacturing concern employing a total of more than 7,000,000 men and women. The board maintains a large staff of economists, statisticians and engineers who are continually investigating domestic and foreign problems of economic-industrial interest, and since its organization in 1916 has issued 115 research and 35 special reports and many monographs on subjects of timely and practical concern.

Mr. Osborne, who is a graduate of Cornell University, '91, joined the Westinghouse organization immediately upon leaving college, and was made vice-president of the Westinghouse Electric & Manufacturing Company in 1902. He is now senior vice-president of that organization. During the war, he was a member of the Council of National Defense, a member of the War Labor Planning Commission, and of the War Labor Board. He succeeds Frederick P. Fish, of Fish, Richardson & Neave, Boston, as chairman of the Conference Board.

Other officers of the Conference Board are: Frederick P. Fish, honorary chairman; Charles Cheney, of South Manchester, Conn., vice-chairman; John W. O'Leary, of Chicago, vice-chairman; Magnus W. Alexander, New York City, president; Fred I. Kent, New York City, treasurer; James M. Robertson, New York City, secretary. These, with William W. Coleman, of South Milwaukee, Wis., Irence du Pont, Wilmington, Del., Russel H. Leonard, Boston, and William H. Nichols, Jr., compose the Executive Committee of the Conference Board.



Loyall A. Osborne, president of the Westinghouse International Company, who has recently been elected chairman of the National Industrial Conference Board.

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Tips on Tooling

Reducing the Tool Cost With Universal Bar Equipment

By M. E. Lange, Production Manager, and H. P. Bailey, Assistant to the President,
The Warner & Swasey Co., Cleveland, Ohio

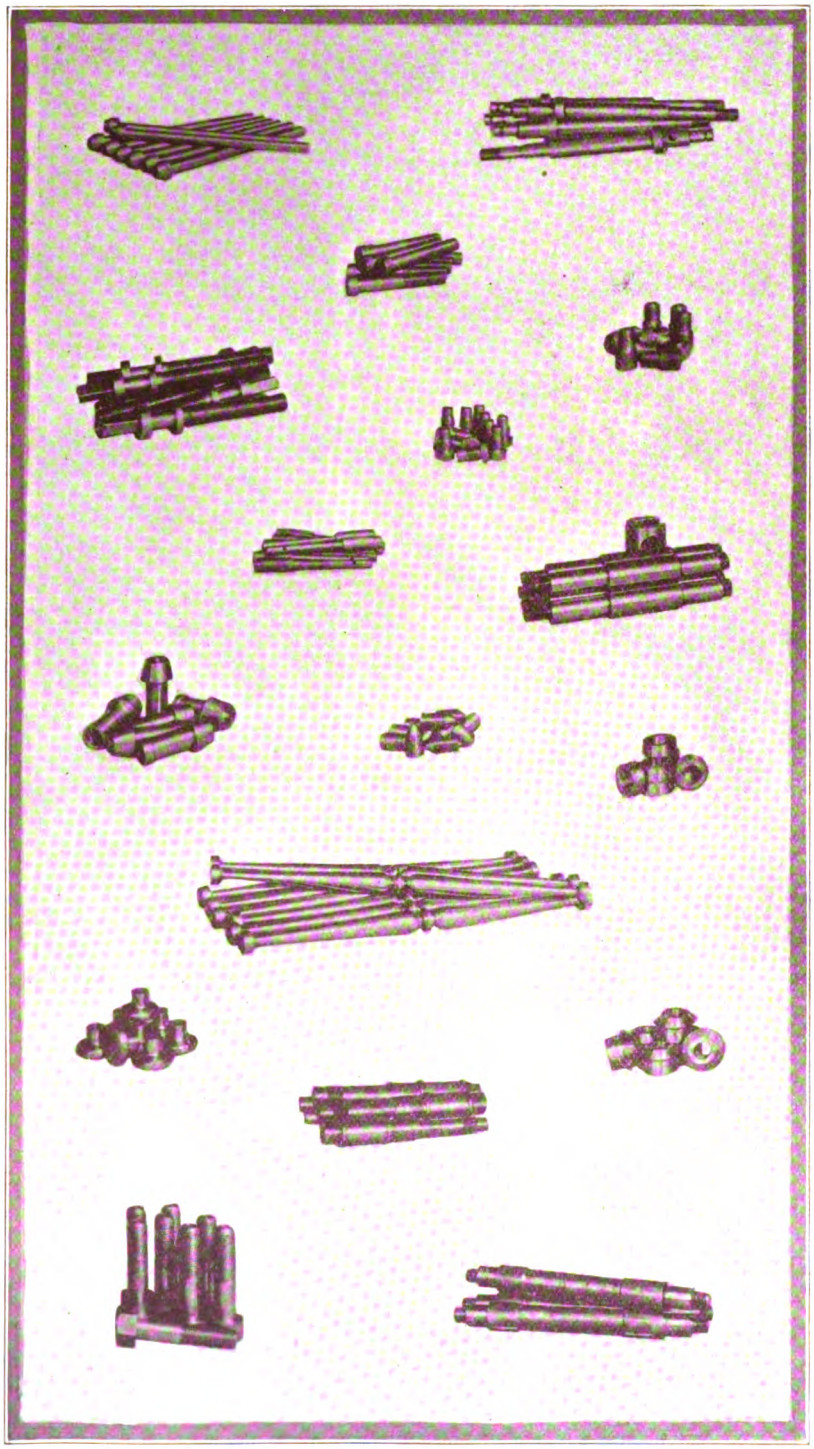


Fig. 1. This shows the variety of work actually ahead of a 1½" bar size turret lathe. Notice the variety of lengths, diameters and contours involved.

THE fundamental problem in tooling machine tools is not only to increase production, but to do so without using elaborate or special equipment. The vast majority of the metal working shops are producing turned parts in lots of one hundred pieces or less, and the cost of expensive special tooling and the time necessary to set up this tooling is a formidable factor.

The way to reduce the tool and set-up cost is to use:

1. Universal Bar Equipment: this means a standard set of Universal tools for bar work, each tool designed for a given operation such as turning, etc., and adjustable for the cutting range of the machine.
2. A Permanent Set-up of this equipment; a permanent arrangement of the tool equipment in the usual order of use. This avoids changing or remounting the standard tools.

Taking an average shop as an example, Fig. 1, at the left, shows the work actu-

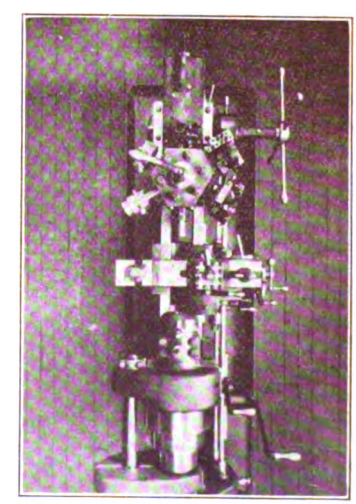


Fig. 2. This is a view looking down on the turret lathe as it is arranged, with the set of tools mounted on the turret, for performing the various operations.

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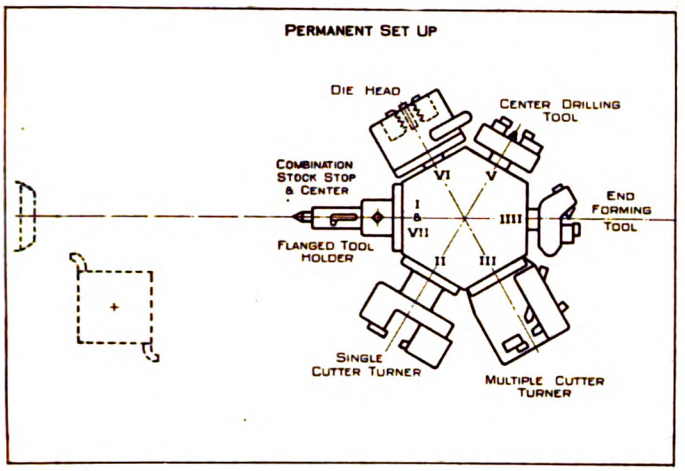


Fig. 3. The above drawing makes clear the arrangement of tools shown in Fig. 2.

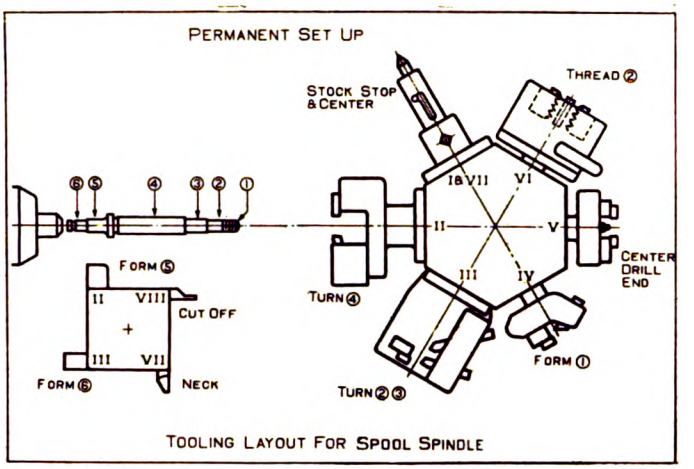


Fig. 4. An arrangement of the universal bar equipment designed to minimize set-up time.

ally ahead of a 1½" bar size turret lathe. The lengths, diameters and contours of these pieces vary widely. The problem of such a shop is, therefore, not only to increase production on this type of work, but to do so with one set of Universal tooling.

Universal Bar Equipment

To develop such a set is no easy task. It is true that work from the bar may be divided into different operations such as turning, chamfering, threading, forming, etc. If the set of tools is to be truly Universal in its application, however, a tool developed for such an operation as turning, for example, must cover the entire range of work handled on the machine. This means in this case that bars ranging in diameter from ⅜ to 1½" must be handled with the same tool.

Long experience in tooling turret lathes has suggested the following set of Universal tools to handle the majority of bar operations:

Flanged Tool Holder, with Combination Stock Stop and Center.

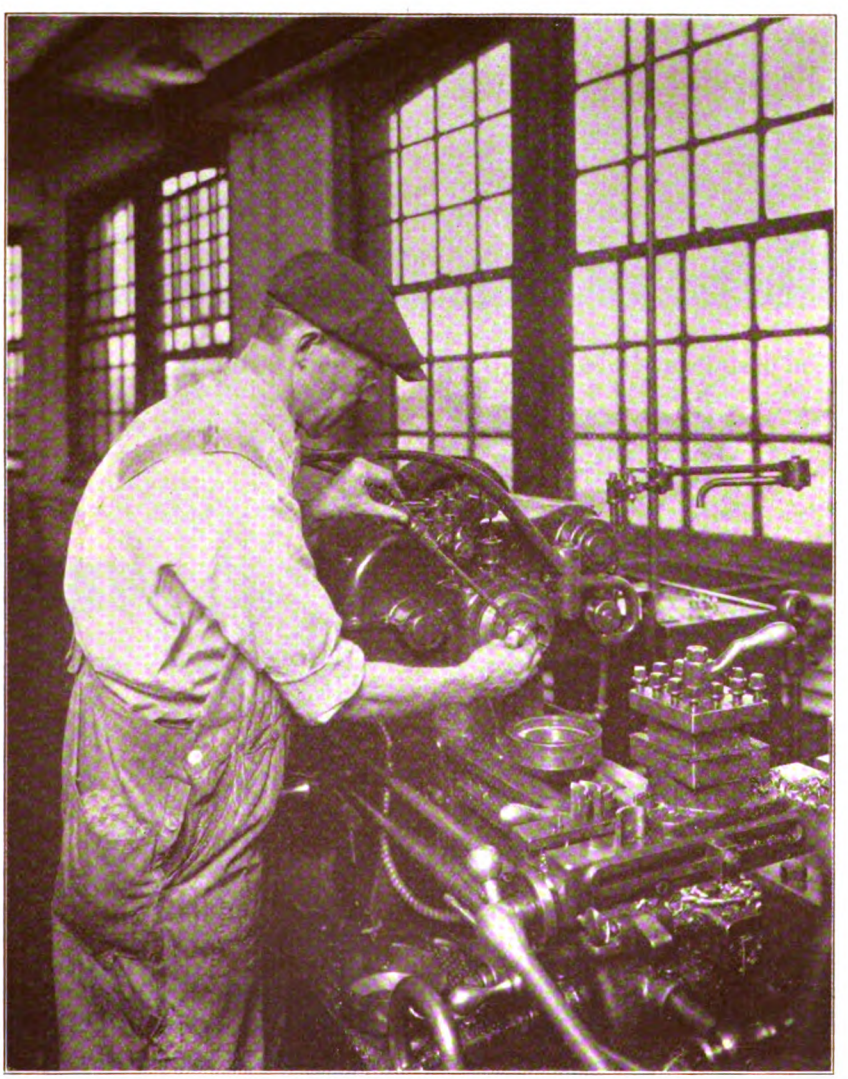


Fig. 5. Changing Collet Bushings. The first step in setting up for this spool spindle is to change the collet bushings to the size needed. Time, 5 minutes.

Single Cutter Turner, for the bulk of the straight turning.

Multiple Cutter Turner, for gang cuts or straight turning.

End Facing Tool, for rounding or chamfering the ends of bars.

Center Drilling Tool, for accurately centering the ends of bar.

Die Head, for threading.

Fig. 2 and Fig. 3 show this set of tools mounted on the turret and will give a general idea of the nature of the equipment.

The final test of the Universal tool equipment is a comparison of its cost with that of other methods. The cost of the Universal set of tools, as shown for a 1½" machine, is about 16% of the cost of the machine itself.

This cost must be compared with that of making up special tools in the shop. Many manufacturers never consider the overhead of such tool room work, and they also overlook the time devoted to designing and experimental work. For example, the tool shown in Posi-

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tion II was developed on the basis of forty-four years' experience in designing and manufacturing this exact type of tool. Even then it was necessary to make three experimental models and put them in actual use before developing a design which gave the maximum production on the wide range of work at the lowest possible cost.

The Permanent Set-Up

One of the important problems in the majority of the metal turning shops is that of set-up time. Many shops recognize fully the advantages of improved equipment, and feel that the time necessary to set-up the job is so great that it will offset the saving. This is particularly true in small lot production, where work in quantities of five to one hundred pieces in a lot is produced. Fig. 4 shows an arrangement of the Universal bar equipment which will reduce substantially the set-up time. This arrangement is best suited for the majority of bar work and the set-up is left identically the same for the different jobs.

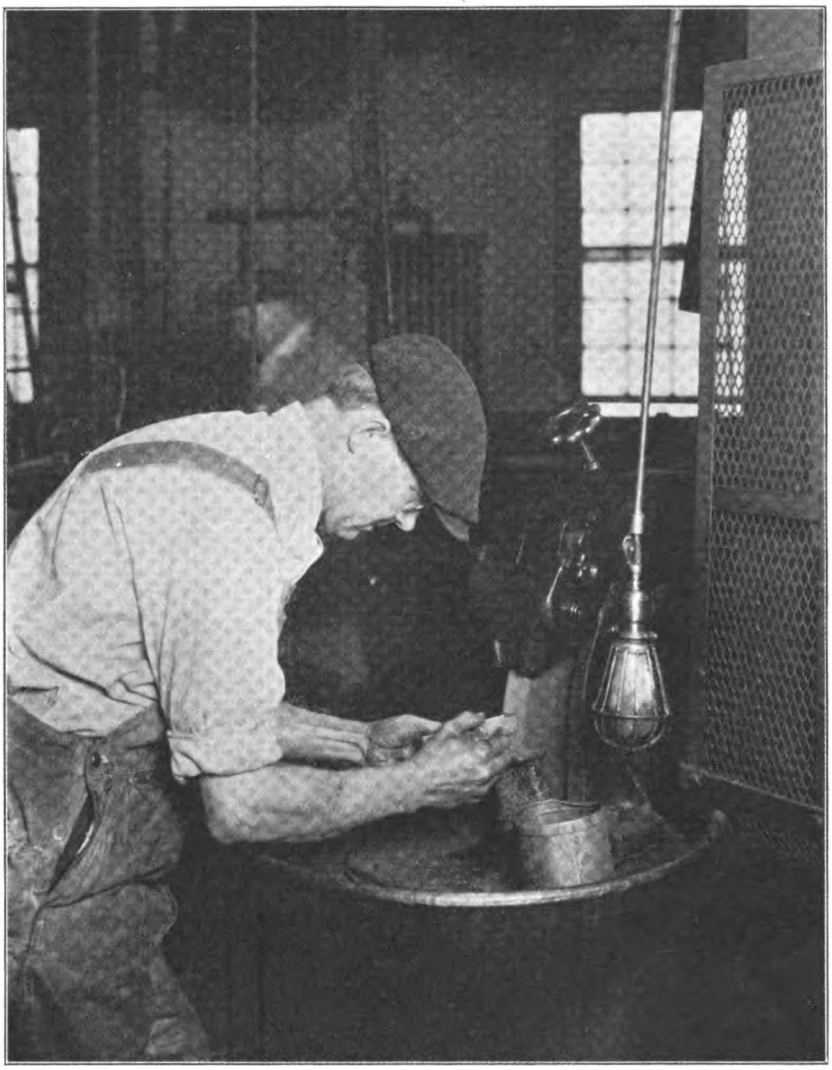


Fig. 6. Sharpening Cutters. Forged cutters and bits must next be sharpened to suit the individual needs of the job. Time, 12 minutes.

If necessary, the turret is back-indexed to obtain the correct sequence of the order of operations. Unless the quantity produced is large, any individual tool which is not used for a particular job remains on the machine. These idle tools are usually shown by dotted lines in the tool layouts.

In changing from job to job with this Permanent Set-up, the only operations necessary are:

Changing the collet bushings.

Sharpening the cutters.

Setting the cutters.

Setting machine stops.

The four illustrations, Figs. 5, 6, 7, 8, show the successive steps necessary for setting up a typical bar job, a spool spindle. The exact time to set up this job under actual shop conditions was 49 minutes, probably less than one-half of the set-up time expected by many factory managers. The captions show clearly why the set-up time is so greatly reduced by the use of the Permanent Set-up.

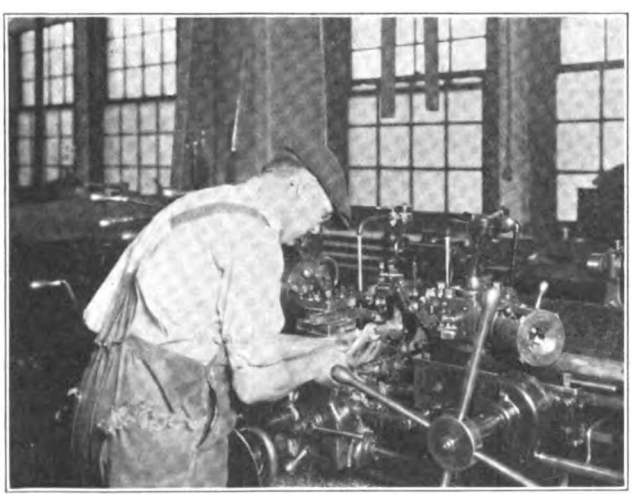


Fig. 7. Setting Cutters. Setting the cutters to turn the correct size is done while the first piece is being machined. Positive adjustment of the tools in the hexagon turret, and adjustable rockers in the square turret reduce this time considerably. Time, 19 minutes.

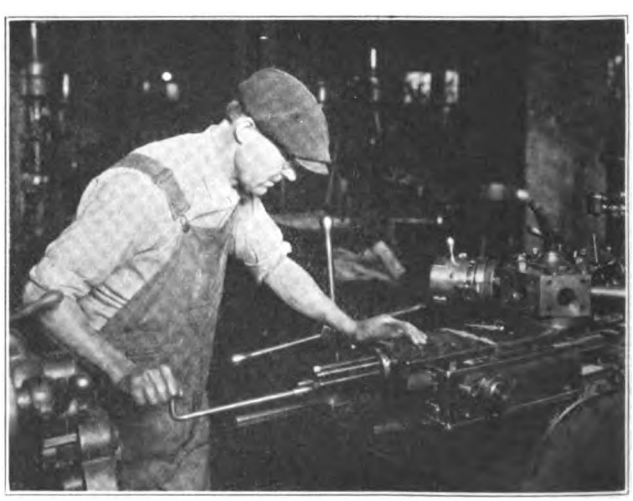
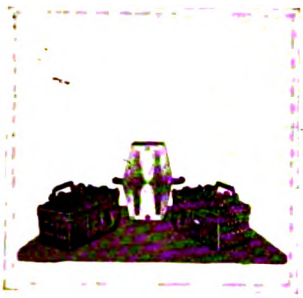


Fig. 8. Setting Stops. The stops for the longitudinal travel of the square and hexagon turrets are adjusted quickly by means of a simple wrench. Time, 13 minutes.

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Giving the Crane a Hand

The Development of the Lifting Magnet

By L. S. Monroe

The Electric Controller & Mfg. Company

THE properties of the electro-magnet by which it is able to attract and hold particles of iron and steel when an electric current is passed through its magnetizing windings, and to release the attached load when the flow of electric current is interrupted, have formed the subject of many interesting and instructive laboratory experiments since 1825. Not until 1895, however, was the first real lifting magnet designed and built.

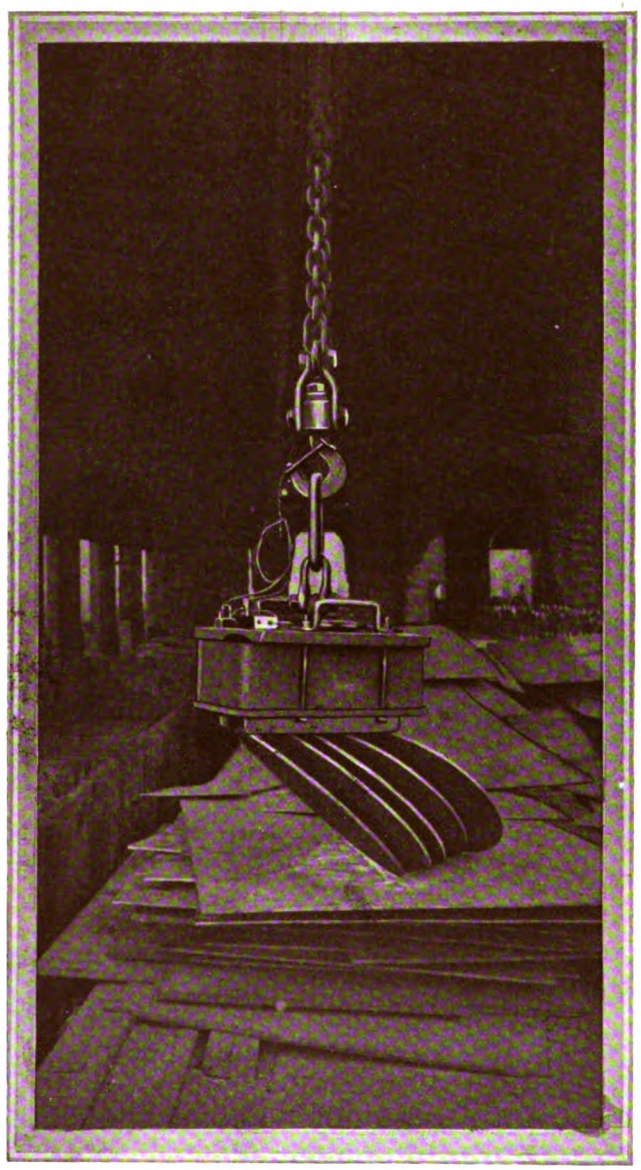
Mr. S. T. Wellman, a pioneer in the manufacture of open-hearth steel in America, was one of the first to grasp the possibilities of the electro-magnet as a ready means of attracting and holding iron and steel products while they were being lifted and transported by cranes and similar labor-saving machines.

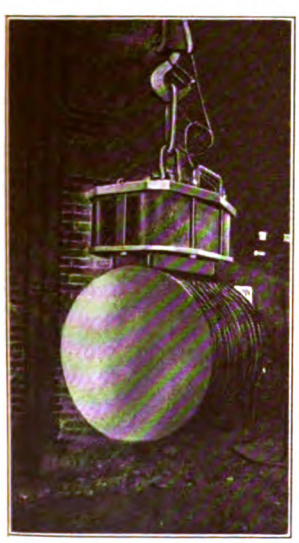
The idea was so enticing that Mr. Wellman at once set about putting it into execution and had a magnet constructed after the style then in vogue for dynamos and motors. This first magnet lasted only long enough after being put into service, to demonstrate the possibilities of the lifting magnet. The magnetizing coils burned out so rapidly as to condemn this type of construction for the purpose in hand.

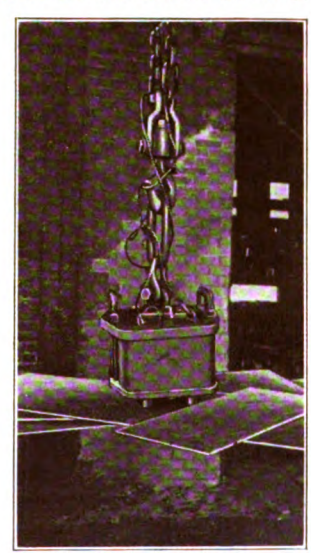
Mr. Wellman then undertook the design of an electro-magnet which, as far as is shown by the records of the United States Patent Office, was the first distinctive "lifting magnet." In this design, the magnetizing windings were entirely enclosed and protected, a practice which has been followed in all subsequent successful lifting magnets. The reason for this is that only the very staunchest construction can withstand the shocks received by the magnet when it is dropped onto the material to be lifted, and the hammering of the materials being lifted as they jump to the magnet.

The design of lifting magnets was later still further advanced by Mr. Eugene B. Clark of the Illinois Steel Company.

At first thought, it seems that the design of lifting magnets should prove a very simple matter, involving nothing more than a consideration of elementary laws of the magnetic circuit. This has not been found to be the case as the magnetic circuit of a lifting magnet is normally incomplete, being dependent upon the character of the load to be lifted







Figs. 1 to 4 inclusive. On this page are shown examples of the first distinctive lifting magnet, as designed by S. T. Wellman in 1895. Mr. Wellman, a pioneer in the manufacture of open-hearth steel in America, was also one of the pioneers in developing the lifting magnet.

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and its position across the face of the magnet. A magnet which would lift a steel ingot weighing 5,000 pounds might not lift a long, thin plate weighing only 500 pounds, because the vibration of the plate introduces a live load which the magnet could not take care of.

Other problems, too, had to be solved in handling what may be termed "detached" materials such as scrap, pig iron, etc. At first, a lifting magnet which would readily lift an ingot weighing 10,000 pounds, would not lift a single pig weighing 100 pounds when lowered upon a pile of pig iron. The magnetic lines seemed to wander aimlessly through the pile of iron in such a scattered fashion that there was not a sufficient flux density to produce the desired lift.

An attempt was made to overcome these difficulties by providing the magnet with movable pole pieces which would adjust themselves more or less to the irregular surface of the pile. The idea appeared to be a good one but the actual performance of the magnet was disappointing.

The first commercially successful lifting magnet for handling pig iron, scrap and miscellaneous magnetic materials was placed on the market by the Electric Controller and Manufacturing Company in 1905. The problem of designing a magnet for handling these materials was attacked in a radically different manner and a circular magnet was built with the central pole withdrawn from the load, with the face of the magnet concave instead of flat.

The thought in mind when this magnet with the concave face was designed, was that this curve would more nearly fit the curve of the piled scrap, pig iron or other materials. It was found, however, that as a magnet dug into a pile, the curve of the pile became dished downward instead of convex upward and the magnet no longer matched the contour of



Fig. 5. An example of the Piek magnet, with movable pole pieces; shown here lifting pig iron from a pile.

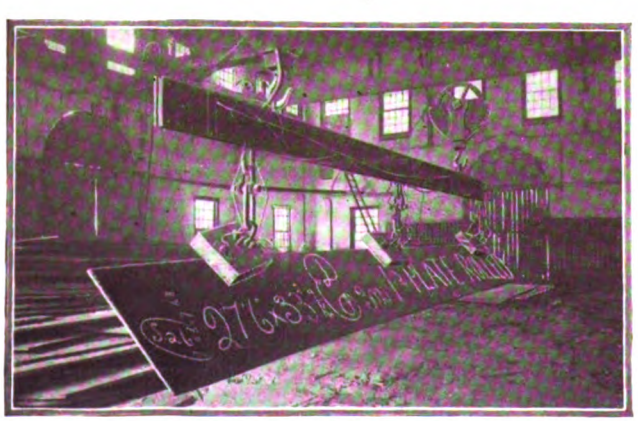


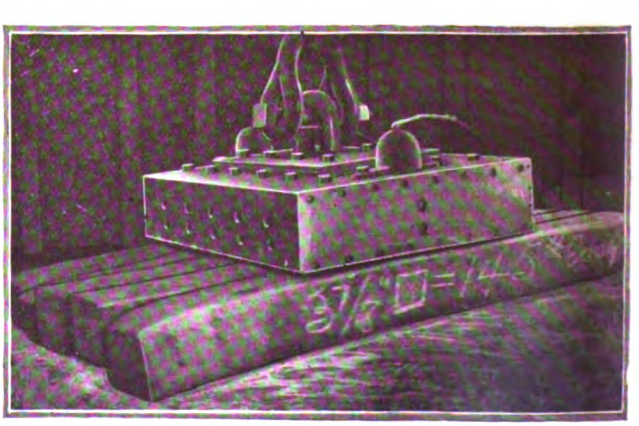
Fig. 6. Above is a close-up view of the Piek magnet, showing the movable pole pieces, designed to suit their contour to the work being handled.



Fig. 7. Above is one of the earliest circular magnets. Note the ventilation holes around the rim, and the delicate binding posts for the wires.

Figs. 8 and 9. Below are shown two views of early models of plate-handling magnets. In this work, the vibration and bending of the sheets introduces a complicating factor that makes the problem far from simple. These are rare photographs.





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the pile. Then, too, a magnet is always being called upon to do all sorts of general utility work such as handling bars, billets and sheets. For this reason, the magnet with the concave bottom surface was abandoned and a design having the center and outer pole shoes at an even height was adopted.

A magnet is oftentimes out-of-doors the year round, in rain and snow, heat and cold. Here moisture is its worst enemy, for the alternate heating and cooling of the coils causes the magnet to "breathe" with the result that moisture condenses on the inside of the magnet if it has not been made absolutely and permanently w a t e r-tight. Sometimes the magnet must work under water at salvaging steel and iron materials that have fallen overboard. A vacuum impregnating treatment prepares the magnet to withstand such ill treatment.

Vacuum is applied f o r twenty-four hours to a magnet coil, while it is at a high temperature. This extracts all moisture. Then hot plastic insulating compound is forced in under pressure, thus moisture proofing every part of the coil. After the coil has been assembled in the magnet case, all spaces are filled with a plastic filling compound, covering the coil and completely filling both terminal cavities. This seals every part of the magnet against moisture.

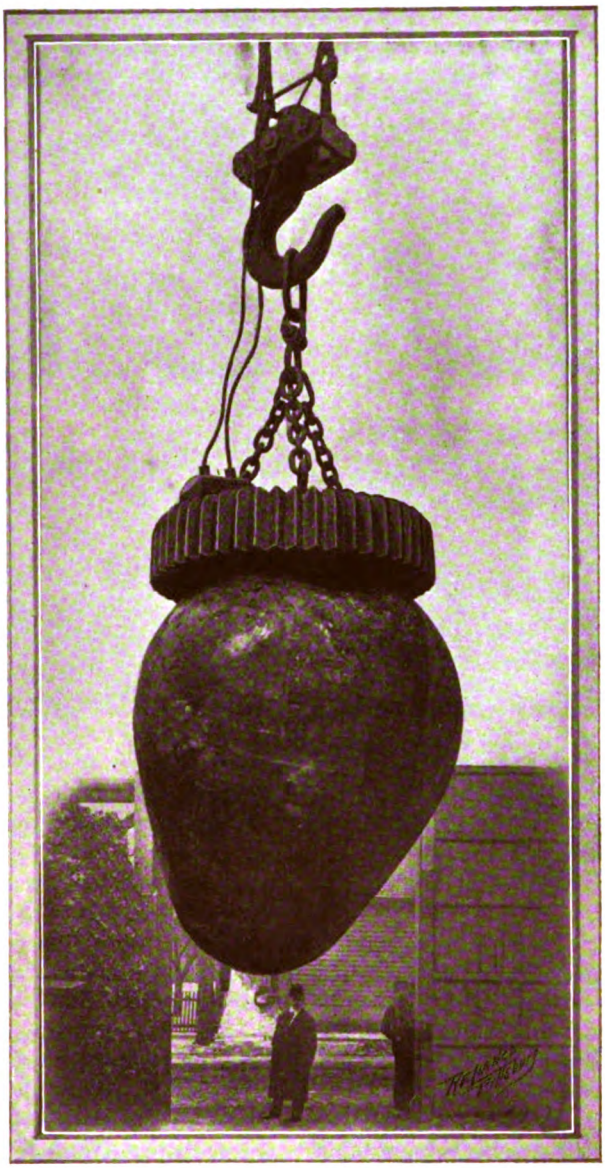


Fig. 10. A magnet handling a 12,000 pound "skull cracker" ball. For breaking up concrete, and even for dismantling certain buildings, this kind of equipment has proved a real boon.

A circular lifting magnet may weigh from one to four tons. Quite often in service, this heavy piece of electrical equipment will be dropped many feet onto the material being handled. It is evident that the magnet must be prepared to withstand the terrific shocks and blows encountered.

The bottom plate must be of a non-magnetic material. The first one used was made of brass but it soon wore through and exposed the coil to injury. Today this extra bottom plate is of manganese steel, a steel to which a small percentage of manganese has been added with the result that the steel is non-magnetic.

Although by far the largest percentage of lifting magnets sold today are of this mushroom type, there are other popular types which are suited to special jobs. For instance there are the rectangular plate and sheet lifting magnets, the bipolar rail magnets, the separator magnet for removing tramp iron from non-magnetic materials, and the small round magnets for l i f t i n g concentrated pieces. Compare these new magnets with the old timers; they're about as similar as the up-to-date eight-cylinder sedan or limousine is to those original high wheeled automobiles, aren't they?



Fig. 11. A modern magnet being used as an automatic hoist for punching scrap; taking the scrap from storage bin and dropping it into gondola cars.



Fig. 12. This casting weighs 3,127 pounds, and it is being held by a one inch line contact on the magnet; a demonstration of "pulling power."

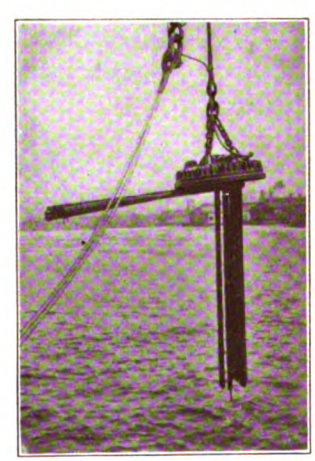


Fig. 13. Not only are modern lifting magnets exposed to weather, but they are often called on to go under water; and they are built to stand it.

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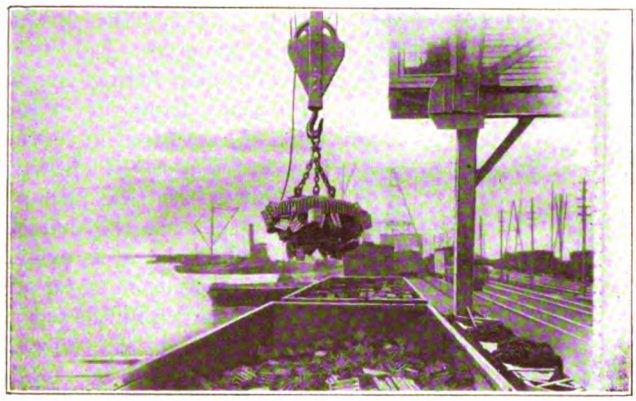


Fig. 14. These old magnets were good workers, and earned their keep. Lifting tie plates from a river barge.

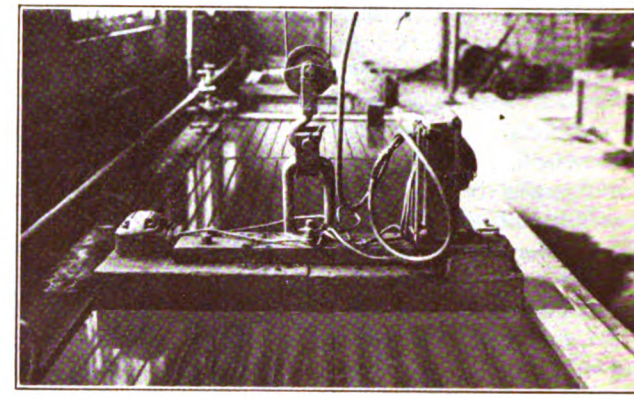


Fig. 15. Above—this magnet has to go into an acid bath after bar stock. It consists of two units fastened end to end.



Fig. 16. Handling pig iron with a modern magnet. Ask the men who have to handle pig by hand, what they think of this method.



Fig. 17. The problem of handling scrap iron and steel has always been a difficult one, and the lifting magnet is unique in this respect.

As with the automobile, too, this progress toward a perfected design is a matter of only the last thirty years. For some seventy years before that, the principles of the electro magnet were known, and used to a limited extent; while the discovery of magnetism as a natural force goes back many hundreds of years.

A very old legend, probably written about the year 200 B. C., tells of a shepherd named Magnes who while guarding his flocks on the slopes of Mount Ida suddenly found the iron ferrule of his staff and the nails of his shoes adhering to a stone. This stone was afterward named after him the "Magnes Stone" or "Magnet." This legend became greatly exaggerated during the Middle Ages, until sailors spun yarns about magnetic mountains which would pull iron nails out of their ships and move the compass needle astray.

As we now know, lumps of iron ore which are composed of a certain oxide of iron, sometimes have the property of attracting small pieces of iron. These old legends were based upon the properties of these first real lifting magnets, the lodestones.

From that early discovery of the natural magnet, there was a long period of years in which little practical use was made of the discovery; nor was there any knowledge of the relationship between electricity and magnetism. And even when this relationship was discovered, it remained a laboratory "toy" for many years more. Then came the tremendous developments in the practical uses of electricity, which made possible the highly useful modern lifting magnet.

In the space available, it is impossible to show all of the widely varied uses of these magnets. The lifting magnet, however, even though it is confined to the handling of magnetic metals only, has become almost indispensable in its field. Not only does it handle rails and sheets and bars of iron and steel quickly and efficiently, but in the case of scrap metal, for example, it does a job which no other type of equipment could do.

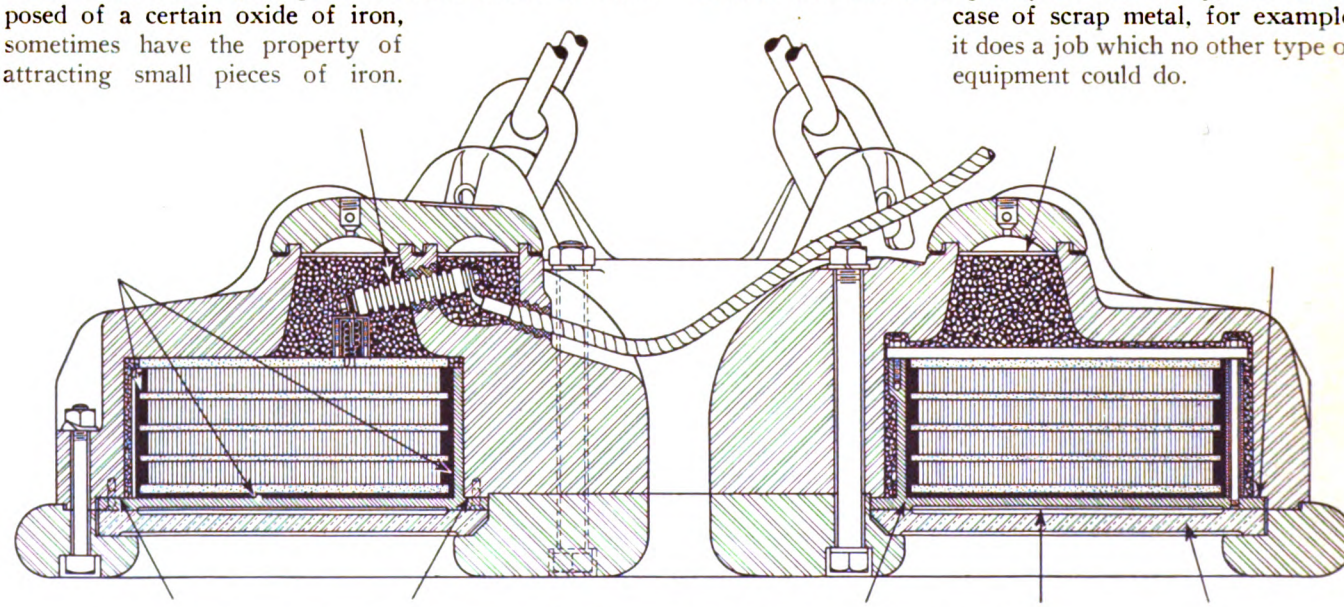
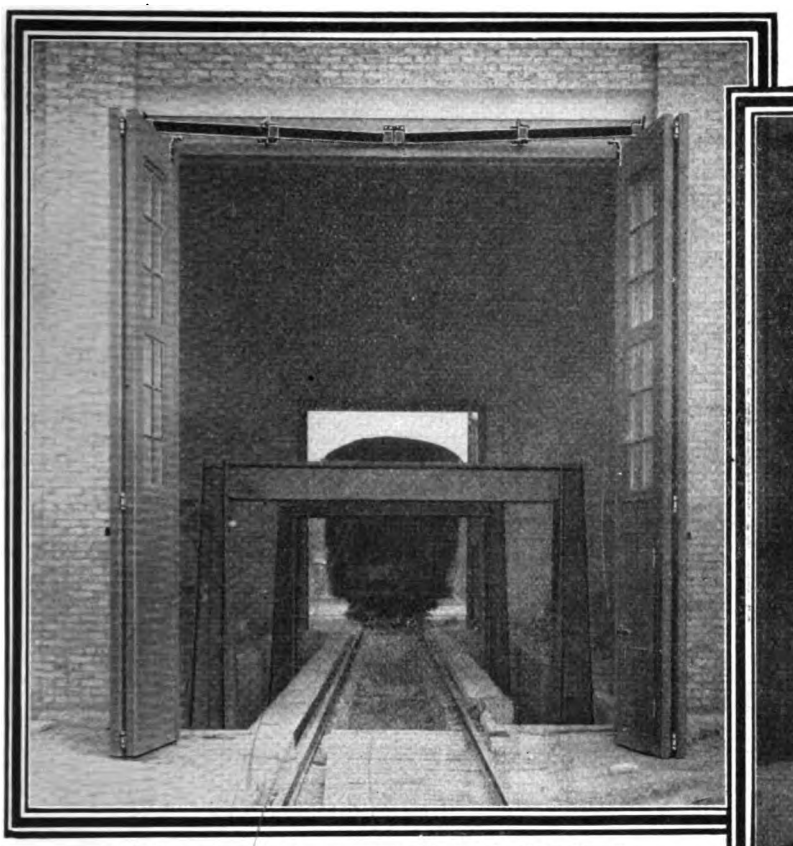


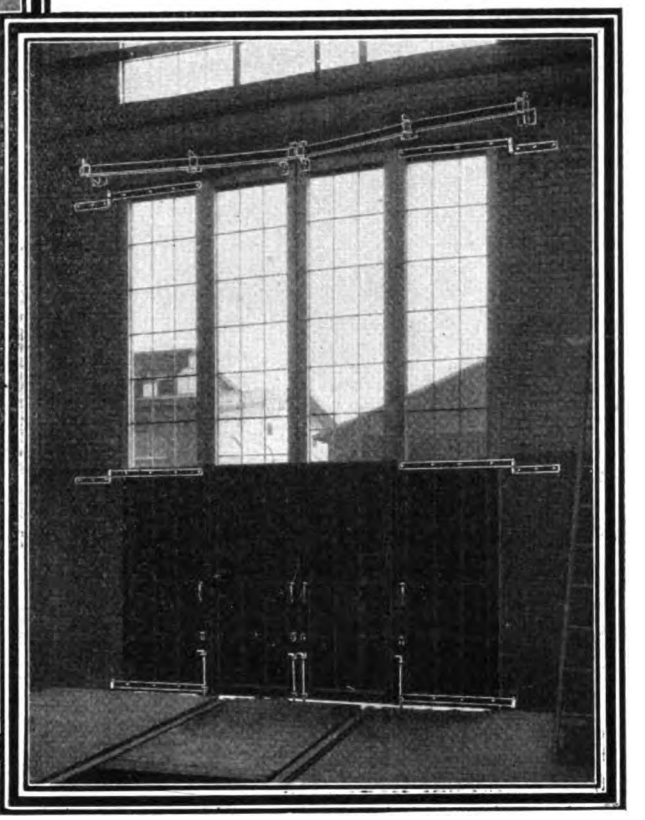
Fig. 18. This cross-section gives an idea of the construction of a modern circular lifting magnet. The many factors that have to be considered, are discussed in the text.

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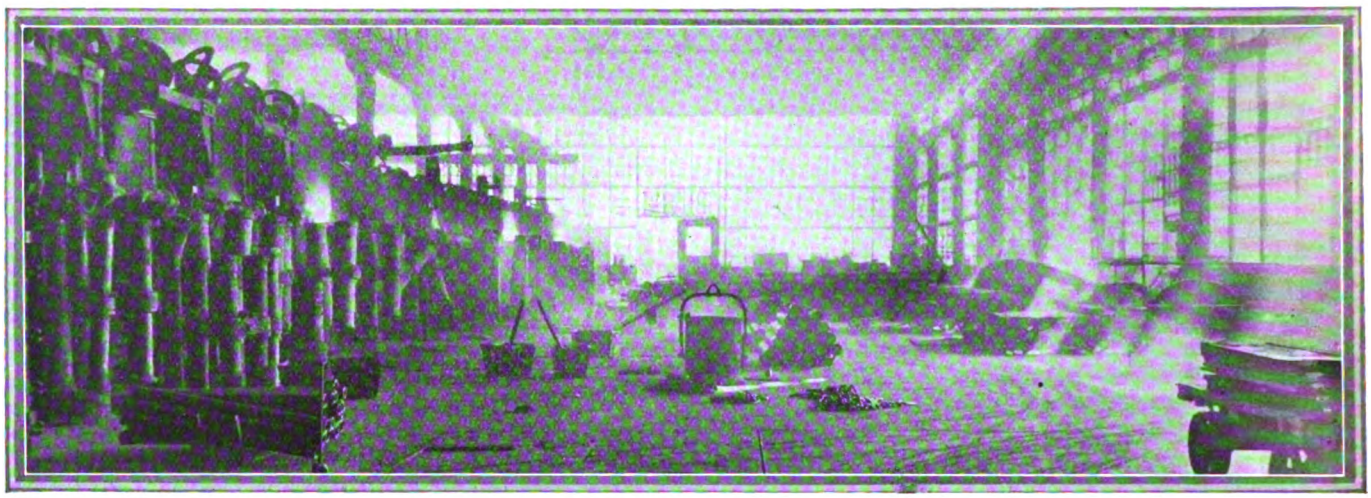


Fig. 1. A general view of the casting room of the Bridgeport Brass Company, where electrical melting furnaces have done much to improve conditions.

Sometimes the Most Expensive Heat Is Cheapest

Economy of Electrical Furnaces in the Brass Industry

By Francis A. Westbrook

ELECTRICAL power has made possible great improvements in the melting and casting of brass bars, billets and shells. In fact until the application about 1918 of the electrical induction furnace by the Bridgeport Brass Company of Bridgeport, Conn., for the melting and mixing of the metals of which the various kinds of brass are composed, there had been no fundamental change in the method of making brass castings since the Middle Ages.

The old way was known as the pit-fire method. There were long rows of pits of anthracite coal fires by which the metal was melted in crucibles holding about 200 lbs. each. Each caster was responsible for about ten pits. He was a highly skilled craftsman who learned the business by experience, and the "secrets" of the art were handed along from his predecessors. It was in this way that he learned when the metal was hot enough for "speltering" (that is, when the zinc should be added) and when the mixture was ready to pour.

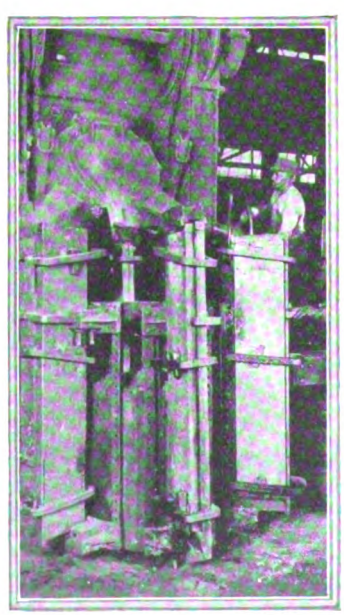


Fig. 2. The molten brass is here being poured into banded moulds.

When the metal was ready for speltering, the zinc was added, the mixture stirred by hand, and the crucible lifted from the fire by long-handled tongs. The stirring had to be done vigorously and during the process the caster would be enveloped in fumes from the zinc, which are decidedly disagreeable and quite likely to make him sick. Furthermore, while one crucible was being stirred some of the others might become overheated or too cool, and when it came to hand skimming the impurities floating on the surface of the molten brass, it was very uncertain whether the job would be thoroughly done or not. In other words, the human element entered into the making of brass to such an extent that uniform quality and rigid conformity to specifications was impossible.

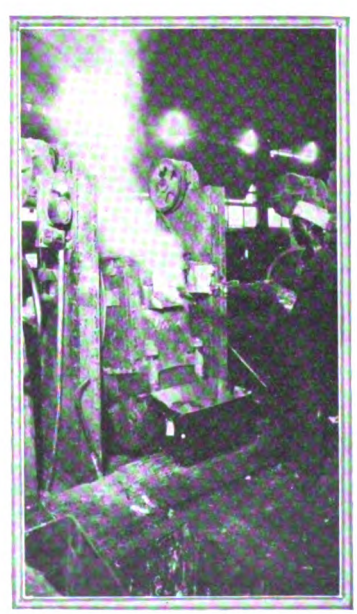


Fig. 3. Skimming impurities from the surface of the molten metal in the electric furnace.

The electrical induction furnace practically does away with all of these difficulties, but one thing should be remembered. That is, that casting brass is like all other engineering problems in that the best method to use depends entirely upon the conditions surrounding the work to be

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done. In a large plant the electric furnace has proved to be a great advance. In a small plant where only small quantities of brass are required incidentally, the old pit-fire method would undoubtedly be the more economical and satisfactory.

With the electrical furnace the heat is under accurate control. An ammeter shows the amount of current flowing and this is regulated by the mere turning of a switch. The variable quality of fuel or amount of draft has nothing to do with the process. The temperature may be directly measured by means of pyrometers. When the metal has reached the proper temperature for speltering there is no guesswork, or "secret," about it and when the spelter, or zinc, is added through the comparatively small opening of the furnace there is no billowing cloud of fumes issuing into the shop. This not only means that the waste of zinc from this cause has been reduced from six per cent. to about .5 per cent. but it also means that the workmen do not have to breathe poisonous gases. The electric furnaces are also so well heat insulated that there is very little discomfort to the workmen from this cause. Manual stirring is to some extent eliminated by the thorough mixing action which takes place automatically within the furnace. The skimming is done through a small opening without subjecting the operator to any discomfort which makes him tend to be careless about it; and the pouring is accomplished by mechanical means which reduces waste from spilling and danger from accidents to a minimum.

Another great advantage in using electrical furnaces is that comparatively large quantities of brass are melted at a time, and this, aside from other obvious merits, makes it easily possible to secure samples at every pour for laboratory test. In addition to this, samples are taken from the furnaces at each shift and every time the mixture is changed, so that the closest kind of check can be kept on the quality of the production at all times.

Finally, the process of brass casting has now been reduced to a state where any intelligent workman can handle it with precision, without such a long apprenticeship as formerly, and then at best only with a wasteful uncertainty.

Among the objections which have been raised to this type of furnace is the necessity of starting with a molten charge and the difficulty of changing from one alloy to another. This is simply another condition calling for good engineering judgment. In some instances these objections would doubtless be serious, but not in the operation of a large casting shop. When a new furnace is put in service there is always a furnace of similar, or nearly similar, alloy available to furnish the molten charge. When a large production is being turned out it is almost always possible to operate so that most of the furnaces are kept on the same alloys practically continuously. When changes from one alloy to another must be made, it is usually practicable to make the first charge of such proportions with respect to the molten charge already in the furnace that it will not be necessary to dump it.

Most of the furnaces are rated at 50 kw., although there are some as large as 90 kw. The usual operating voltage is 220 single phase at 60 cycles. The power factor is about 80 per cent.

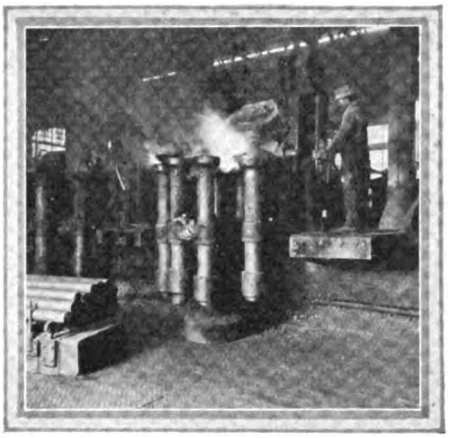
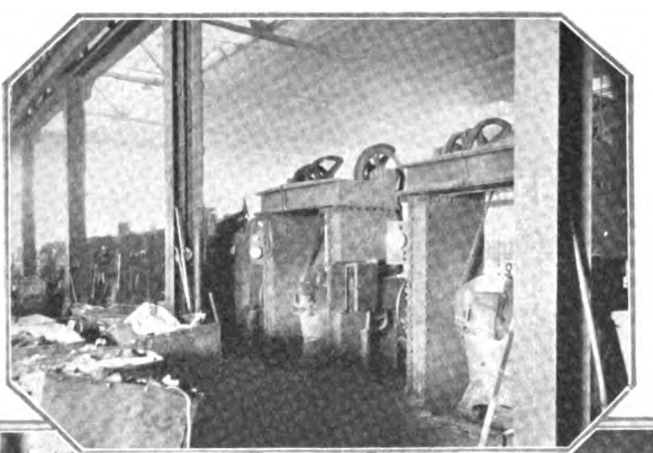


Fig. 4. This shows the pouring side of a furnace. Note the small amount of escaping fumes, as these ingots are being poured.

Fig. 5. Below, a row of electric furnaces at the Bridgeport works. Large volume production is a factor in the economical employment of these furnaces.



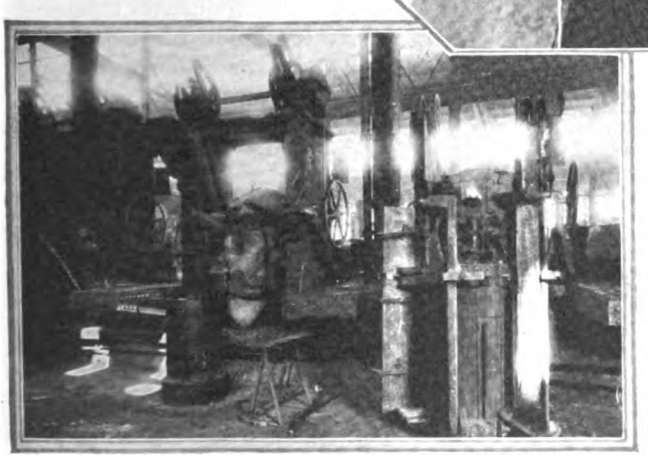


Fig. 6. A step in the production of flat brass shapes. Brass being an alloy of copper and zinc, it is necessary to vary the proportions for different uses; which involves extensive furnace equipment.

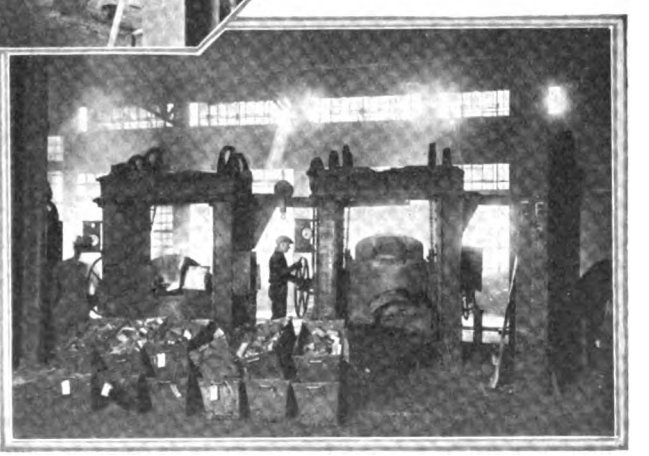


Fig. 7. The charging side of one of the electric furnaces for brass melting. Note the containers for the melting charge, and the ammeter at each furnace.

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Fig. 1. This is the way they clear away the ice in the arena, after a hockey match —a job formerly requiring some thirty men and four to ten times as much time.

Modern Methods Invade the Sports Arena

Electric Trucks at Madison Square Garden

HOW the new Madison Square Garden, New York, said to be the world's greatest sport center, is changed from a skating rink to a boxing match arena over night provides an interesting example of modern materials handling methods applied to sports promotion.

This transformation scene takes place every night over a period as long as a week at a time. For instance, following a hockey match on one night there may be a convention or an athletic meet the following, with a bout on the third evening. Then it is necessary to convert the arena into a rink again for one night and so on from one to another.

Modern factory efficiency enters into this transformation with the use of two electric industrial trucks, each operated by a 12 cell storage battery. These trucks, it may be observed, "do everything about the Garden except perform the duties of a night watchman."

Immediately following a hockey game, warm brine is circulated through the refrigeration pipes, which are imbedded in the concrete floor. This warm brine quickly loosens the ice and the two industrial trucks then get busy. One truck is equipped with a plow for breaking up the ice and the other with a scoop, which shovels the ice into a convenient opening in the arena and onto a truck below. The ice, which is 1½ inches thick and covers over 24,000 square feet, weighs 85 tons.

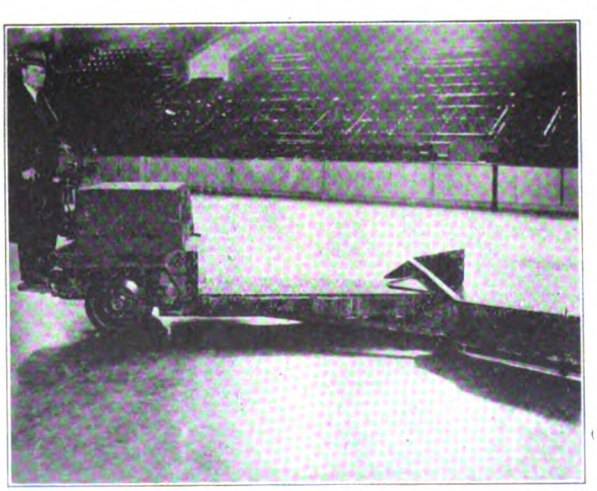


Fig. 2. A famous sports promoter in a new role; Tex Rickard demonstrates one of his mechanical pets.

J. J. McNally, superintendent of the arena, states that the two trucks clear the entire arena in two hours. At the end of that time, the arena is dry and ready for the next act. Mr. McNally further states that without these trucks it would require at least 30 men working from 8 to 10 hours to clear the ice away, which would seriously interfere with their schedule.

As soon as the ice is cleared away, the two busy little industrial trucks carry the chairs and other furniture into the arena. This furniture is stored on skids, which are lifted by the elevating platform of the truck. During circus time the fodder for the various animals is distributed on the two industrial trucks.

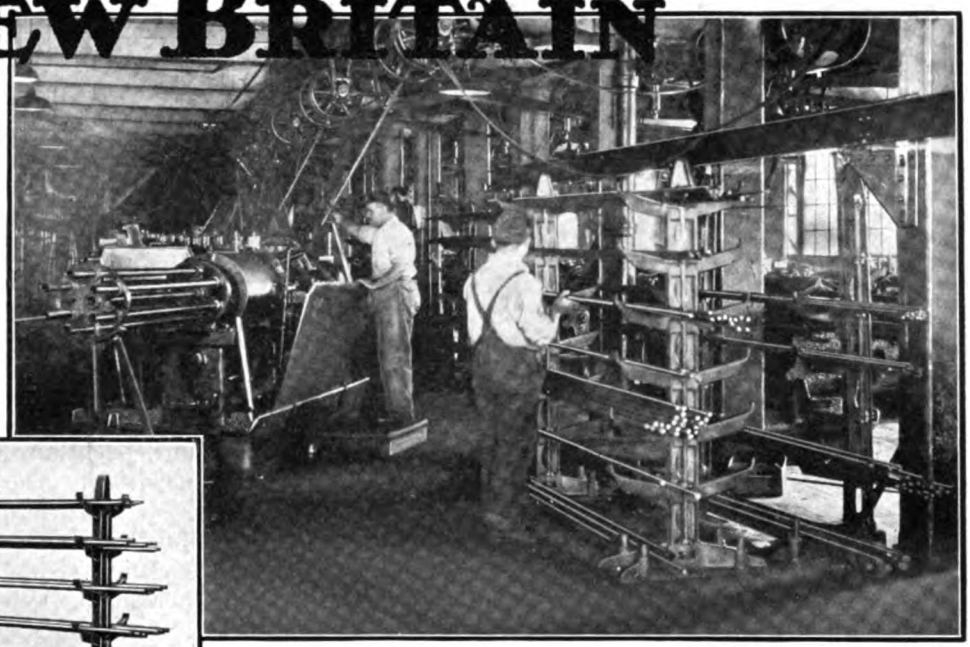
Naturally, in the case of an arena such as this, the saving in labor is far overshadowed by the saving of time.

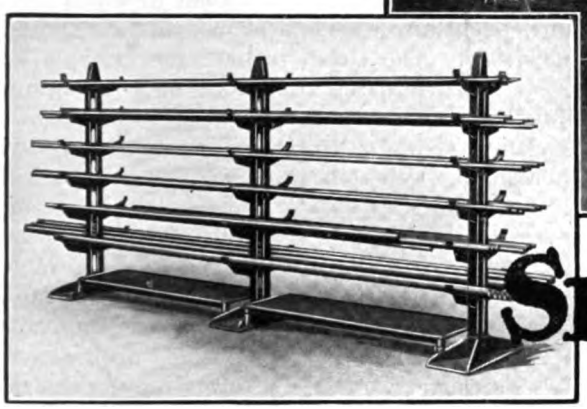
Tex Rickard, world's greatest sport promoter, is the owner of the two trucks. Besides being interested in sport promotion he is also interested in modern efficiency methods of this nature and he understands thoroughly the operation of these industrial trucks. In fact, "Tex" takes great pride in demonstrating them to his friends. On such occasions he personally operates them.

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Getting the Most Service from Lubricating Oils

Oil Filters and Cleaners in the Industrial Plant

By Allen F. Brewer

THE development of means and methods for lubricating oil purification and reclamation has been one of the outstanding problems in the evolution of the science of industrial plant lubrication. The era of experimental waste has passed, to give way to present day methods of economy unhoped for but a few years back.

It is not enough to devote our energies to fuel conservation, too easily can we lose out on all our savings, by inattention to power generation and transmission, or by disregard of those factors which may promote friction and prevent lubricating oils from functioning at their best. The most deleterious of these is, of course, contamination, or the entry of water, dust, dirt, or metallic particles, all of which if allowed to remain in the oil will reduce its lubricating ability, forming sludges, clogging oil ducts and scoring bearings.

Foreign matter must therefore be removed, and the oil purified or reconditioned. This may be necessary continuously or periodically, dependent upon the service involved, the possibility of entry of foreign matter, the type of purifier or filter, and the extent to which faulty lubrication might affect general plant operation and machine efficiency. The steam turbine for example will impose far more exacting conditions upon its bearing lubricants than a reciprocating pump.

Oil reclamation was a logical development along with flood lubrication. Where bearings are fed with periodic doses of lubricating oils, these latter may frequently be considered as waste after one usage, and accumulated drippings are often thrown away as of no value. Collection of these, however, with suitable filtering or purification to remove grit, dirt, metallic particles, water and sludge, introduces the possibility of increasing the rate of lubrication and decreasing the oil consumption.

Oil purification, cleansing or filtration have essentially the

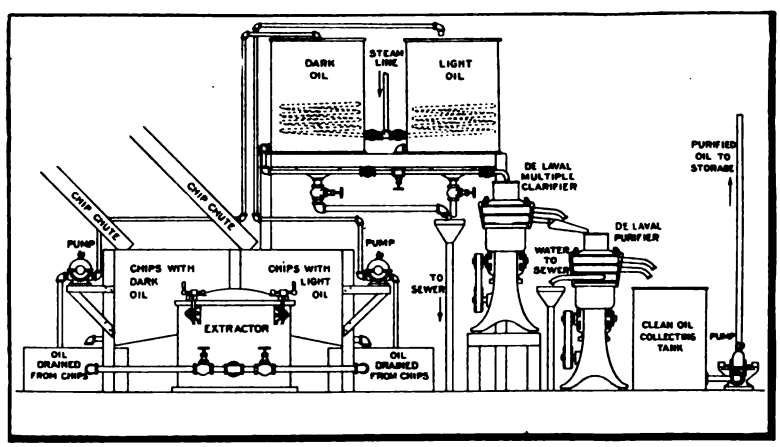


Fig. 1. A modern cutting oil purification system in the machine shop showing the necessary piping, the relative size and location of tanks, chip extractors and oil purifiers, and the chip chutes to eliminate manual handling as far as possible.

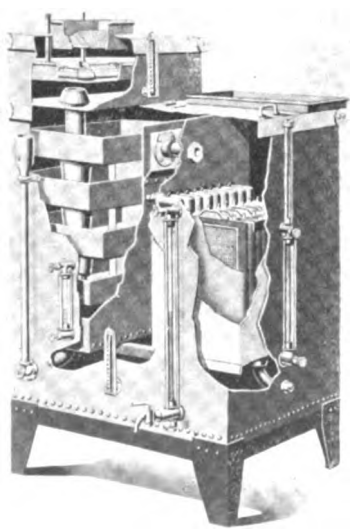


Fig. 2. Details of a modern oil filter which is capable of removing both water and solid foreign matter from lubricating oil by means of sedimentation and filtration. Note the settling pans at the left, the filters being located at the right. Oil as it comes from service on the steam turbine, Diesel engine, machine tool, etc., flows first over the settling pans and then through the filters.

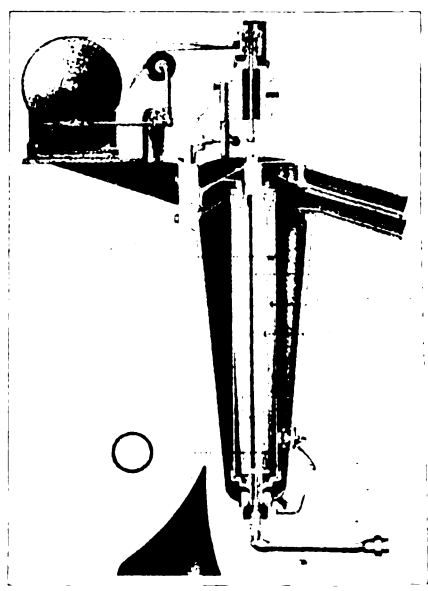
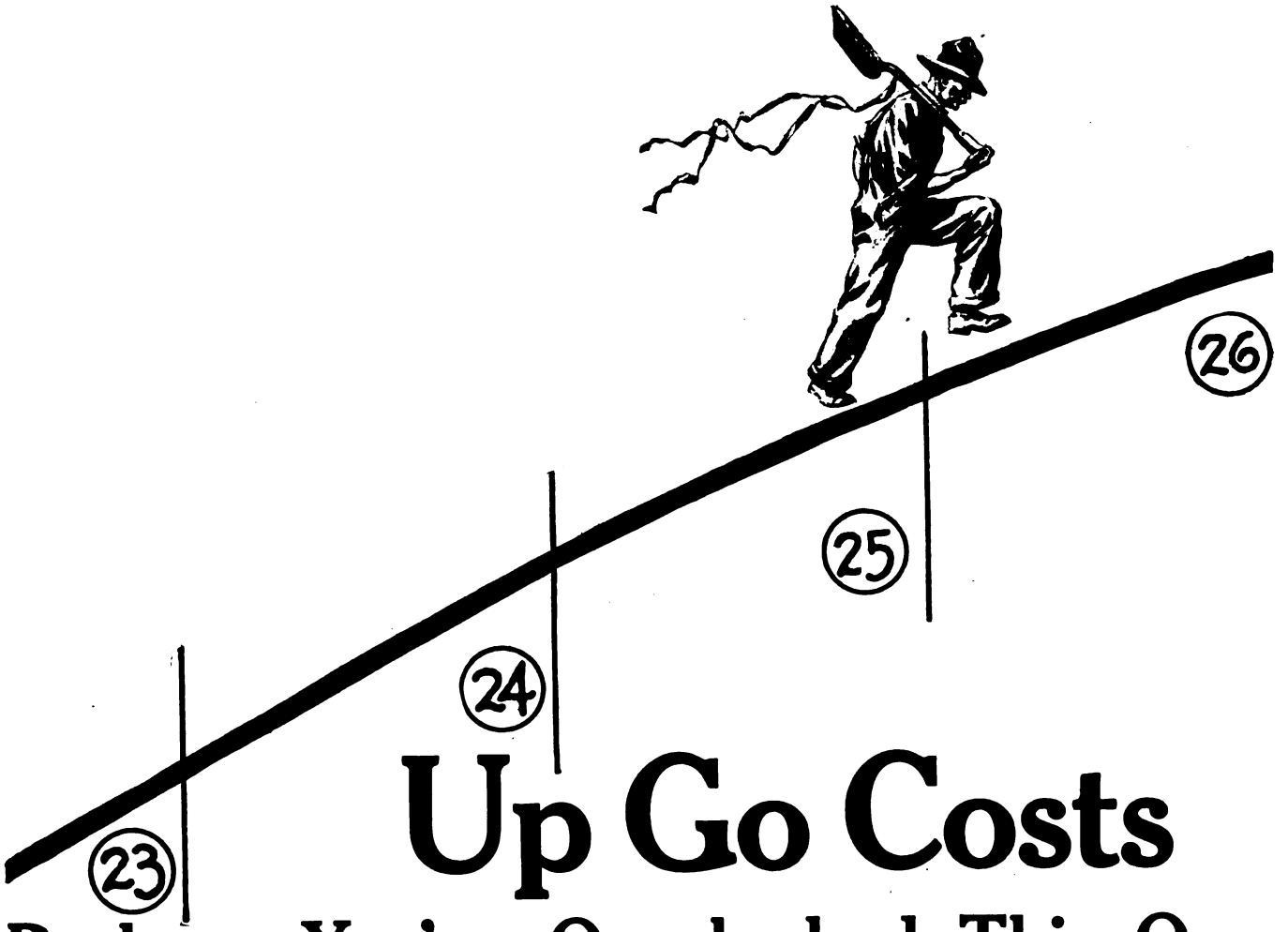


Fig. 3. Sectional view of a centrifuge designed for handling and purifying lubricating oil, showing the various parts, and relative positions of air, water and oil. In this type of centrifuge the liquids pass through the bowl to discharge separately, the solids in the course of separation being deposited on the wall of the latter.

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same meaning. They are attained by the application of one of three basic principles, i. e., filtration, precipitation or centrifugal force; or certain combinations, in various types of apparatus. Precipitation, as related to lubricating oils, is generally known as the natural separation by gravity that occurs between an oil and any foreign substance of different specific gravity.

The rate of precipitation can frequently be increased by chemical or mechanical means, or heating. To a great extent precipitation depends upon the length of time the oil is allowed to stand and the state of quietude. Naturally agitation to any degree, or movement of the mediums will interfere with the suspended impurities seeking their relative stratums in the shortest possible time. To gain the maximum of precipitation the liquid should be in a state of perfect rest.

Filtration may be described as the process of screening the oil through some porous substance or material with fine openings such as fabric or wire mesh, the oil passing easily through but the foreign matter being retained by the filter. The efficiency of filtration depends upon the density or fineness of the filtering medium.

The extent to which an oil must be cleansed or purified should be the governing factor as to the period of precipitation or the density of the filter; or, if both methods are combined, the relative effectiveness of each

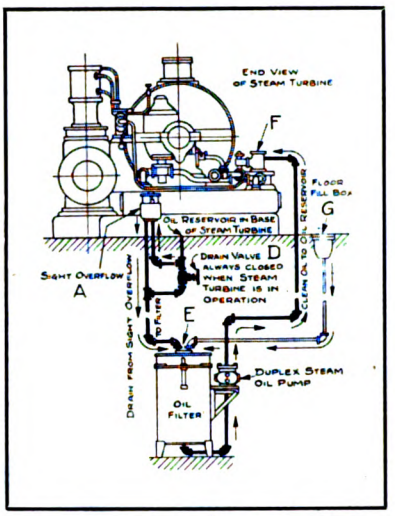


Fig. 4. End view of a steam turbine showing details of a lubricating oil filtration system. Arrows indicate path of oil to and from turbine bearings, in passage through the oil filter.

commensurate with the volume of oil to be treated, and the time available. Perfect separation is an unnecessary and abnormally expensive goal. Suffice it to say that the oil should simply be treated till it approximates new oil in its ability to insure desired results.

Centrifugal force as a means of separating substances of different specific gravities has long been known to give far more effective results than the simple action of gravity in far less time. This is only natural since centrifugal separation involves a much greater force. Applied to oil purification centrifugal force gives a positive separation, in a few minutes, of foreign matter of greater or less specific gravity than the oil involved, that practically could not be obtained by simple precipitation over perhaps days of settling.

Similar to precipitation, it has been developed that lubricating oil purification can be materially hastened by heating to a certain extent to reduce the viscosity or body of the oil somewhat, and break up any contained emulsions. Thus foreign particles of different specific gravity can separate more readily, regardless of slight variations in gravity or their relative fineness.

It is possible, with few exceptions, to reclaim or purify lubricating oils whatever usage they may have been put to, though the type of apparatus involved may differ somewhat. Oils from steam driven stationary or

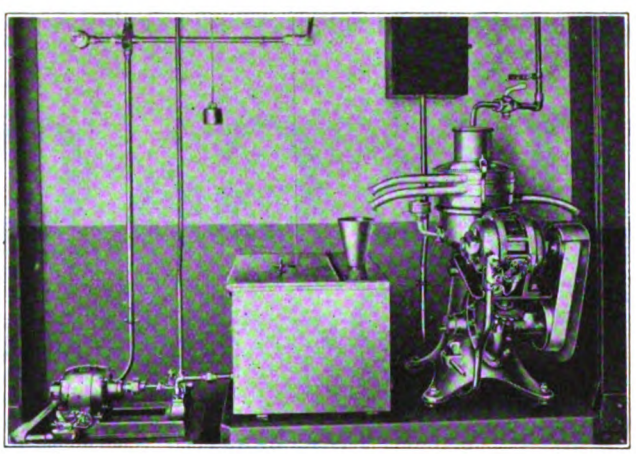


Fig. 5. The compactness of a centrifugal separator installation is well illustrated by this view. Such a separator is adaptable to lubricating oil purification of any nature. It is of the motor driven type, the relative size of clean oil tank and circulating pump being clearly shown.

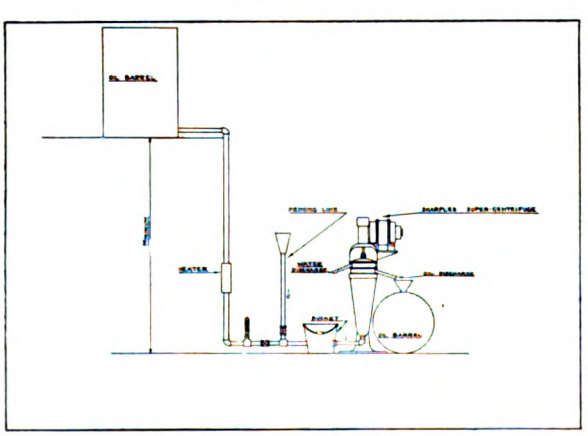


Fig. 6. The essential piping, storage containers and other equiment required in a typical centrifugal separator installation is shown above.

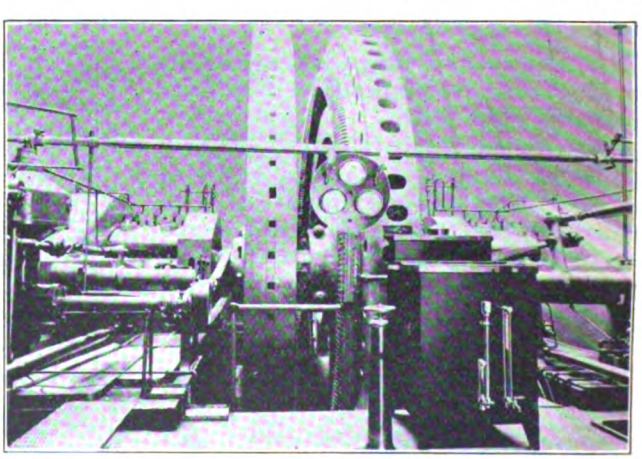


Fig. 7. An individual oiling and filtering system installed on a cross-compound type of engine. Both oil filter and the respective lubricating oil pipes to the various bearings are very well brought out. Relatively pure oil in the circulating system of a steam engine is of decided importance, and the oil filter is well known for its success in insuring this end.

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Miles Per Hour



1924
by HILL
(250 Miles)
126.9
Miles Per Hour
1926
(250 Miles)
131.29
Miles Per Hour



1925
by De PAOLO
(500 Miles)
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Miles Per Hour
1926
(300 Miles)
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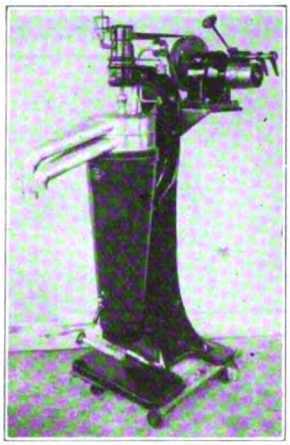


Fig. 8. How compact and relatively simple the centrifuge actually is can be appreciated from this view. Where necessary it can be portable, and it is adaptable to the power plant, machine shop, car house, or, in fact, wherever lubricating oil must be purified.

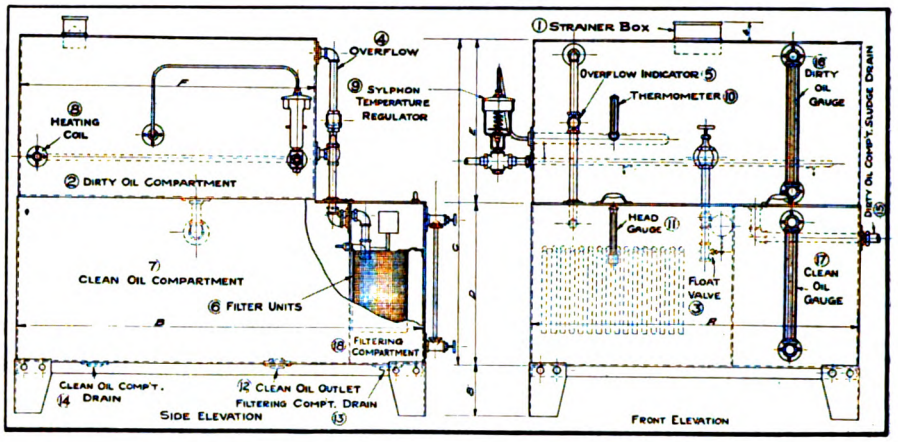


Fig. 9. Where necessary to recondition lubricating and cutting oils by means of the "Batch Method," the oil filter as shown is especially adaptable. The dirtiest oils can be readily treated since the length of time necessary for precipitation and filtration can be regulated according to the degree of contamination, the extent to which the oils must be cleansed, and their physical characteristics.

marine power plants, car oils in journal box waste, gasoline engine crank case oils, lubricants present in condensate from condensing engines, Diesel engine oils, lubricants from splash systems and ring or chain oiled bearings, and cutting oils from machine shops, are a few of the more common instances where installation of oil reconditioning equipment will show wonderful savings.

To bring this about one of two general processes is generally used, i. e., a filtering system involving combined precipitation and filtration, or a system wherein the principles of centrifugal force are employed. Use of either system will depend to a great extent on the class of service involved, the volume of lubricants to be treated and the degree to which they are contaminated. To meet these conditions three distinct methods of operation are in use, i. e., batch, continuous, and partial (or continuous by-pass) treatment.

In batch purification the periodic removal of the entire volume of the oil from the lubricating system is necessary. It is replaced by a clean charge of oil meanwhile. Frequently this method is not entirely practical due to the limitations of operation which it entails. For example, the machine must be shut down while the dirty oil is being withdrawn and clean oil substituted; the oil in service may not be treated until it is very dirty or contaminated with considerable water, and hence the machine often is run over an indefinite period on oil conducive to excessive sludge formation, probable emulsification, scoring and clogging of the oil lines. Finally, the opinion of the operator is usually the guiding factor as to when the oil is dirty enough for treatment. In continuous reconditioning the entire volume of the oil involved is treated in the purification apparatus each time it is pumped by the lubricating pump. Thus the possibility of foreign matter being transmitted to, or lodged in, the bearings, etc., is practically eliminated. As well, in the treatment of cutting oils the possibility of the used oils still containing metallic particles due to imperfect separation is effectively overcome.

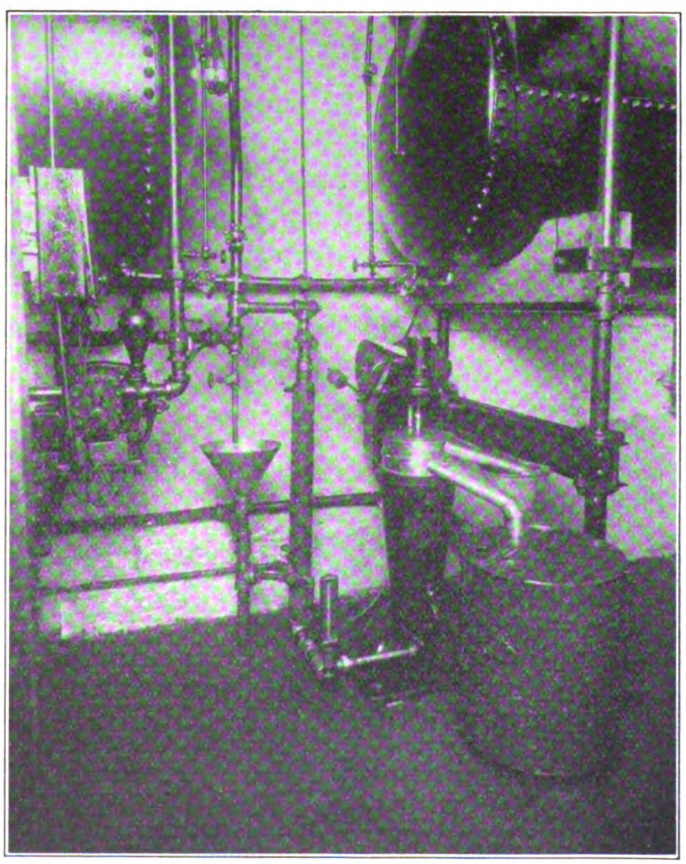


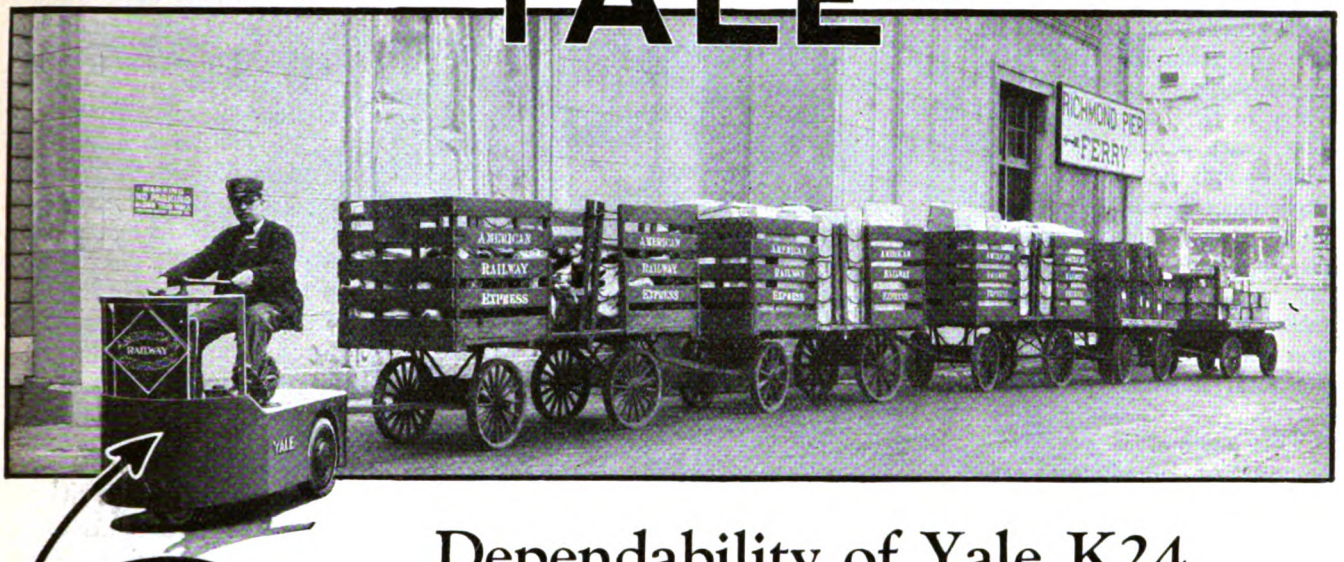
Fig. 10. A centrifuge installation in the modern power plant for turbine and engine oil purification is distinctive for the compactness of its piping and layout. Here is a very good example of the necessary equipment and fitting involved.

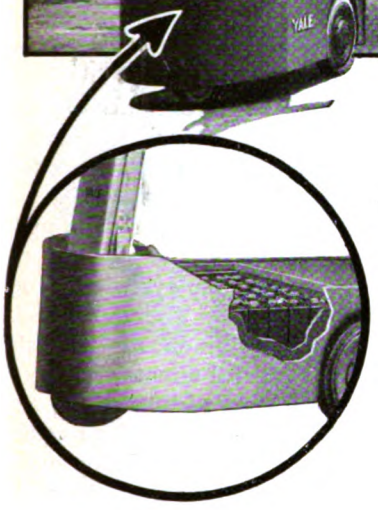
To afford the degree of positive lubrication with relatively clean lubricants, that is so necessary on such machinery as steam turbines, etc., the partial or continuous by-pass method of purification has been developed. The principle of this method is based on the continuous removal (or by-passing) of from ten to twenty per cent. of the oil in the system by means of a suitable sight overflow, leading it therefrom to the reconditioning equipment. In this latter the oil is separated from emulsified matter, sludge, dirt, water, air,

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YALE—the Key to lower handling costs. Chapter 32 on *Storage Battery Trucking.*

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etc., and any further impurities that would tend to render lubrication inefficient.

In general the oil should be removed from the lower part of the sump tank prior to delivery to the filter or purifier. The exact percentage to bypass should be developed by experiment, based on the grade of oil in use, the approximate rate at which water enters it, the condition of wearing surfaces, the rate of oil circulation through the system, and the total amount of oil involved.

This method is very economical of oil and insures proper and efficient lubrication provided (1)—That the initial charge of oil is a high grade properly refined product, and (2)—That the purification apparatus is not overworked. In general this latter should be large enough to treat all the oil in the system in about four hours. This should always be done on shutting down, so that when starting up again the entire volume of oil in the system will be as clean as possible.

It should be borne in mind that ultimately all lubricating oils, whatever service they may be put to, will become more or less contaminated with water, dirt, sludge, metallic particles, or other impurities, which will cause a marked decrease in lubricating value, and consequently higher friction losses and greater power consumption. If such contamination is allowed to continue unchecked, or, in other words, without proper reclamation of the oils, sooner or later these will practically wear out from a lubricating viewpoint.

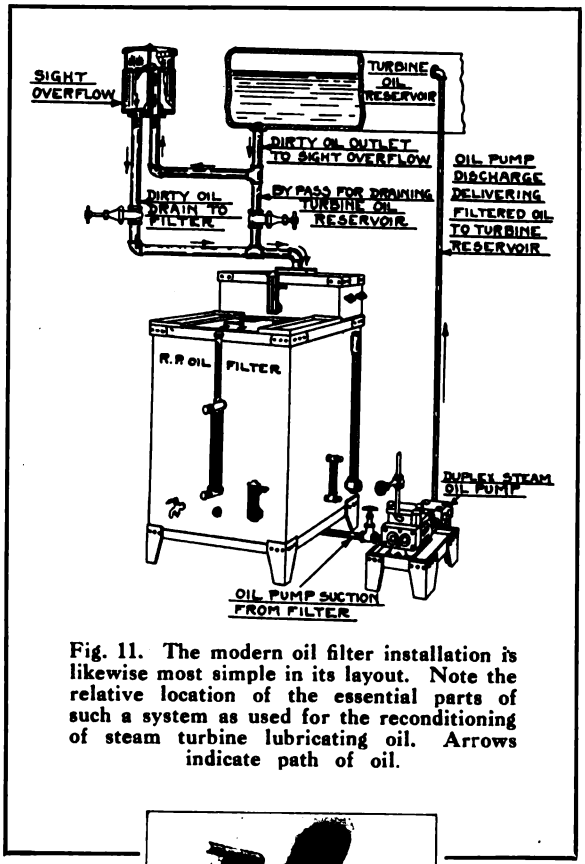


Fig. 11. The modern oil filter installation is likewise most simple in its layout. Note the relative location of the essential parts of such a system as used for the reconditioning of steam turbine lubricating oil. Arrows indicate path of oil.



Fig. 12. The filter as involved in an oil filtering system. Note type of mesh, the outside cover, and the provision for handling.

It will, therefore, be to the interest of every user of lubricating oils to assure himself that at all times his lubricants are in such a state of purity that breakdowns will be guarded against. This only can be maintained by use of the highest grades of lubricants, absolutely suited to the service involved, applied in a scientifically correct manner, and properly filtered or purified so they will constantly be capable of meeting requirements.

Proper reconditioning of lubricating oils will also have a marked psychological effect upon the plant as a whole. The elimination of worry and mental strain on the part of responsible employees is a decided asset. They will be in better condition to give the most careful attention to operation, the functioning of lubricating systems, and the maintenance of all equipment in such a state as to develop maximum efficiency. This will all be probable if they can feel that bearings are being protected against entry of foreign matter. For, too often a burned out bearing will mean shutdown, overtime work, loss of production, subsequent overload, and not infrequently the job of the operator. No wonder lubricating oil reconditioning is, therefore, favored by the man who keeps things running.

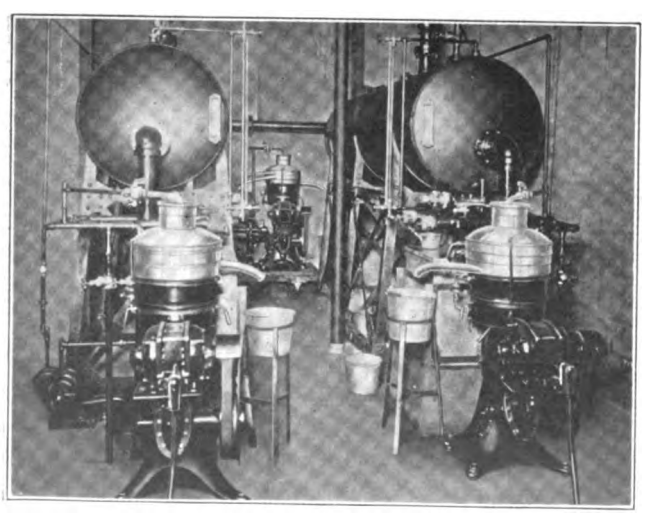


Fig. 13. In many plants the volume of oil involved may require more than one purification installation. Frequently an oil recovery room may be planned for. Here all such equipment can be located, under conditions of cleanliness conducive to best reconditioning of the oils to be treated.

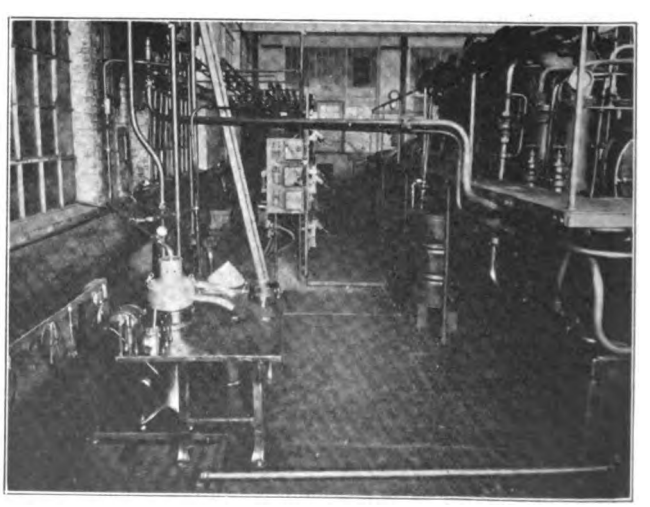
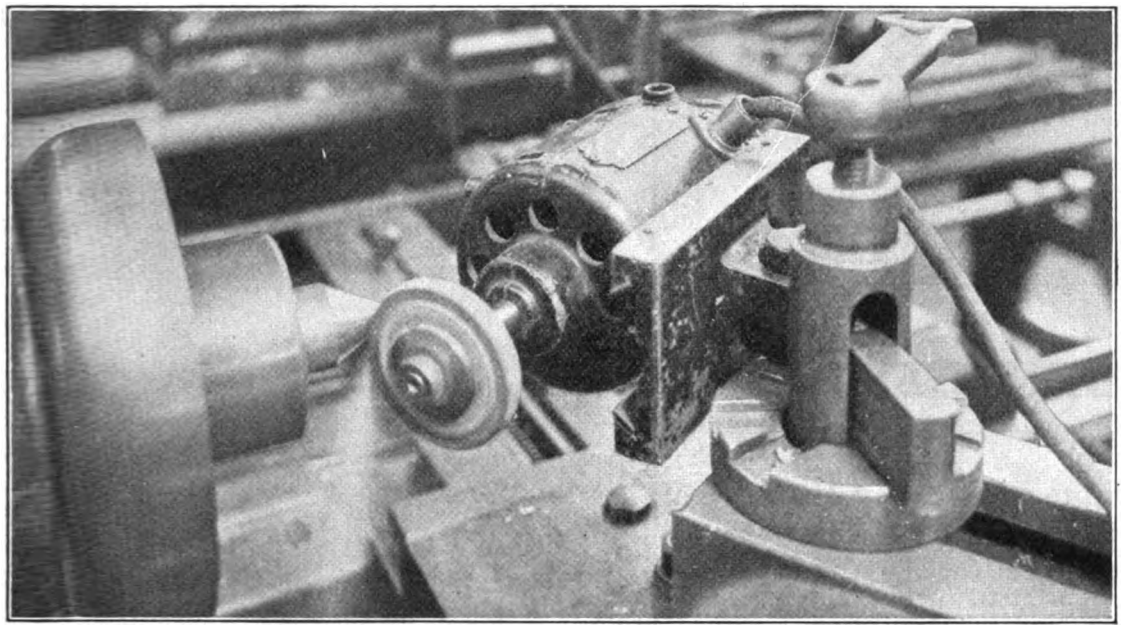


Fig. 14. An oil purification installation for handling lubricating oils from a battery of Diesel engines. On such equipment crankcase lubricants for serving the various bearings must be kept in good condition, and the oil purifier does the job in an enviable manner.

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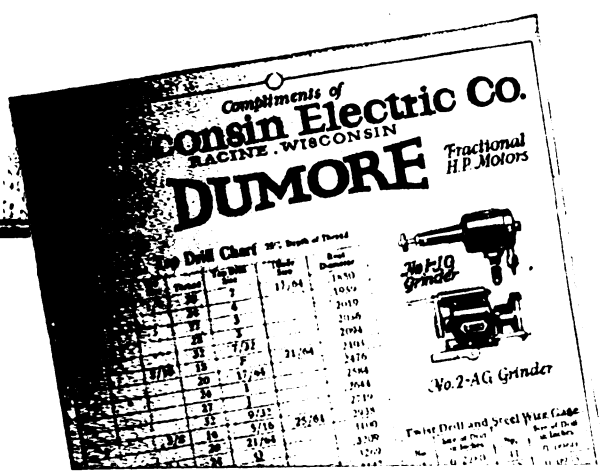


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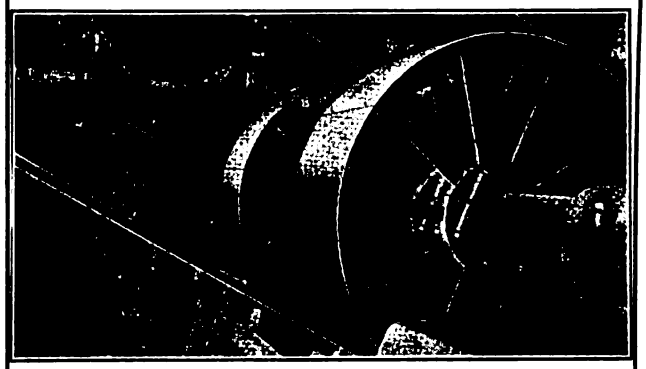
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Accident Liability and the Physically Unfit Worker

The Right of an Employee to Recover, Under Workmen's Compensation Statute, for Injury Caused by His Pre-Existing Physical Condition

By Leslie Childs

THE question of the right of an employee, under a workmen's compensation statute, to recover for injuries received, which have been caused or contributed to by such employee's pre-existing physical condition, is worthy the attention of employers in general. Especially is this true in factories and other industrial plants where a large labor turnover is the rule, which is frequently made with but slight, if any, investigation of the physical condition and history of employees when they are employed.

For, in such a situation, employees may be placed on the pay roll that will constitute a potential liability to the employer from the start; men who are weak in some physical requirement that may not be noticeable at the time of their employment, but which may subject them to a breakdown or lapse thereafter. If then such an employee suffers injury, because of his pre-existing physical condition, during the course of his employment, the question of the liability of the current employer therefor may assume great importance.

With this in mind, a brief review of certain cases on the question may prove of interest and profit in illustrating the trend of judicial reasoning on the subject. For this purpose Carroll vs. Industrial Commission, 69 Colo. 473, will serve as a beginning.

Employee Had Heart Trouble

In this case Joseph Carroll was employed in an alfalfa mill, where he was required to work in an inclosed building in dust-laden air. Carroll had organic heart trouble. During the course of his employment he suffered an attack of heart failure, caused by the work and his surroundings, which resulted in his instant death. In upholding an award of compensation to his dependents the court said:

"The dust-laden condition of the air was the 'proximate cause' of the death because, had it not been for such condition, the death would not have occurred at the time. Such condition of the air which decedent was required to breathe brought on an attack of heart trouble, resulting in death. The dust-laden condition of the air was the cause, and the fatal attack of heart failure was the result. The result was unexpected and unintended, and therefore an accident."

Another case of this kind was Re Madden, decided by the Massachusetts Supreme Judicial Court, 222 Mass. 487. In this case an employee was employed by a carpet company. Before entering the service of the company the employee had a "weak heart condition," and during the course of the employment suffered a pain in the region

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of the heart. The employee's condition became so serious as to require hospital attention.

Application was made by the employee for compensation under the Massachusetts Law. The Industrial Accident Board awarded the employee compensation based on a finding that the work the employee was doing on the day of the injury "so aggravated and accelerated a weak heart condition as to incapacitate her for work, and that she received a personal injury arising out of and in the course of her employment." In passing upon the question of how the pre-existing weak heart condition of the employee would affect the right to compensation, and in affirming the award, the court said:

"The act . . . protects the 'employee'. . . . There is nothing said about the protection being confined to the healthy employee. The previous condition of health is of no consequence in determining the amount of relief to be afforded. . . . The act makes no distinction between wise or foolish, skilled or inexperienced, healthy or diseased employees. All who rightly are describable as employees come within the act. . . .

"When a pre-existing heart disease of the employee is accelerated to the point of disablement by the exertion and strain of the employment, not due to the character of the disease acting alone, or progressing as it would in any rational work, there may be found to have been a personal injury."

Epilepsy as Affecting Right to Compensation

So much for heart disease in this connection, and now let us see how another common disability, namely, epilepsy, may affect the right of an employee so afflicted to claim compensation for an injury which has been contributed to by an attack of this kind in the course of his employment.

In one case of this kind, Rockford Hotel Company vs. Industrial Commission et al., 300 Ill. 87, an employee whose duties required him to remove cinders and ashes from a furnace fell into the ash pit and suffered burns which resulted in his death. His widow applied for compensation under the Illinois statute, which was opposed on the ground that the employee fell into the ash pit while seized with an epileptic fit. In upholding an award of compensation the court said:

"The fact that we cannot overlook or ignore is that Madison (the employee), by reason of his falling into the pit while engaged in performing the duties of his employment, was so severely injured that he died from the injuries. He did not die from epilepsy or pre-existing illness, but from the burns he received from falling into the pit. Some cases hold that, where an employee is seized with a fit and falls to his death, the employer is not liable, because the injury did not arise out of the employment. . . . But a majority of the courts, American and English, hold that, if the injury is due to the fall, the employer is liable, even though the fall was caused by a pre-existing idiopathic condition."

The other view of this phase of the question is illustrated in a striking manner in Van Gorder vs. Packard Motor Car Company, a Michigan case reported in 162 N. W. 107. The facts which culminated in the action being, briefly stated, as follows:

An employee, who was a plumber and steam fitter, was predisposed to epilepsy though his employer had no knowledge of this. In the course of his employment he was seized with an epileptic fit, fell from a scaffold, and

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But, remember that the point is sharp and hard, the flutes and clearances accurate, the body tough and true, and the resulting hole clean and smooth because *they* make it their special business to see that you receive and use only the tools that are as nearly RIGHT as men and machinery can make them.

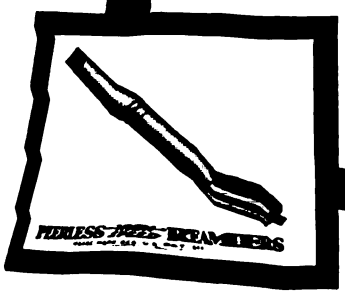


The CLEVELAND TWIST DRILL COMPANY CLEVELAND NEW YORK · CHICAGO · LONDON

TRADE MARK REG. U S PAT OFF AND FOREIGN COUNTRIES

Manufacturers of Carbon and Cle-Forge High Speed Drills for every purpose; "Mezzo" Super-Carbon Drills; Hand, Jobbers' and Shell Reamers; "Peerless" High Speed Reamers; "Paradox" Adjustable Reamers; "Quick-Set" Reamers; "Spirex" Machine Taper Pin Reamers; Chucking Reamers for Turret Lathes; Counterbores; Countersinks; Sockets; End Mills; and the "Ezy-Out" Screw Extractor.











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Enter the edge of the lap about 2½ inches back from the point so it can be opened gradually without tearing



"There's money in this for you"

Get one of these new booklets for your belt man. Each of the 16 pages details a fine point in the operation of repairing and making belts endless, just as it is done by *Schieren* workmen.

If you haven't already adopted this method of belt care send for the booklet now. It will assist in putting your belting on a more rigidly economical basis. Literally, there's money in this booklet for you. Send for it now.

BOXBAR BELTING TRADE MARK

Chas. A. Schieren Company ESTABLISHED 1848

Tanners
Belt Manufacturers
31 Ferry Street, New York

suffered injuries which resulted in his death. In denying his dependents compensation under the Michigan Workmen's Compensation Act the court said:

"In the instant case the deceased was performing the ordinary services of his trade, that of a plumber and steam fitter. He was standing on a scaffold a few feet from the floor. There is no claim that the scaffold was improperly constructed or in any way unsuitable for the service. Due to no condition arising out of his employment, but solely to his predisposition to epilepsy, of which his employer had no notice, he fell from the scaffold, receiving an injury from which death resulted. The fall was caused and caused only by the epileptic fit. The fit was the direct and only cause of his injury. . . . This unfortunate man fell to his death when in an epileptic fit, which did not arise out of his employment and for which his employer was not responsible."

Conclusion

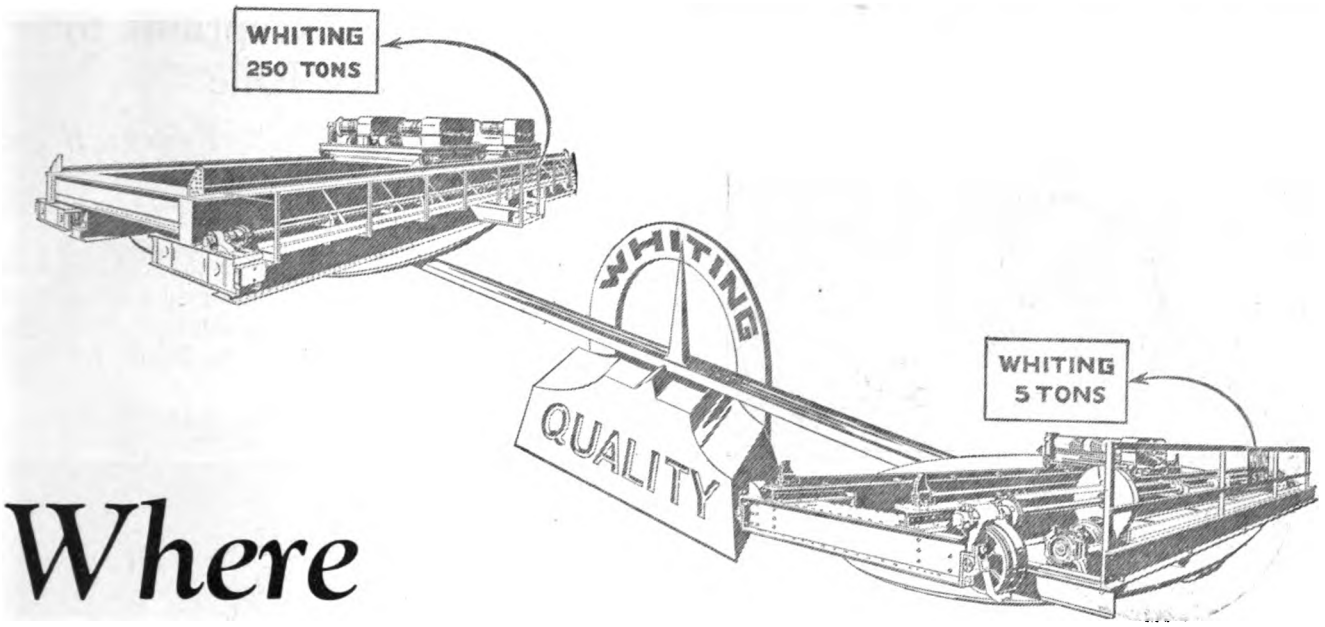
From the foregoing reviews, it is obvious that the question of how a pre-existing physical weakness, which causes or contributes to an injury suffered by an employee, may affect his right to compensation under workmen's compensation statutes cannot be answered by the statement of a hard and fast rule. As illustrated above, the decisions on certain phases of the subject are not in accord, and not subject to classification save as to results.

However, since statutes of this kind are remedial they are generally given a liberal construction by the courts, and, by the seeming weight of authority, where an employee suffers a definite mishap in the course of his employment, he will be entitled to compensation though he was physically unsound at the time, and the injury would not have occurred in the absence of the employee's pre-existing weakness. In other words, the general rule of construction seems to be that the risk is of the employment on the particular employee in his condition of health, and not what the risk would be upon a healthy or average employee.

With this in mind it is clear that, in the great majority of cases, the employer who employs workmen who are predisposed to such ailments as hernia, epilepsy, heart trouble, etc., may be padding his payroll with potential liabilities the extent of which cannot be computed. The question of how to guard against such risks is one of many angles, and must necessarily be decided by each employer in the light of the character of his business. However, in consideration of the possible liabilities from this source, the importance of answering the question by some consistent method in the employment of workmen seems fairly apparent.

WHEN the stock market declined last March there were dire prophecies of a big slump in building, notwithstanding the fact that mortgage financing was easy and the prices of steel and lumber had not been inflated. The pessimists were unduly influenced by the stock market. Building contracts, however, have continued to show increases over last year. During the past weeks, with the stock market advancing, the pessimists have largely remained silent and favorable opinions are more frequently heard. Neither the stock market reaction in March nor the rally since May 19th has caused an appreciable change in the production and distribution of commodities. The chief change has been in business sentiment and the stock market has been responsible for that.—*Alexander Hamilton Institute.*

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Where 5 Tons Balance 250 Tons

ON the scale of Whiting Quality a small crane exactly balances a big one. There is no lowering of standards in the 10 ton, 5 ton or even 2 ton Whiting cranes as compared with the 250-ton design.

Whiting small cranes are not built down to a price. They are built up to a standard of quality backed by the Whiting name and a generation of experience.

In equipment whose performance so often limits the productive capacity of your plant, the assurance of permanent satisfaction is of far greater importance than any temporary saving in cost.

Just because the crane you buy is of low capacity, it does not need to be of low quality. You can get the same high standard of design and construction in a small Whiting crane as in the big ones.

Our new crane catalog shows features of quality which make Whiting cranes of any size stand up and deliver dependable service through their long lifetime. May we send you a copy?

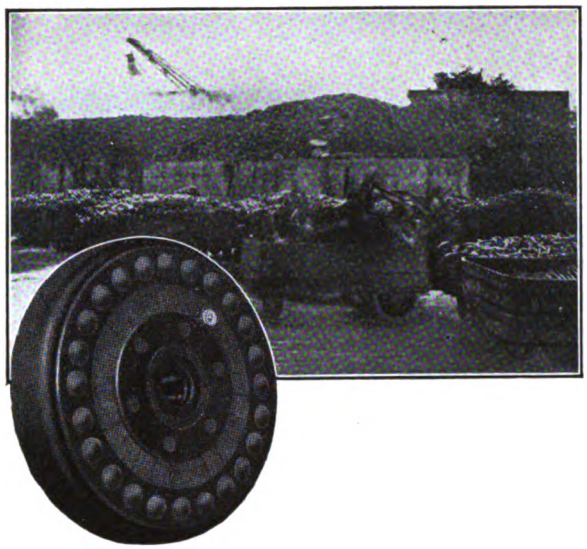
Whiting Corporation

15651 Lathrop Ave.
Harvey, Illinois
(Chicago Suburb)

WHITING

IM-7 Gray

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THIS picture was taken in the yards of one of the world's greatest factories where Metzgar wheels have been in use for many years on several hundred trailers under high production, heavily loaded with metal products—in and out of doors with reckless abandon.

You don't have to pick out some preferred duty for Metzger End-Grain Wood Wheels—we make them to fit any type of truck and to meet the most exasperating conditions.

Many of the leading institutions throughout the country who have made these wheels standard are saving as high as 95% in floor repairs.

It is far cheaper to use Metzgar wheels than to do without them.

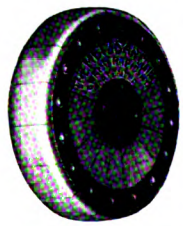
Any Metzgar wheel user will tell you they are not an expense, but a splendid dividend-paying investment.

Write for booklet and prices.

Metzgar Co. Inc.



GRAND RAPIDS
MICHIGAN
U. S. A.



Heavy Duty
Hyatt Bearing

Regular Duty
Wood Bearing

METZGAR
End-Grain Wood
WHEELS

There Are Exceptions to Every Rule

A Case Where 4-Wheel Trucks Work Best

By H. H. Squire

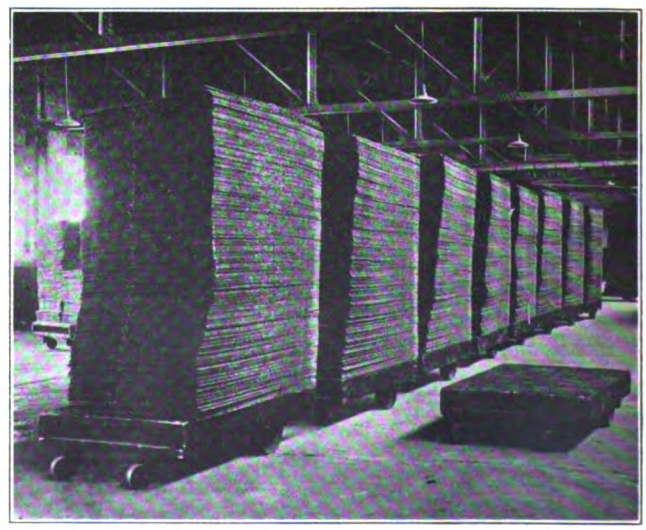
MODERN material handling methods have done wonders for industry, but that they are improved here and there by variation from established practice has been proven in the experience of the Hinde & Dauch Paper Company.

The lift-truck, for instance, is a God-send to many an

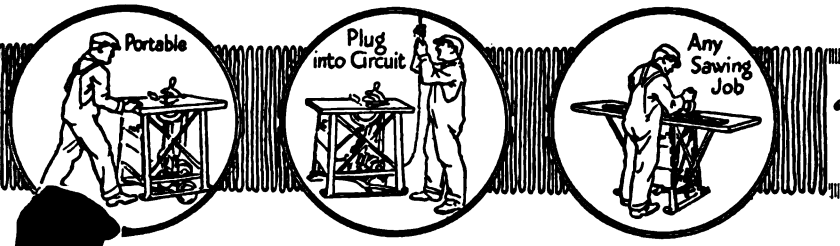


industry and no one can doubt that its general use has greatly speeded up production and lessened the labor of intra-plant transportation. We do not believe there are many exceptions to the general rule of its efficiency, yet in our own plant we have found great benefit from the perpetuation of an older system in use long before the lift-truck made its appearance.

Our goods and materials are light in weight and require high stacking on carriers of broad carrying surface. Years ago we adopted the plan of piling all supplies and products on broad low trucks, each provided with four wheels, two of which roll on rigid axles while the two at the opposite end of the truck are swiveled,

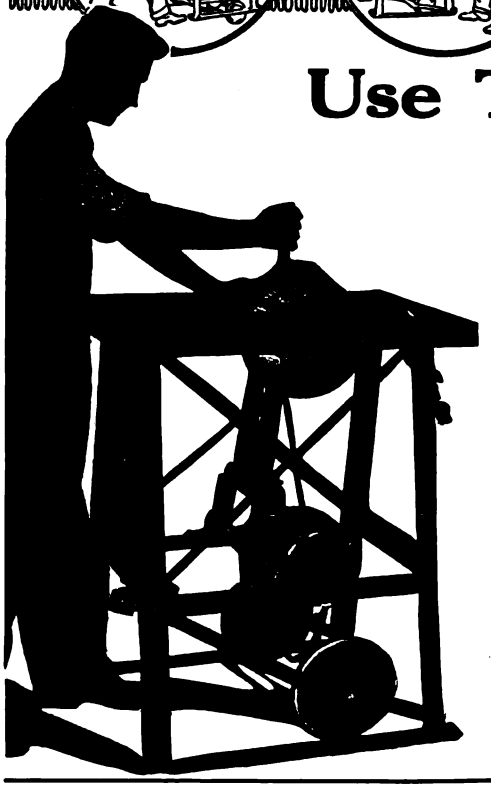


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"It Is Portable"

Use This Saw Anywhere



Take It Right to the Job

One of the big advantages of the **Onan "Safty Saw"** is that you can take it anywhere in the plant. Just plug in on the lighting circuit and the saw is ready for immediate use. No delays. No installation charges are necessary.

The **Onan "Safty Saw"** is a compact, complete, all-steel unit run by an electric motor. Easily moved. Nothing to break or get out of order. Use this saw for cutting lumber for crates, packing, rebuilding boxes, shelves, bins, repairing, general carpentry work—any sawing job. With extension leaves, it makes a work bench eight feet long. Works so fast and economically that it soon pays for itself. One man with an **Onan "Safty Saw"** can do the work of 10 men sawing by hand. This is a saving in labor alone of 90%. And you get better work, too. G. Bettner's Sons, Louisville, Ky., say: "Our crates look much better than when we sawed by other methods."

Try at Our Risk!

Get the full facts about the **Onan "Safty Saw."** Read the letters of satisfied users. See how handy and convenient this saw really is. To prove to you the savings you can make, we will send the saw on trial. Write today for descriptive circulars and Trial Offer. No obligations now or later.

D. W. ONAN & SONS
201 Royalston Avenue, Minneapolis, Minnesota
ONAN "SAFTY SAW"

The best will always be made of wood —steel-bound—

—steel-bound to protect all wood surfaces from wear. The selected wood stock itself is plenty strong enough to carry the weight any giant might handle.

Wooden trucks are light, flexible, easily manipulated, perfectly balanced; and wooden grips are indispensable during cold weather.

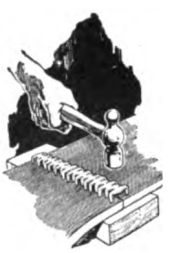
Ask the men what trucks they prefer—then get our booklet on models and prices.



The **Fairbanks** Company
New York City

"Ask the man who does the pushing"

for a quick job well done



A hammer is all you need

No long costly delays because of broken belts, when you use Bristol's. Any man on the job can repair a break quickly and make a good strong joint. All he needs is a few Bristol's Fasteners and a hammer.

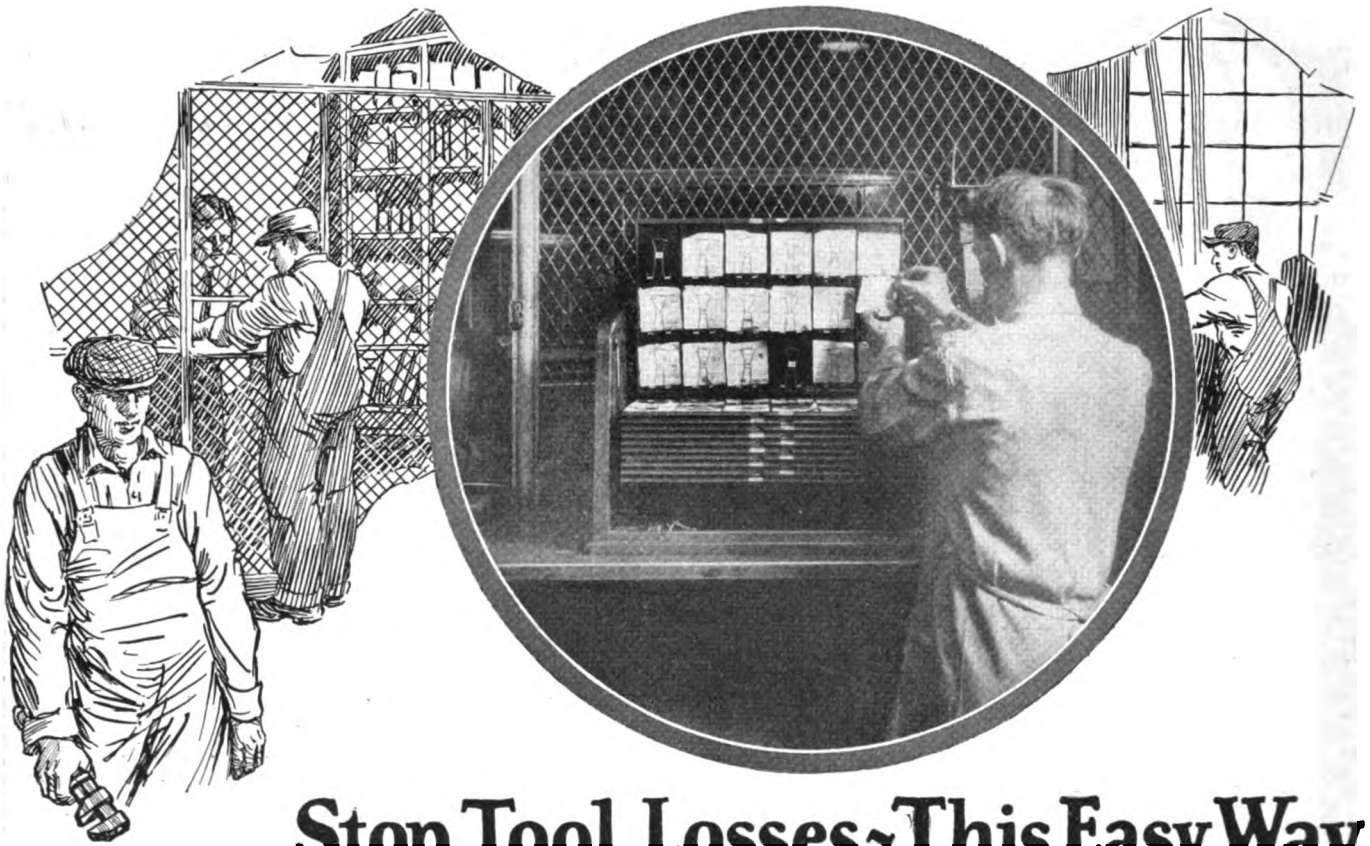
Bristol has been serving belt users for over thirty-five years. Would you like to test samples and look over folder CE-719? Write

THE BRISTOL CO.
Waterbury Conn.

BRISTOL'S STEEL BELT LACING
PATENTED

When writing advertisers please mention Industry Illustrated

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Stop Tool Losses~This Easy Way

DO you have difficulty in checking up tools loaned to workers? Can you tell instantly *what* tools various workers have? What happens when a worker loses his brass check? Should you like to put an end to tool losses, arguments and waste time? The most efficient way to keep a record of tools is to use the McCaskey System. Read what E. H. Yerger, Manager, Parts Department, The Thornton-Fuller Automobile Co., Philadelphia, Pa. says about the McCaskey System:

"When we moved into larger quarters last August, in order to handle the increasing demand for Dodge and Graham Bros., motor vehicles, a McCaskey Register System was installed in the tool room to replace the brass checks formerly used. The old system furnished no positive proof that a given tool had been drawn by a particular man and not returned. And checks are easily lost, misplaced, or counterfeited.

"Now when a tool is drawn, the workman signs a numbered slip showing tool number and name. At one writing the McCaskey carbon-backed forms make two duplicates. The workman receives one copy, the original is filed in the McCaskey cabinet under his number, and the duplicate is filed under the tool number. When the tool is returned the original is exchanged for it and destroyed by the workman.

"Each week the toolroom keeper checks up on each man who has more than 5 tool slips against him. The men know they are held responsible for tools drawn, and so return them promptly. This means fewer losses and a smaller inventory.

"A broken tool must be exchanged for the original McCaskey slip, and the man's foreman must write a requisition for replacement. This check on broken tools reduces carelessness. In two months the only tool orders have been for a few dozen drills.

"The duplicate tickets filed under tool numbers give us data on tool use and service on which to base our tool purchase."

Investigate This Method of Keeping Records

The McCaskey System can be used for keeping records of all kinds—perpetual inventory, payroll, shop orders, cost records, production control—any place in shop or office. It gives you tell-tale figures quickly—INSTANTLY. Nothing complicated. Easy to keep up to date.

Let us send surveys showing how other plants in your own line use the McCaskey System. No obligation. Mail the coupon for complete information.

McCaskey—"One Writing–Visible Filing"
Methods have been applied to phases of Industrial Control of which the following are some:

—Perpetual Inventory
—Single & Dual Control
—Process Inventory
—Cost & Payroll Records
—Production Control
—Machine Control
—Order Control
—Planning—Routing & Dispatching
—Tool Check & Tool Investment Control

Some of the lines using McCaskey Industrial Control Methods:

—Steel Plants
—Metal Products Plants
—Wood Products Plants
—Automotive Plants
—Paper Plants
—Clothing Plants
—Boards of Education
—Shoe Manufacturers.

The McCaskey Register Co.,
Industrial Division 276,
Alliance, Ohio

Please send more information about the McCaskey System showing how firms have applied your methods.

NAME .....

TITLE .....

FIRM .....

ADDRESS .....

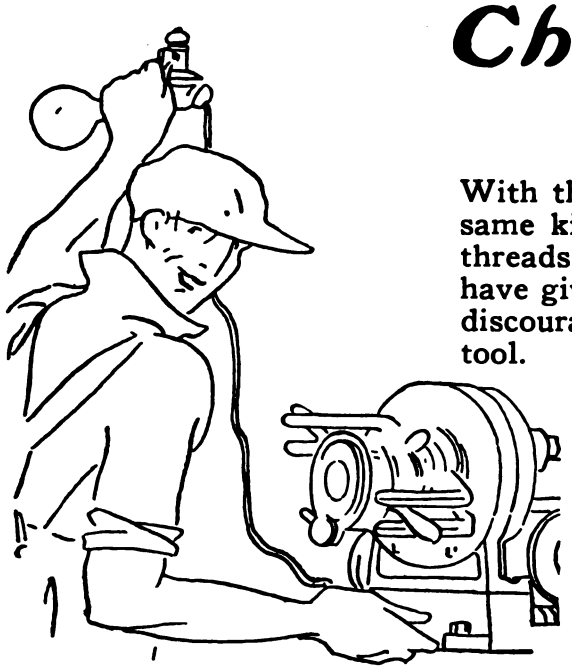
McCASKEY ONE WRITING SYSTEMS

THE McCASKEY REGISTER CO.
INDUSTRIAL DIVISION 276 · ALLIANCE, OHIO.
GALT, CANADA

For products not advertised in this issue write Industry Illustrated

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Performance That Challenges Comparison



With the Oster Power Boy you get the same kind of tight-fitting, workmanlike threads that Oster Bull Dog Die Stocks have given for 35 years—but without the discouraging manual labor of the hand tool.

Its revolving arms thread, cut-off and make up fittings from ¼ to 2 inches, inclusive, at the turn of a switch. An auxiliary drive shaft for operating geared die stocks increases the range to 4 inch pipe. And this is what you can expect from this modest little helper.

Size of Pipe	Threading Speed	Cutting-off Speed	Number of Revolutions
2 inch	40 seconds	35 seconds	16 R. P. M.
1½ "	34 "	30 "	18 "
1¼ "	30 "	25 "	20 "
1 "	25 "	20 "	21 "
¾ "	29 "	17 "	22 "
½ "	27 "	15 "	24 "
⅜ "	27 "	12 "	26 "
¼ "	27 "	10 "	26 "

OSTER

THE OSTER MANUFACTURING CO.

Manufacturers of the most complete line of pipe threading equipment in the world

2103 East 61st Place, Cleveland, Ohio

This coupon will bring full details of this grief and money saver. *Mail it today.*

Name..... *City*.....

Street..... *State*.....

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Buy a Pack of Lenox Wolves

There was a time, in the days of the Highland Scottish clan regime, when wolves became a scourge and terror in many sections of the British Isles.

Up in that wild, rugged, densely wooded strip of land along the Western shore of Loch Lommond, where the Earl of Lenox established the doughty clan McFarlane, great numbers of these savage marauders found ready shelter and protection,—with food aplenty in the borderland.

They swept down over the lowland pastures from their wild Highland haunts to steal and kill sheep and cattle until their raids were known and feared throughout the country. People spoke of them as "The Wolves of Lenox." Big, rangy, tough animals they were, too, with powerful jaws and teeth that slashed and ripped and tore through sinew and bone.

In just that same way the hack saw blades that now carry their name—"Lenox"—tear and rip and slash their way through the toughest kind of jobs. Each one of them perfectly fashioned from the best of steel, and carefully inspected for any inaccuracy before being packed, makes dependability one of their built-in qualities. You can get them almost anywhere and they are easy to identify—these "Wolves of Lenox," are the "Blades in the Plaid Box."

Drop us a note if your mill supply dealer doesn't stock them

American Saw & Mfg. Co.
Springfield, Mass.



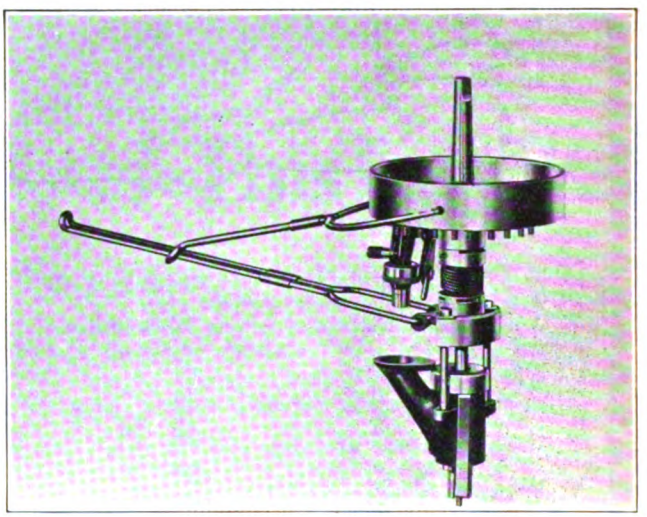
castor fashion. This system promotes the maximum economy of floor space and renders each truck load instantly movable without the necessity of waiting for a carrying truck to pick it up, and we have found our investment in some hundreds of these complete carriers amply justified by the elasticity of the system and the time saving they have effected.

All this may seem reactionary, but it is not so, for it is purely incidental to the peculiar character of our materials and products, and merely indicates the wisdom of adapting facilities to the work in hand.

Automatic Screw Driving Machine

A RECENT addition to the line of products manufactured by the Metal Saw and Machine Company, of Springfield, Mass., is an automatic screw driving machine, here illustrated.

These machines are manufactured to accommodate all



styles of machine screws and wood screws from ¼" to 3" long. In describing this machine, the manufacturers state:

"After attaching the automatic to any ordinary drilling machine, screws of the desired size are poured into the hopper. The eccentric motion of the hopper causes them to fall into a slot large enough to loosely enclose the necks of the screws, but not allowing the heads to pass. Screws can be driven, regardless of variation of the work, without separate adjustment of either the machine table or the delivery member."

These machines are made in twelve sizes, to accommodate various lengths and gauges of screws from ¼" No. 2 to 3" No. 14.

EYE protection for workers at the charging furnaces in the plant of the Timken Roller Bearing Company, Canton, Ohio, is provided by a pane of safety glass 18 by 24 inches and one-quarter inch thick. Blue glass, similar to that used for melters' goggles, is used in a wooden frame and four inches in front of it is another frame covered with copper screen to break the heat and protect the glass.—*National Safety News.*

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LIKE A JAGGED ROCK JUTTING ITS RUGGED SURFACE ABOVE THE SEA, SO *VALDURA ASPHALT PAINT* STANDS OUT SUPREME AMONG PAINTS.

VALDURA is not an ordinary paint. It is decidedly different. It will stand up under the severest conditions. It will satisfy where other paints fail.

Waterproof; acid, alkali and brine resisting—VALDURA has a large covering capacity, flows easily under the brush, and is moderately priced.

Genuine 99.5% pure Gilsonite Natural Asphalt forms its base. No coal tar, oil asphalt, or other inferior substances in VALDURA. It is *real* paint.

Interesting booklet, as well as sample can, will be sent free upon request.

AMERICAN ASPHALT PAINT CO.
844 Rush Street Chicago

Factory: LINCOLN, N. J.
Warehouses: OAKLAND, CAL., CHICAGO, ILL.

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BROWN & SHARPE

QUALITY

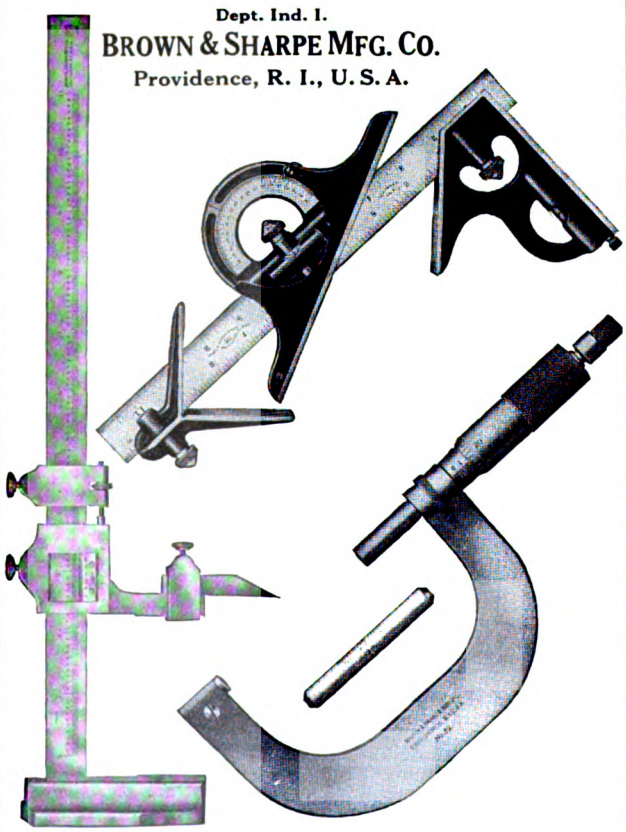
Costs less in the long run

After all, what is more important to the owner of a tool than its Quality? Its Accuracy, Long Life, Utility, *all* depend on High Quality.

For nearly a century Brown & Sharpe Tools have been recognized as standard throughout the world. It pays to buy tools whose reputation for High Quality has been established so thoroughly.

Send for Small Tool Catalog No. 30. It lists over 2300 Brown & Sharpe Tools.

Dept. Ind. I.
BROWN & SHARPE MFG. CO.
Providence, R. I., U. S. A.



BROWN & SHARPE

"Standard of the Mechanical World"

Another Evidence of Waste Elimination by Simplification

The New Standard Line of Westinghouse Mazda Lamps

THE new Standard Line of Westinghouse Mazda Lamps, which will replace the forty-five types now in use for general lighting purposes, consists of only five lamps.

This illustration shows the display that will be exhibited throughout the country to demonstrate the new line. The first lamp of the new standard line at the top on the right is 25 watts, and replaces the top row of the display. The second lamp replaces the next row, which is 40 watts, the third replacing the 50 watt lamps, the



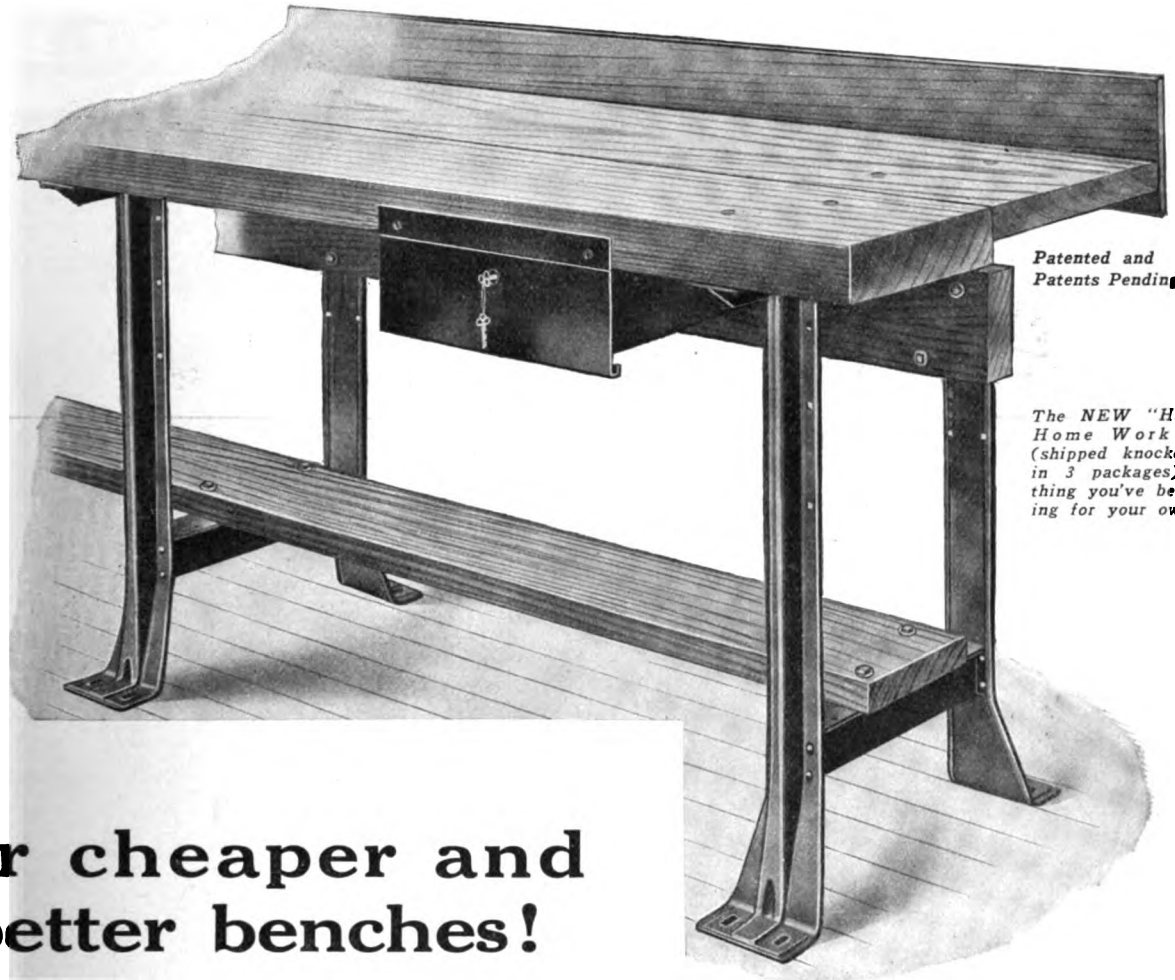
fourth the 100 watt lamps, and the bottom replacing the 60 watt lamps.

The small 15 watt lamp on the extreme left of the top display is a special lamp used for signs and decorative purposes.

They are all inside frosted lamps, and are said to be a big improvement on both the old clear and outside frosted lamps in many respects. The most important improvements claimed are the elimination of practically all glare, the decrease in the absorption of light compared with the outside frosted lamps, and the smooth outside surface, permitting convenient cleaning and avoiding streaks and stains.

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"HALLOWELL" Steel Bench Legs



Patented and Patents Pending

The NEW "Hallowell" Home Work Bench (shipped knocked down in 3 packages) is the thing you've been wanting for your own home.

for cheaper and better benches!

Build your benches with "Hallowell" Steel Legs and then equip them with "Hallowell" Steel Bench Drawers. That's the one sure way to have strong and rugged benches that will really last—and at a price that shows an immediate saving, too.

"Hallowell" steel-legged Benches actually cost less to build than wooden benches and last much longer—besides, they are easily moved and never come apart.

Another great feature about "Hallowell" Steel Bench Legs is that you can pick them up from stock—exactly as wanted and just when needed. That's service!

Every bench should be equipped with a "Hallowell" Steel Bench Drawer. They're strong, fire and dust-proof and may come equipped with a sliding Tray that is most convenient for smaller tools.

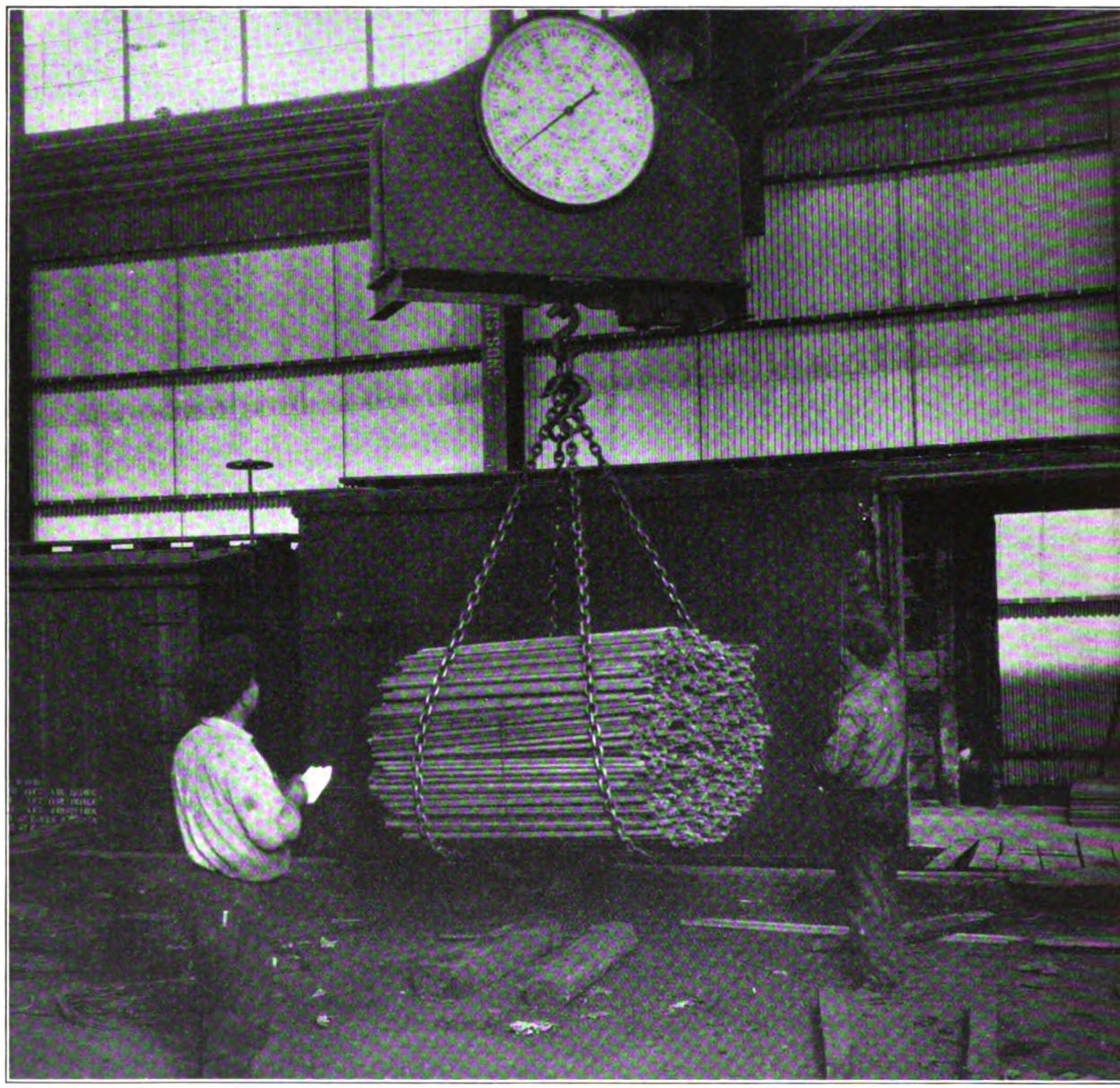
Standard Pressed Steel Co.

Box 8 Jenkintown, Pennsylvania

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KRON SCALES

Weigh it While You Move



The Calumet Steel Company, Chicago Heights, Illinois, have eliminated all weighing troubles, errors, etc., since installing this KRON SCALE.

"We couldn't get along without Kron Scales," says L. H. Hook, Works Manager. With these scales attached to the crane they can pick up, weigh and load steel into freight cars, all in one operation.

Kron Scales will weigh anything instantly, accurately and automatically. Remarkably simple in construction—no weights to juggle—no beams—no springs. **Simply load and look.**

Write for a copy of our 62 page catalog describing all the various types.

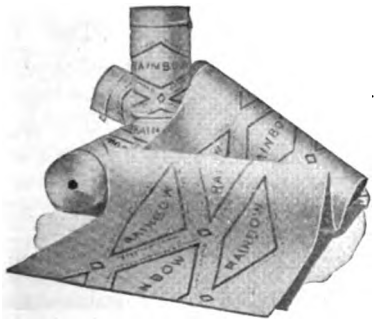
KRON SCALES

The American Kron Scale Co.
430 East 53rd Street New York City

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Here are four "U. S." Packings built for all-around industrial service



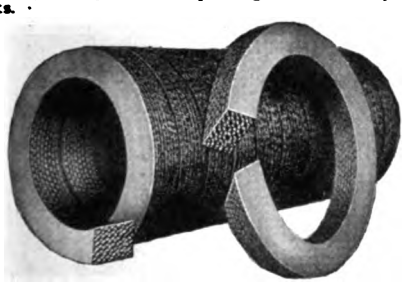
"U. S." Rainbow Sheet Packing

For packing flanges or joints against steam, air, hot or cold water. Recommended for all saturated steam pressures up to 150 pounds and all hydraulic conditions, such as high pressure hot and cold water flange joints, cylinder heads, etc.



"U. S." Rainbesto High Pressure Packing

For packing rods against high pressure steam and air. Recommended for all high pressure steam conditions on rods and valve stems of all types of engines, air compressors, steam turbines, pumps, and the air end of high pressure air compressors. This packing will also be found a very desirable packing for steam expansion joints.



"U. S." Peerless Cross Expansion Packing

For packing rods or plungers against medium pressure steam, hot or cold water and ammonia. A very desirable type of packing for worn rods or plungers and those running out of alignment. This packing is thoroughly graphited and lubricated. The special construction permits expansion in either direction under pressure.



"U. S." Peerless Piston Packing

Recommended as the best all-around piston rod packing for saturated steam up to 150 pounds pressure. Particularly adapted for use on high speed engines.

"U. S." Packings *do* make a difference—

There's a "U. S." Packing built for every industrial need —

Every time a packing goes wrong it means a shutdown for repacking—and a resultant drop in output somewhere along the line.

There is a difference in packings. No one packing will serve all your packing needs nor will any old packing do. Packings that give unfailing service under one condition often fail to deliver the same service under another and different condition. There is a special packing for each and every industrial need.

"U. S." Packings are the result of thorough investigations of the packing requirements of modern industrial plants combined with long years of manufacturing experience by the United States Rubber Company, the world's largest grower, manufacturer and distributor of rubber and its products.

Thousands of industrial plants are learning the value of standardizing on "U. S." Packings.

Our Sales Engineers are experts on packing requirements. Let them advise you as to the most suitable type or combination to meet your packing needs.

United States Rubber Company

1790 Broadway Trade US Mark New York City

Branches in every industrial center

"U.S." PACKINGS

for every industrial need

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UNEQUALED FOR SERVICE

In addition to its accepted use as an ash can, the Guaranteed Witt No. 2 Corrugated Can covers a broad scope of service in thousands of manufacturing plants, warehouses and institutions throughout the nation.

It is extensively used for storing small metal parts, as a paste container, as an oil container in heat-treating departments, for handling garbage, for collecting dirt under blower systems, etc.

And remember this: Each genuine Witt Can carries the manufacturer's guarantee tag wired to the handle, guaranteeing it to outlast 3 to 5 ordinary cans or pails. You know what this means in cutting down replacement expense.

See your jobber at once or write:

THE WITT CORNICE COMPANY
2117 Winchell Avenue
Cincinnati, Ohio
Manufacturers of

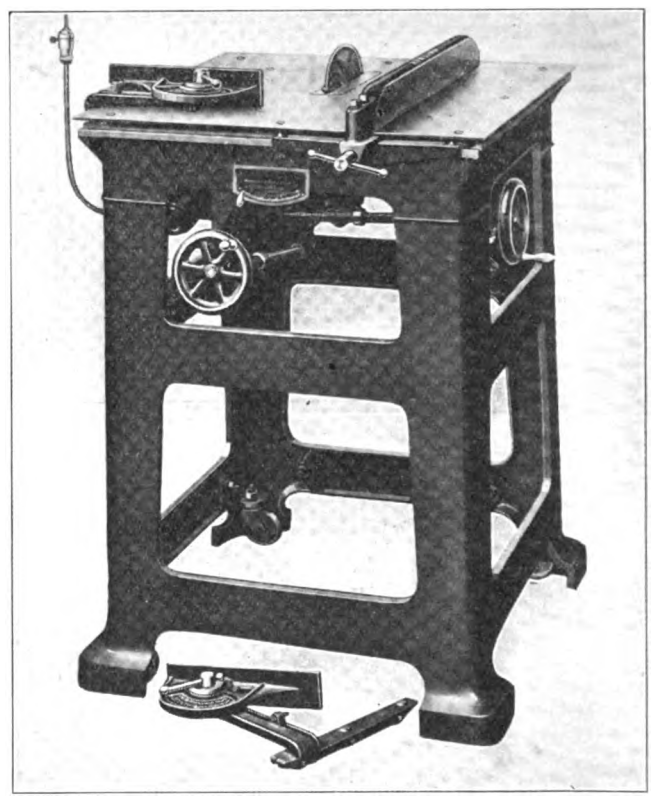
WITT
CORRUGATED
•CANS and PAILS•

A New Large Portable Universal Saw

THE accompanying illustration shows the new and larger Wallace Portable Universal Saw manufactured by J. D. Wallace & Co., Chicago, Ill.

This is a portable floor type of Universal Circular Saw that is said to combine all the advantages of the portable bench machine and the self-contained floor type. The one-way castors make it easy to move from one department of the shop to another and yet it is claimed to be perfectly rigid in operation. The motor and all working parts are built into the upper portion with the table and fences, thus the top part is a complete self-contained bench type saw when lifted off the regular stand. When it is desired to take the saw out on a job, and it is not convenient to take the regular cast iron stand, the saw can be taken without its base, and placed on any substantial wood stand that can be easily made.

The manufacturers describe the No. 8 Wallace Portable Universal Saw equipped with a 1 hp. three-phase motor as an ideal factory production machine having



great cutting capacity with precision accuracy: angle cutting, either rip or cross cut; large size table with a capacity of 12" x 2¼" between blade and fence.

The motor operates on either electric light or power circuit. It is started and stopped by means of a toggle switch located on the motor itself.

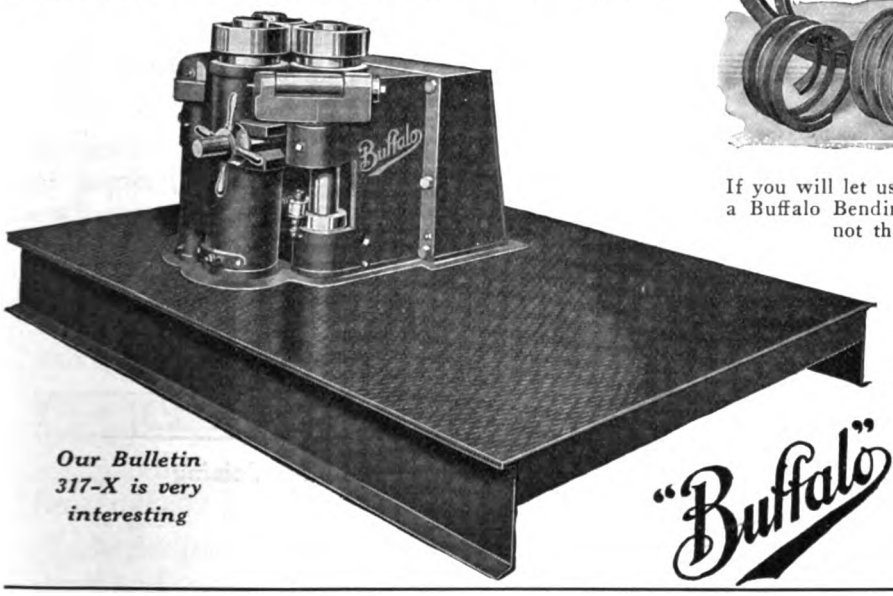
The table is one piece of finished steel 25" x 25" fitted with a removable throat piece so that special saws, dado and cope heads requiring a wider throat opening may be used. This machine is designed to handle the smallest and most delicate work with accuracy, safely and quickly, yet is said to be rugged and powerful enough to cut rapidly stock 2¼" thick. Utilizing the various adjustments it is also capable of cutting compound mitres, grooves ⅞" wide, and 1" deep, moldings, groove and tongue, etc., by means of a special dado head.

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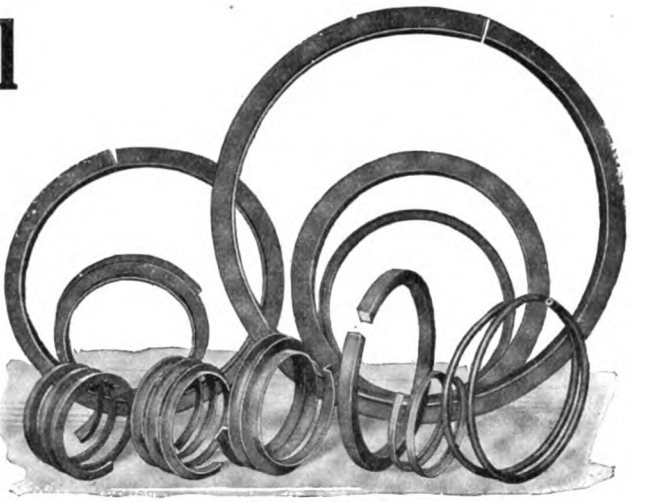
If you bend metal you need this—

Angles, flats, squares, rounds, copper tubes, steel pipe, channels, and I-beams can be bent quickly, easily, accurately and cheaply on a Buffalo Horizontal Bending Roll.

Users tell us that the machine pays for itself in less than a year, and it enables them to handle two or three times as much work.



Our Bulletin 317-X is very interesting



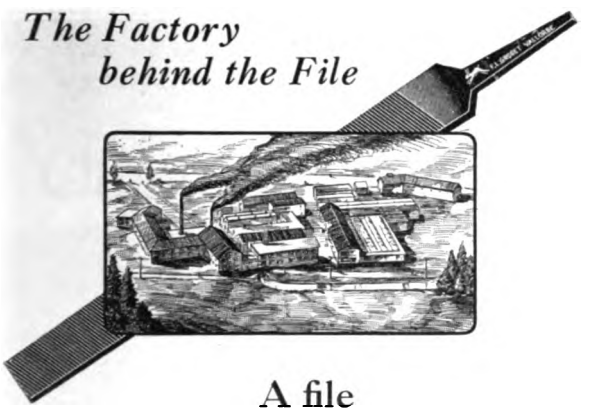
If you will let us tell you how little it costs to bend stock on a Buffalo Bending Roll—you can decide easily whether or not this machine belongs in your shop.

Buffalo Forge Company
440 Broadway, Buffalo, N. Y.

In Canada—Canadian Blower & Forge Co., Ltd. Kitchener, Ont.

"Buffalo" Bending Roll

The Factory behind the File



A file you can be sure of

This factory in Vallorbe, Switzerland, has been manufacturing files for over a century and today they offer the Grobet Swiss File as a supreme achievement backed by 112 years of manufacturing experience.

Write for Catalog H

GROBET FILE CORP. OF AMERICA
3 Park Place, New York



Don't Buy Sales Talk—Buy VICTOR

Each week there are more buyers for Victor Hack Saw Blades that have in the past bought hack saw sales talk.

Under actual test the Victor blade will prove its value by actual cutting efficiency.

We will be glad to send you free samples of our new Special Flexible Blade which has Victor cutting qualities combined with amazing flexibility.

Let us send you free samples of this Wonder Blade

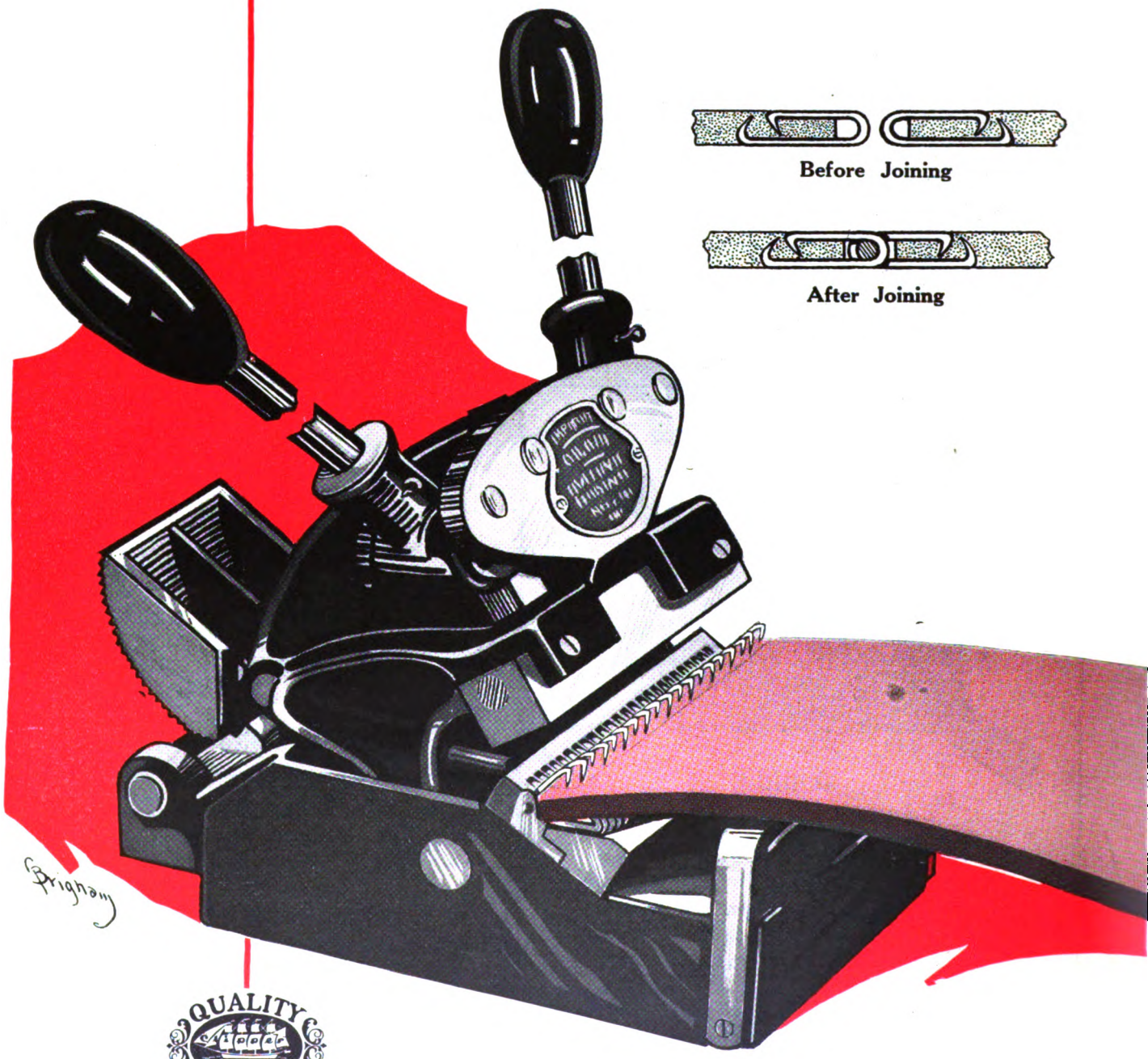
VICTOR SAW WORKS, Inc.
MIDDLETOWN, N. Y.

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Join with

Before Joining

After Joining



QUALITY BELT LACING

For products not advertised in this issue write Industry Illustrated

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Clipper Lacings

In nearly every branch of manufacturing the proper connection of joints is a problem worthy of serious consideration—and each manufacturer has his own individual joint problem.

Practically every factory man is familiar with the present accepted method of joining machinery belts with Clipper Lacings. He recognizes the superiority of Clipper Hooks, Clipper Pins and the Clipper Lacer.

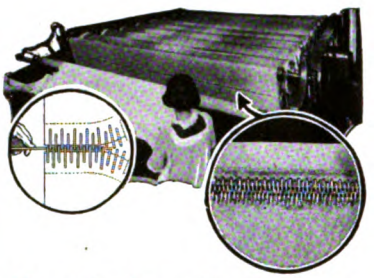
But why apply the wonderful efficiency of Clipper Lacings only to belts? A Clipper Lacing can be used with equal success in many other cases where flexible materials require a smooth, firm, quickly joined connection.

Study the joints in your factory equipment or in your product itself and consider them in terms of Clipper Lacings. Experiment with your Clipper Lacer where you now glue, nail, rivet or sew. You may find in Clipper Lacings, as many have already found, an ideal solution to your joint problem.

We will be glad to cooperate with manufacturers in the application of Clipper Lacings to their purposes.

Clipper Belt Lacer Company
GRAND RAPIDS MICHIGAN

New Uses Found for Clipper Lacings



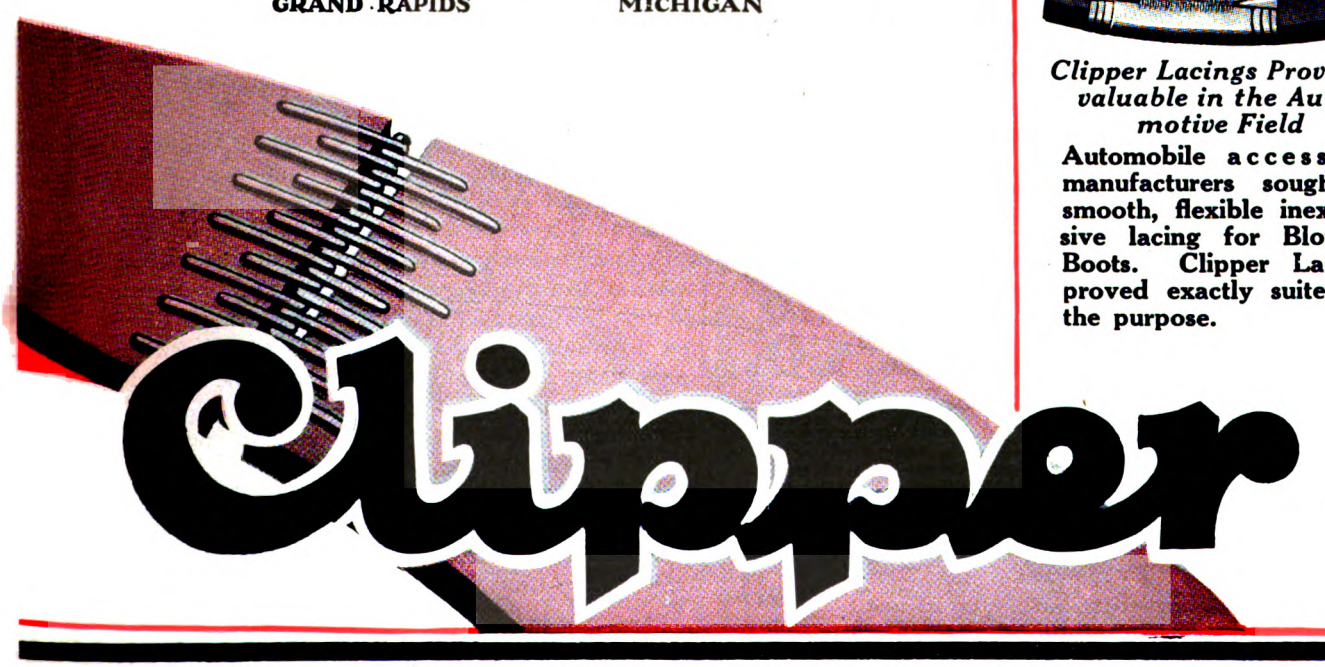
How the Laundry Industry "Joins with Clipper"

Clipper Lacings are rapidly replacing old methods of joining Laundry Aprons. Inestimable savings in time, efficiency and costs are being made.



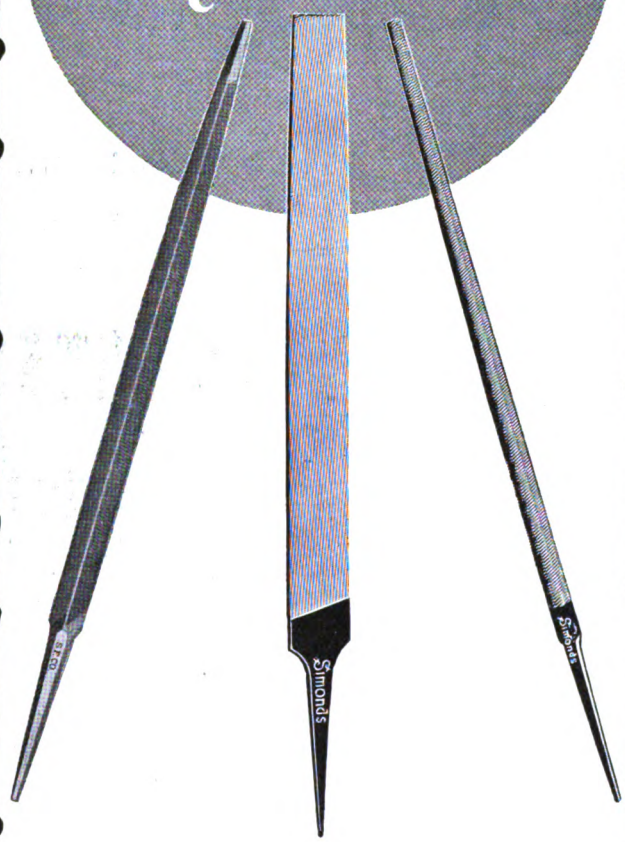
Clipper Lacings Prove Invaluable in the Automotive Field

Automobile accessory manufacturers sought a smooth, flexible inexpensive lacing for Blowout Boots. Clipper Lacings proved exactly suited to the purpose.



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FILES
of Lasting Cutting Qualities



The steel, method of heat-treating and the sharp, perfectly shaped teeth are reasons why you get longer service from a Simonds File. For machine shop use there is none that compares with the Simonds File. Write for our special File catalog and prices.

SIMONDS SAW AND STEEL CO.

FITCHBURG, MASS. CHICAGO, ILL. BOSTON, MASS. DETROIT, MICH. NEW YORK CITY LOCKPORT, N. Y. MEMPHIS, TENN. NEW ORLEANS, LA. LONDON, ENGLAND PORTLAND, ORE. SAN FRANCISCO, CAL. SEATTLE, WASH.

SIMONDS CANADA SAW COMPANY, LTD.
MONTREAL, QUE. ST JOHN, N.B. TORONTO, ONT. VANCOUVER, B.C.



Makers of
Hack Saws, Metal Band Saws, Inserted Tooth Metal Saws, Solid Tooth Metal Saws, Slitting and Slotting Saws, Files, Tool Bits.

New Styles in Safety Slogans

By C. L. Peake

SAFETY FIRST as a slogan is worn out. A slogan must be found which is new and which will make an impression where the old one is failing. Newspaper editorials have contained this safe observation. More than once in the past few months trade journals and safety magazines carried articles on the age and growing debility of this old catch phrase.

Yet the question arises as to whether age and too much use is really the trouble with the old slogan which has done duty so long. There'll be a Hot Time in the Old Town Tonight was scrapped as a popular song years ago. Red Hot Mamma and a hundred newer songs have come and gone. Before these lines are in print a dozen songs unheard of today will reign supreme and new in the always up-to-date jazz emporiums. Must Safety First repose side by side with Hot Time on the scrap heap because it too has been used so many times and so long?

Safety First called attention to the need of greater care and plead for the establishment of the safety movement itself. Now the movement is established—has been established for years past and there is need for moving along to more advanced ground. The debatable question is not any more *shall* men work and travel in greater safety. What is being debated is *how* shall it be done, and it is in the direction of answering this query that slogans and catch phrases must be directed.

A recent railroad poster carries well the new element in safety slogans. Cross Crossings Cautiously is an excellent example of the newest style in safety slogans. It is brief, easily remembered and above all a specific instruction to the driver. Nevertheless one of the best safety catch slogans is among the oldest. Stop, Look, Listen antedates Safety First itself and it's as good—better than the day it was born. Short, pertinent and above all it tells the hearer just exactly those things to do which will preserve his life and limb.

Cross Crossings Cautiously is a slogan which carries about all the elements needed. In spite of the fact, however, that it is better than most slogans and a score of years younger than Stop, Look, Listen it probably will not last nearly so long as the old crossing slogan. Age is by no means the index of the usefulness of a slogan.

In many employment offices there stares from the wall a notice on a green background advising all who seek work that "unless you are willing to practise safety there is no use looking for a job in this plant." Again when the new worker reaches his department he is told by his new foreman to "Be Careful" and to "Work Safely." Some plants consider this sufficient in the line of safety instruction but the slogan is only one line of safety instruction which is being overhauled in the interest of becoming more specific.

Many progressive employers realize that the new employee along with his instructions as to how to work efficiently must be instructed specifically how to work safely. It is too easy even yet when a new workman is sent into a plant to go to work to send him in with instructions to work more carefully—to be careful not to get hurt. The real job now is to give him something a little more

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Kill that Glare!



"FROSTINE"

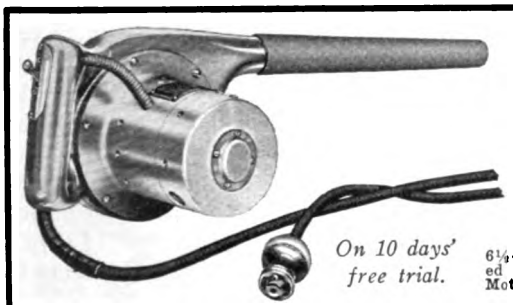
Better Than Shades — and Extremely Economical

FROSTINE does to your windows what frosting does to an electric light bulb. Kills the glare. Glare means eye strain and lowered efficiency and *that* means higher cost of production. FROSTINE allows practically all the light to enter but in a softly diffused form with a marked lowering of temperature. FROSTINE is easily removed with water when desired. One application will prove the wisdom of its use. Let us send you a barrel, half or quarter barrel at our risk—satisfaction, or complete refund.

Sample and details on request

THE GERSON-STEWART CORP., 3541 E. 76th St., CLEVELAND, OHIO

Manufacturers of Famous "Sunburst" Hi-Speed Window Cleaner



Ball Bearing Portable Blower

On 10 days' free trial.

6¼-lb. Air Cooled Ball Bearing Motor $45.00 Net

This "MARVEL" Portable Blower is designed for blowing dust and dirt out of WOOD-WORKING MACHINERY, MOTORS, GENERATORS, SWITCHBOARDS, LOOMS, KNITTING and all kinds of MACHINERY. Has 20 feet high grade cable and armored plug. Perfectly balanced. Has TOGGLE SWITCH in handle, operated by thumb. Gives 16-in. water column pressure.

Note the Metal Conduit carrying wires from motor to handle.

Motor operates at 10,000-R.P.M. on "NORMA" BALL BEARINGS. This blower is a great time and labor saver, and its mechanical and electrical design gives assurance of a very long life, with a minimum of attention.



Made with UNIVERSAL motors (A.C. & D.C.) for both 110 volts and 220 volts. SHIPPING WEIGHT 18 lbs. Shipped on 10 days' trial, ANYWHERE.

A Complete Set of VACUUM CLEANER ATTACHMENTS for $10.00 additional

Manufactured by

Electric Blower Company

352 Atlantic Ave., Boston 9, Mass., U.S.A.

The Popular Choice



Century *The Modern Thirst Quencher*

Get Yours Now!

Every Industrial Plant employing 10 or more people needs Century Sanitary Ice-Cooled Drinking Fountains, to promote and maintain the efficiency of workers.

During the hot weather the Century cools the water to a pleasing and healthful temperature, in winter it serves as a sanitary dispenser—always ready for use in any season.

Outstanding Features

Century Fountains are preferred for their many exclusive features. The coils are made of seamless copper tubing, tinned inside and out—The Century Bubbler Head has a patented concealed regulator, stops water waste.

The cooler tank is insulated with a thick wall of tightly packed granulated cork, lid and base are insulated with heavy sectional cork-board. The fittings are brass, heavily nickel plated, other exposed parts are painted with beautiful Gray Enamel rust-resisting paint.

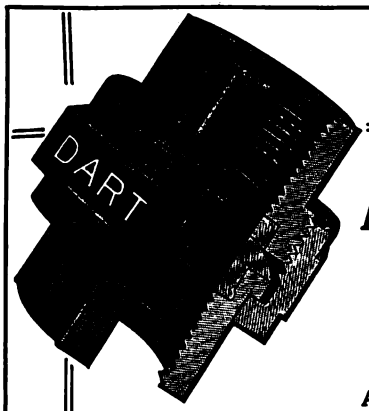
There is a particular Century Fountain or group of fountains fitted for your plant, made in many sizes to serve 10 to 100 persons per day. Prices $44.00 to $90.00.

Write or wire to-day for our new catalogue which gives complete specifications and prices.

CENTURY BRASS WORKS, Inc.

404 N. ILLINOIS ST. BELLEVILLE, ILL.

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The Bronze to Bronze Seats

Hold the Steam

And hold it so it can't escape. That's saving power and saving dollars. DART Unions keep the steam in the pipes where they belong. The bronze to bronze seating surfaces are ground together into an absolute tight seating ball and socket joint. As bronze cannot corrode or rust absolutely tight joints are assured. Our guarantee is ironclad. Here it is—two DART Unions in place of any one that proves defective.

Sales Agents
THE FAIRBANKS CO.
New York

Canadian Factory
DART UNION CO.
(Ltd.)
Toronto, Canada

E. M. DART MFG. CO.
Providence, R. I.

Use is the Test that Proves them Best!

There's economy in the use of Lay Metal Case brooms that recommends them most strongly to your consideration.

Economy of first cost and economy of replacement—for these brooms have been scientifically built and improved since 1876—until now they represent the last word in durability and efficiency.

Write us for prices, stating your requirements.

LAY Metal Case BROOMS



The Joseph Lay Company
Portland, Indiana

Branches:
New York City:
110 West 34th St.
Chicago:
920 Medinah Bldg.
Cleveland:
9343 Gorman Ave.
Milwaukee:
400 University Bldg.

useful in the way of instructions to carry with him. Some specific direction can be given him on which his foreman can check him up from time to time.

"You are going to work as a pourer. Be sure to wear your goggles."

"Those shoes you have on have a couple of bad holes in them. Better go up to the stock room and get you a new pair. We can sell you a new pair for less money than you will have to pay for them outside. You don't want any hot iron to get through those holes."

"You are a power press operator. Under no circumstances when feeding your press must you allow your hands to come between the dies. Better take off the necktie, too, and put it in your pocket. You wouldn't want it to catch on that shaft over there and wind you up around it."

These brief instructions carried out for the first time under the eye of the foreman or an assistant with the tools of the new job or at the new machine make up the elements of *how* to work safely and carefully.

Other lines of safety are feeling the change. When your old time safety speaker went into the shop, often he held forth for twenty minutes on the necessity for everybody to keep from getting hurt.

"Foremen, you are responsible for the well-being of your men. The foreman is the top sergeant of industry."

"Men, think of your families and witness the awful end to which your fellows have come when they have not been careful. Let Safety First be your motto."

The very fact that management took twenty minutes of its own or its employees' time to give to the subject of safety served a certain purpose and this type of speaker has his place. From time to time foremen and men must be brought up short to realize the gravity of accidents. Be sure, however, that no one will move very far toward the elimination of injuries in the shop who simply tells his men to be careful and not get hurt. He must tell them just how to handle themselves, just what to do and what not to do.

Now the up-to-date shop speaker after he has told his introductory story will take twenty minutes to tell his audience how to lift in order to avoid strain and hernia. At another time he will tell them just what he means by good housekeeping and in what way they can bring it about.

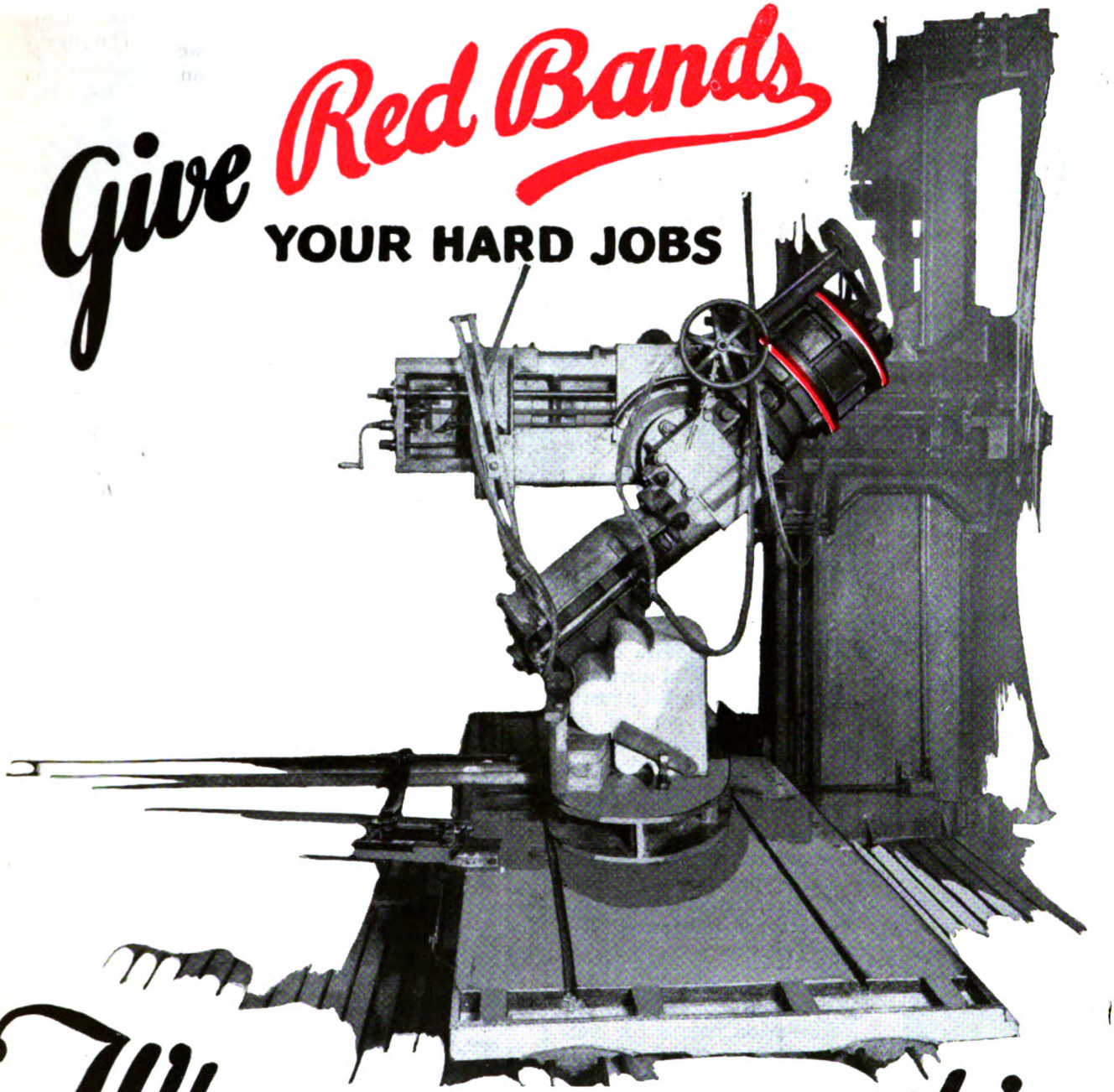
Instead of the great shop rally with 500 or 1,000 men present, and when because of the varied nature of the crowd only generalities delivered in a profound voice can be heard, we are having more departmental gatherings. A small group of pipe fitters are cautioned as to the results of cutting off sections of pipe and leaving them on some beam high above the floor, to fall on an unsuspecting head an hour later. The yard man is cautioned to cord up his pig iron, not just heap it on the truck; else later he or one of his fellows may go to the hospital with a broken toe or a fractured foot. The common laborer or the molder is told the beneficial results of lifting with his legs rather than with his back.

The early safety bulletin carried a large caption beseeching the man who gazed upon it to keep out of harm's way. Now this bulletin is largely giving way to the bulletin pointing out specific methods of working safely; of the need of working with closely reefed sleeves and tucked-in-neckties; of the necessity of crossing a conveyor only at a crossover.

The new style in safety slogans requires a little more

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Give Red Bands YOUR HARD JOBS



When users say this

We are specialists in the manufacture of carborundum machines for finishing marble and stone by grinding. The Howell Motors which we use on them **are subjected to grit, moisture and frequent overloading and have proved very satisfactory. Their rugged construction, generous shaft sizes and extra** heavy insulation make them stand up under steady overloads and run cool. For our highspeed work we have found the Timken roller bearings of the Howell motor well suited, eliminating all trouble from burned out or worn bearings. Their prices and deliveries compare favorably with other well known **makes.**

Above all else we feel in duty bound to praise the prompt and efficient service of the Howell Motor Co., rendered unfailingly without consideration of trouble or expense.

JULIUS WEGNER MACHINE WORKS
Astoria, Long Island, New York

What more can we say!

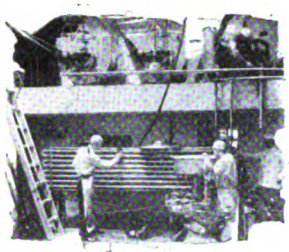
HOWELL ELECTRIC MOTORS COMPANY, HOWELL, MICHIGAN

(76)

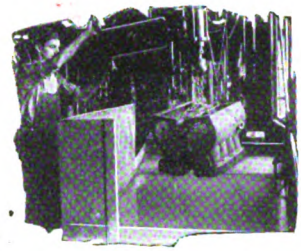
Howell RED BAND ELECTRIC Motors

When writing advertisers please mention Industry Illustrated

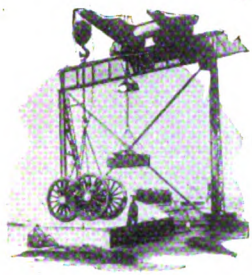
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Cleaning-up equipment in dairies



Cleaning motor parts during manufacture



Cleaning driver wheels in Oakite solution



Cleaning painted surface of storage tanks



Cleaning in garages before repair



Rust-proofing parts in process of manufacture

Competition demands OAKITE economies

PRODUCTS cannot sell at low prices while overhead expenses are high. To meet present day competition, costs must be a minimum. Wasteful practices must go.

That is why Oakite cleaning materials and methods deserve such careful consideration on the part of the progressive manufacturer. By putting industrial cleaning on a standardized, predetermined, efficient basis, all guess-work is eliminated. The whole cleaning operation is speeded up. Time, labor and material are saved. Rejects are minimized.

These facts are affirmed by the experiences of over 18,000 Oakite users. For full information, write for bulletins that pertain to your particular cleaning work. Or better, ask to have one of our service men call. No obligation.

Oakite Service Men, cleaning specialists, are located at:—

Albany, Allentown, Pa., *Atlanta, Ga., Baltimore, Boston, Bridgeport, *Brooklyn, Buffalo, Camden, Charlotte, N. C., *Chicago, *Cincinnati, *Cleveland, *Dallas, *Davenport, Dayton, *Denver, *Des Moines, *Detroit, Erie, Flint, Mich., Grand Rapids, Harrisburg, Hartford, *Indianapolis, Jacksonville, Fla., *Kansas City, *Los Angeles, *Milwaukee, *Minneapolis, *Montreal, Newark, Newburgh, N. Y., New Haven, *New York, *Oakland, Cal., Philadelphia, Pittsburgh, Portland, Me., *Portland, Ore., Providence, Reading, Rochester, Rockford, Rock Island, *San Francisco, *Seattle, *St. Louis, Springfield, Ill., Syracuse, Toledo, *Toronto, *Tulsa, Okla., Utica, *Vancouver, B. C., Williamsport, Pa., Worcester.

***Stocks of Oakite Materials are carried in these cities.**

OAKITE

TRADE MARK REG U S PAT OFF.

Industrial Cleaning Materials and Methods

OAKITE IS MANUFACTURED BY OAKLEY CHEMICAL CO
40A THAMES ST., NEW YORK, N.Y.

effort. One slogan, one speech, one bulletin for all purposes was a very simple arrangement. The question is not, What shall we put in the place of the slogan Safety First? The slogan is having to meet the same requirement as that which is being put to the speechmaker, the bulletin artist and above all to the foreman. The question is, Where can we find a hundred slogans which we can add to the serviceable old slogan Safety First to make it more effective?

Stop, Look, Listen for the motorist.

Make Haste Slowly for the taxidriver.

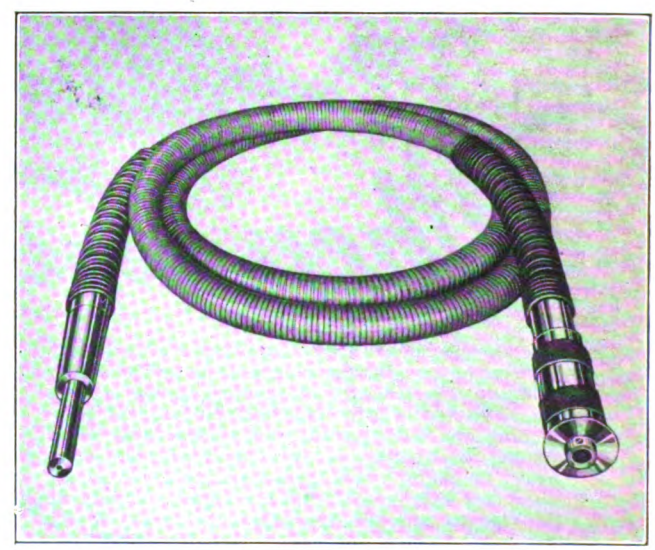
Reef up your sleeves and make all your clothing snug and tight for the machine operator.

Right Shoes Mean Right Feet for the foundryman.

These slogans and scores of others burned down into the mind, one bearing on each individual's job in each individual department is the next step which is having to be taken in the safety movement.

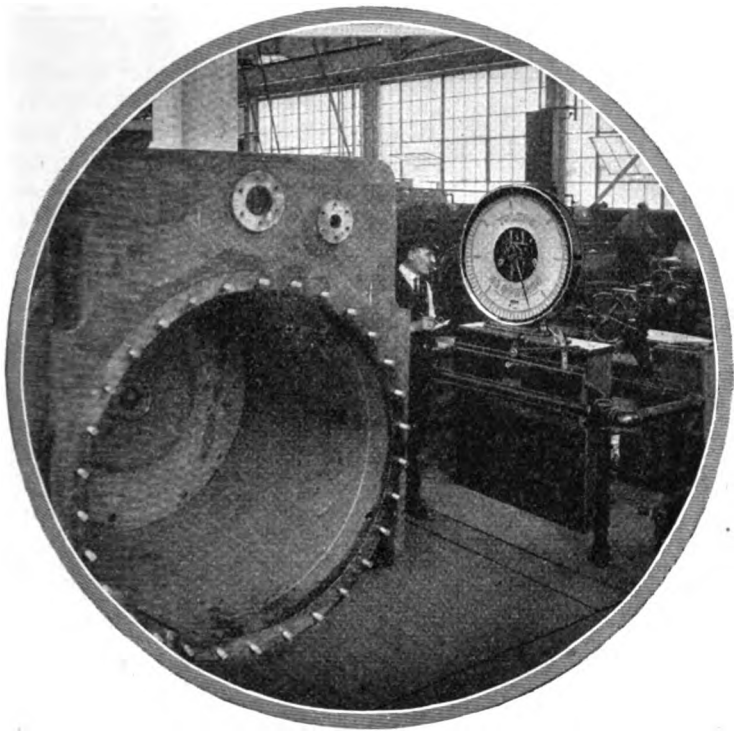
Flexible Shafting

THE Biax Flexible Shaft Company, 136 Liberty Street, New York City, have recently put on the market a complete line of flexible shafting designed for a wide range of applications. In describing this product, the Biax Company states that the outer casing is made of zinc plated steel, oil-tight, inside which is a coil of tempered steel wire, flat in section; a re-enforcement being



mounted at each end, outside the casing, to protect the assembly at the point of greatest strain. There are ten standard sizes of this shaft, from the high-speed, light power type transmitting 1/15 hp. at 4,000 r.p.m., to the heavy model capable of transmitting as much as 5 hp. at 3,000 r.p.m. The standard shaft is designed for counter-clockwise operation, but a reverse winding can be had if desired. This shaft is supplied in any length up to 36 feet.

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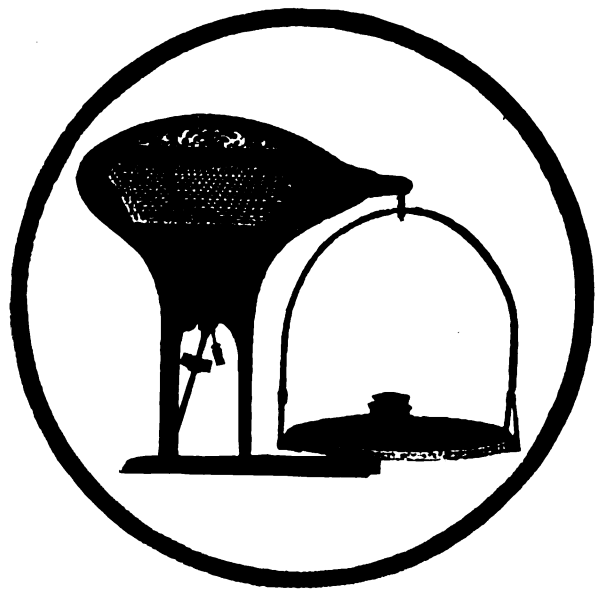


To-Day

A Toledo automatic scale of 30 tons capacity, weighing the cylinder head of a ship's engine, placed on the scale by a traveling crane.

25 Years Ago

The first model of Toledo Scale (below) designed for weighing meats and groceries and computing the value.



Weighing Revolutionized in 25 Years

THIS year the Toledo Scale Company celebrates the silver anniversary of its founding. In twenty-five years automatic scales have grown from a novel experiment to standard, world-wide usage.

Little had been done for centuries before to improve the methods of weighing. Stores and factories were limited to the use of hand-operated scales, with which time was wasted and mistakes made in manual and mental operations.

The mistakes went into the factory records. This resulted in errors in production figures; errors in cost accounting; errors in the inventory; errors in invoices, and unexplainable manufacturing losses.

Toledo Scales automatically give accurate weight. The operator rolls on the load and reads the weight in plain figures on a great dial from five to seven feet in circumference. By saving time, preventing errors and stopping losses in thousands of factories, Toledo Scales have contributed to America's low cost production.

From the first simple scale shown above has grown a line of automatic weighing scales ranging in capacity from eight ounces to thirty tons, and devices for many special purposes.

Today Toledo Scales are used throughout the world. They are serviced by an international organization of trained representatives and service men. On its silver anniversary the Toledo organization can look with pardonable pride upon a record of notable accomplishment.

Toledo Scale Company, Toledo, Ohio
Canadian Toledo Scale Co., Limited, Windsor, Ont.
Manufacturers of Automatic Scales for Every Purpose
Offices and Service Stations in 106 Cities in the United States and Canada

TOLEDO SCALES

NO SPRINGS HONEST WEIGHT

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for

good hard work—try a Prentiss

A Prentiss Vise will hold anything. It's built to withstand lots of racking. It won't stand continued abuse—no vise will—but it will outlast most of 'em.

The lever on a Prentiss is press-forged; there's a press-forged head on the screw; the castellated collar fastening—an exclusive Prentiss feature—replaces the usual set screw and prevents the front jaw from working loose; and the sliding arm is machined separately on all four sides to .002" tolerance.

If you want a vise that'll do real work and stand a lot of punishment, too—ask for a Prentiss. It's stood the test for more than half a century.

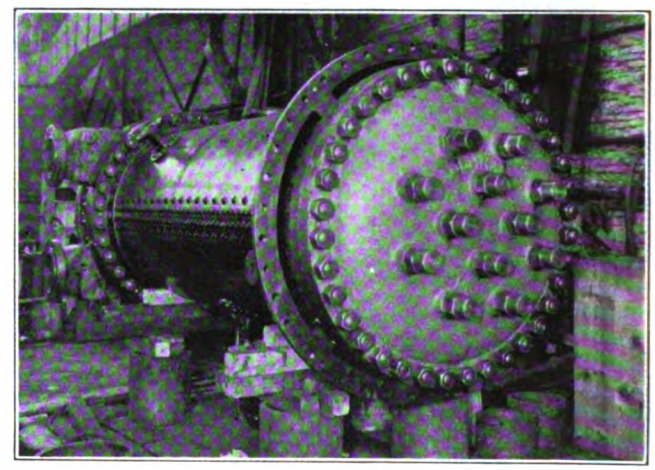
PRENTISS VISES
PRENTISS
106 - 110 LAFAYETTE ST. NEW YORK CITY
VISE CO.
CHENEY HAMMERS

9244

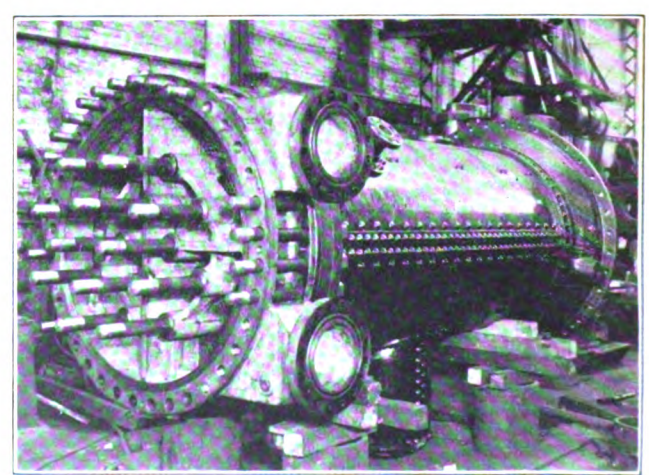
Closed Feed Water Heaters for High Pressure

IN an ideal steam power plant the feed water would be heated from condenser temperature up to the temperature corresponding to saturated steam at the initial pressure by means of steam withdrawn from expansion at progressively higher temperatures. In certain recent large plants this ideal is being approached, as many as four extraction or bleeder connections being provided on the main turbines delivering steam to socalled "stage" heaters, the last one necessarily under a rather high pressure. In the new Richmond Station of the Philadelphia Electric Company, each of the 50,000 kw. units will have three bleeder heating stages, designed to deliver 600,000 lbs. of water per hour to the boilers at 305° Fahr. These heaters were constructed by the Cochrane Corporation, of Philadelphia.

The accompanying illustrations give some idea of the

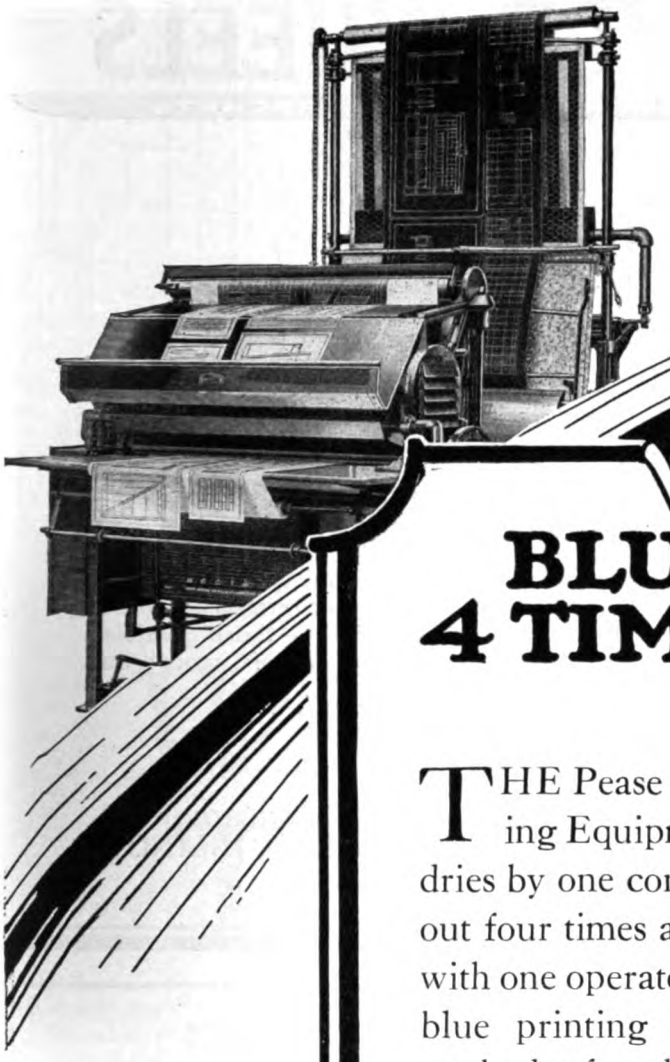


heavy construction required to meet the high pressures. The heater weighs over 14 tons. The tube sheets, which are of Muntz metal, are 3¼ inches thick and are faced on both sides. The water boxes and covers, nozzles and rings are of cast steel, while the shell proper is of 5/16 in. steel plate. The water head, which is 4 ft. inside diameter, is held in place by 36 two-inch bolts and is further supported by twelve 2¼-inch steel stays. Bosses in the water box and the head abut the tube sheet so that the



latter is not distorted when the stay bolts are pulled up. The tension of the stay bolts is not taken on threads in the tube sheet but by steel cap nuts which have wide

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Speed

PEASE
CHICAGO

BLUE PRINTS 4 TIMES AS FAST

THE Pease Peerless Continuous Blue Printing Equipment prints, washes, potashes and dries by one continuous operation. It will turn out four times as many blue prints in one hour, with one operator, as can be turned out on ANY blue printing equipment where independent methods of washing and drying are used.

The Peerless will give you up to 120 linear yards per hour of perfect prints—printed, washed, potashed and dried ready for immediate use—or it can be operated very economically for as short a run as five to ten yards.

Ask for the Peerless Story

Our new Catalog M-28 gives complete data on the Pease Peerless—it costs you nothing—ask for your copy.

The C. F. Pease Company
828 N. Franklin Street
Chicago, Ill

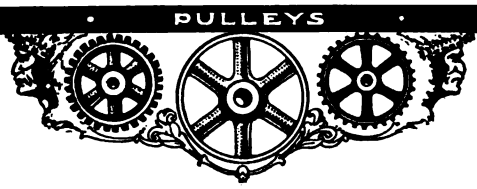
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PYOTT POWER WHEELS

· GEARS · · PULLEYS · · SPROCKETS ·



"As Good as Pyott"

For more than a quarter century Pyott has been making cast iron pulleys better than they were ever made before. So consistently have these pulleys been better that today the recognized standard of pulley quality is the

PYOTT *Red Face* PULLEYS

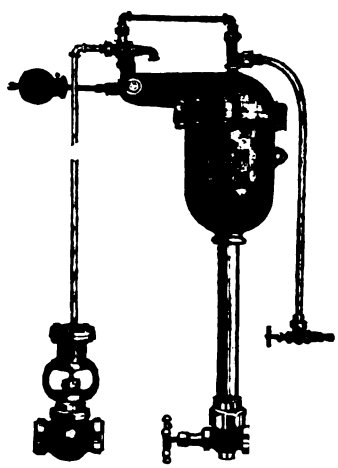
No matter what your use of pulleys is—no matter whether you need one or a thousand—from three inches to twelve feet in diameter—you will have your order promptly filled. And there'll be no question as to balance, true-running, crown or weight—those qualities are inbuilt. Compared with ordinary pulleys, Pyott Red Face probably cost more; but they are cheapest when belt wear and power loss are figured.

Write for booklet on pulleys, gears and sheaves. It's yours for the asking

PYOTT FOUNDRY CO., 332 N. Sangamon St. CHICAGO, ILLINOIS

Leaders in quality pulleys for over 25 years

O.K.



The experienced power plant engineer knows that a constant water level in boilers is essential if the plant is to be run economically.

So he puts his O. K. on

VIGILANT

Feed Water Regulators

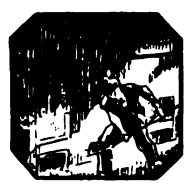
They eliminate careless hand feeding and assure a constant water level. Boiler strain is reduced, steam production is increased and fuel economy is secured.

Play safe with a Vigilant.

Write for catalogue.

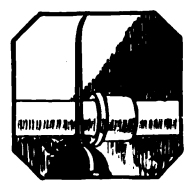
The Chaplin-Fulton Mfg. Co.
28-36 Penn Ave., Pittsburgh

Use Nitrose for:



. . . all heated surfaces

Ordinary surfacing compounds crack, blister, and peel on hot metal surfaces. Nitrose Metal Coating won't. It resists heat. And you can apply it while surfaces are heated, too.



. . . all oily surfaces

Oil and grease don't bother Nitrose Metal Coating—it grips the metal despite an oily coating. You can find no substitute for Nitrose for oily, greasy surfaces.



. . . all rusted surfaces

Nitrose can be applied to rusted surfaces with half the usual surface preparation. Only one coat is needed. It sinks through the rust to the bare metal.

Order a drum of Nitrose for trial. See how easily it's applied with a brush or spray without mixing—how superior it is to paints and other surfacing compounds—how economically it can be applied—how it conquers corrosion. Only one coat is needed. After giving Nitrose a trial, you'll want to go over the whole plant's metal surfaces with Nitrose Metal Coating.

THE NITROSE COMPANY
Peoria Life Building, Peoria, Illinois

See phone book for representatives in:

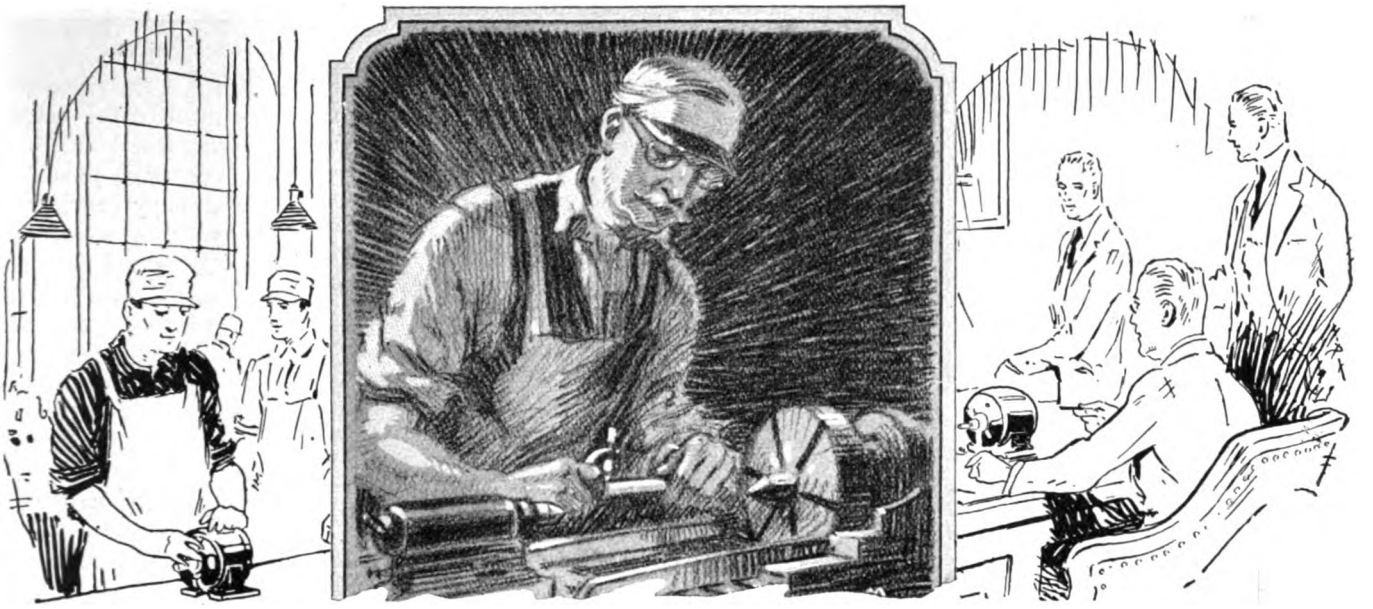
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NITROSE Metal Coating

II 7-Gray

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Will it get the THIRD O.K.?

Of course, any electric motor you use will bear the O. K. of its *maker* before it leaves his factory. And, of course, it must have *your* O. K. before it is accepted.

But will it get the third O. K.—the important O. K.—from the housewife who buys a vacuum cleaner, ironer, washing machine or sewing machine; from skilled and unskilled labor operating a wide variety of drills, pipe-threading machines, saws and grinders?

Every activity of the Domestic Electric Company is concentrated on this third O. K., which can be won only through satisfactory and uninterrupted motor service.

Three features of Domestic Electric policy assure such satisfaction *to the user*. Domestic Electric engineers first study the appliance and thoroughly familiarize themselves with the conditions under which the motor must work. Then the same engineers supervise development of a motor to meet these special needs. Lastly, Domestic standards of manufacture and inspection insure flawless materials and workmanship.

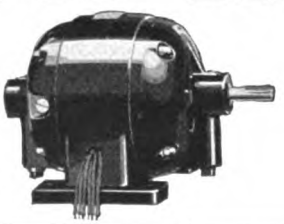
You will never find a haphazard application of Domestic Electric motors. You need never gamble or guess on the service they will give in actual use.

Our engineers will gladly show you how you, too, may eliminate motor service troubles, cut service costs and insure the same satisfaction from motors that is pledged in your guarantee of the appliance itself. Fill in the coupon. Mail it. We shall arrange an interview to suit your convenience.

DOMESTIC ELECTRIC COMPANY, CLEVELAND, OHIO

Manufacturers of fractional horsepower motors exclusively

Domestic Electric Motors



CLIP THIS COUPON AND SEND IT

NAME

STREET

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Domestic Electric Company Cleveland, O.

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The New



Every Part Hardened

Ettco

Eight Good Reasons for Using the New Ettco.

1. Lighter in weight.
2. All Hardened Body.
3. Keyless.
4. Hand Operated.
5. Ball Bearing.
6. Continuous Grip.
7. Self Centering.
8. Simple Construction

Send us your old drill Chucks. We will allow 15% on the exchange.

No. 1A	Ettco—0 to ¼ in.	$ 5.50
No. 1½A	Ettco—0 to 5/16 in.	6.00
No. 2	Ettco—0 to ⅜ in.	6.50
No. 3A	Ettco—0 to ½ in.	9.00
No. 3½A	Ettco—⅛ to ⅝ in.	11.00

ETTCO Chucks Increase the Value of Your Electric Drills

EASTERN TUBE & TOOL COMPANY, Inc.
594-602 Johnson Avenue, Brooklyn, N. Y.

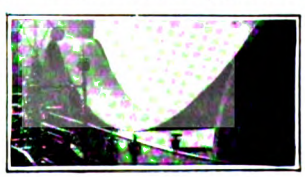


Unmasked!

The Secret of Saving Money, Power, Belts with CLING-SURFACE

Cling-Surface Preservative is a special treatment for leather and fabric belts that has been successfully used all over the world for 30 years.

It doubles, yes triples, the life of belts by keeping them soft and pliable. It also enables you to run them slack, thereby preventing hot-boxes, costly shut-downs and by actual test permitting the belt to deliver maximum power.



Maddock Pottery, Trenton, N.J.

Sold in Light, Medium or Heavy densities in gallon, 3-gallon or 6-gallon tins. Send in the coupon today.

CLING-SURFACE

PRESERVES BELTS—ELIMINATES BELT SLIP

FREE 60 Day Return Privilege COUPON

Conditions in our plant are about as checked:

☐ cold ☐ hot
☐ damp ☐ dry
☐ dusty ☐ clean
☐ 3 gal. Tin at $3.40 gal.
☐ 6 gal. Tin at $3.25 gal. F.O.B. nearest Warehouse.

Cling-Surface Co., 1056 Niagara St., Buffalo, N. Y.

Gentlemen: I am always willing to give a belt-saving, money-saving proposition a trial on its own merits. Send tin to fit conditions noted and of the size checked. If need be, I shall use the entire contents. If satisfactory I shall pay in 60 days. Otherwise no pay.

Company ..... Attention.....

Address II-7-26

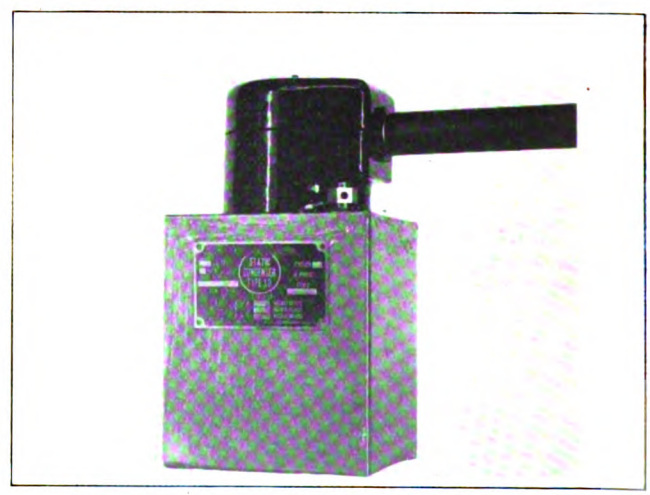
shoulders recessed into the tube sheet. The total load on each of the water heads when under the hydrostatic test pressure of 1,100 lbs. per square inch amounts to over 2,000,000 lbs.

As may be noted from the arrangement of the baffles in the water box, there are four water passes. Expansion of the tubes independently of the shell is provided for by a floating head, which also is strongly reinforced by steel stays. Four of the through bolts by which the floating head is secured to the tube plate extend through the latter and are turned down to form smooth pins which slide through holes in lugs projecting inwardly from the cast steel flange of the heater shell, thus supporting the head while leaving it free to move. This may be seen in one of the photographs, where the steam head has been removed and the tube plate of the floating head is shown thus supported in place but without the tubes inserted. The head projects beyond the flange of the heater shell sufficiently to leave ample space for applying a wrench to the heads of the bolts which hold the cover plate.

New Static Condenser for Individual Motor Application

THE Westinghouse Electric and Manufacturing Company has recently developed a new line of static condensers for individual motor application on motor circuits of 220, 440, and 550 volts for two and three-phase circuits. The new condenser consists of insulation inclosed in a sheet-metal container and a porcelain terminal housing arranged for conduit connections.

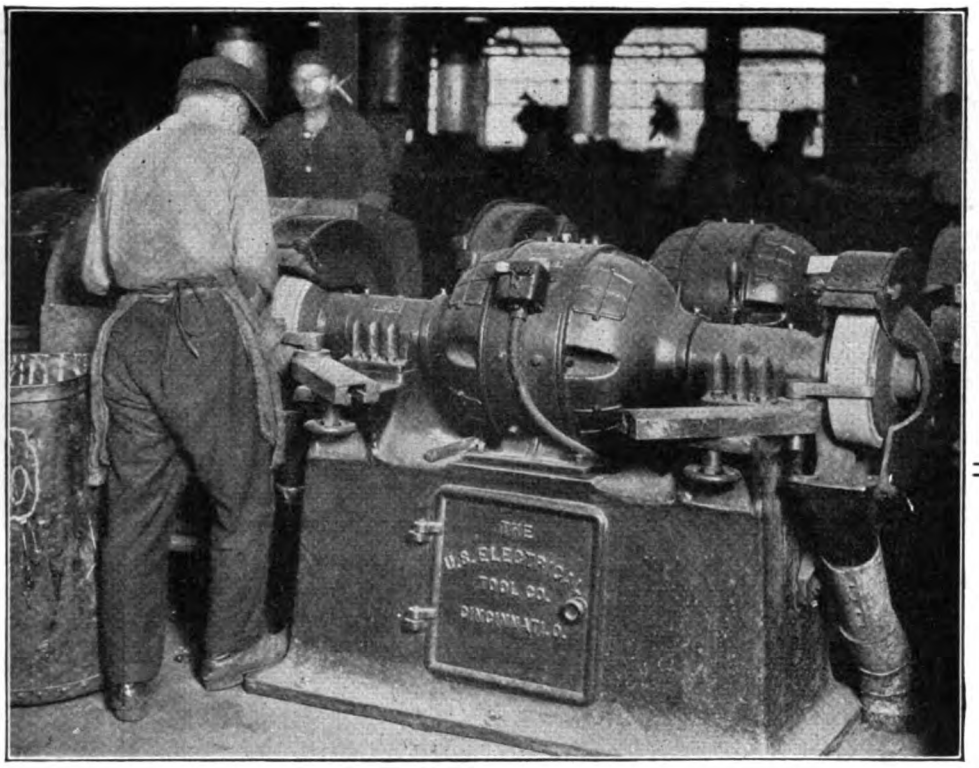
The correction at the motor by means of these static condensors, the manufacturer claims, is productive of a number of advantages. Low losses of less than ½ per cent. regardless of kv-a rating; power factor, correction



at or very near the source as desired; improvement of voltage regulation at the motor or on the feeders, due to the reduction of line current and flexible localized form of correction, are some of the outstanding ones.

In addition, it is pointed out, further correction may be bought with each motor, or the condenser may be changed from one motor to another. These condensers which may be connected at the motor side and switched on and off with the motor without additional attention may be obtained in ½, 1, 2½ and 5 kv-a units. All live parts are completely covered assuring safety to operators.

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Use the Wheels Down to the Flange

Without Loss of Production

Maintain the peripheral speed of approximately 5500 feet per minute *regardless of the wheel diameter* and you increase the life of the wheel—automatically reducing your production costs. Furthermore, you can step up your production to its maximum as wheels can be used down to their flanges.

These advantages can only be obtained through the use of U. S. (A. C. or D. C.) Adjustable Speed Grinders —members of the oldest and broadest line of electric drills, grinders and buffers in the world.

Investigate the U. S. Adjustable Speed Grinders—and see how you can save the cost of the new installation within one year. Our Engineering Department is at your service.

Write for Catalog "E"



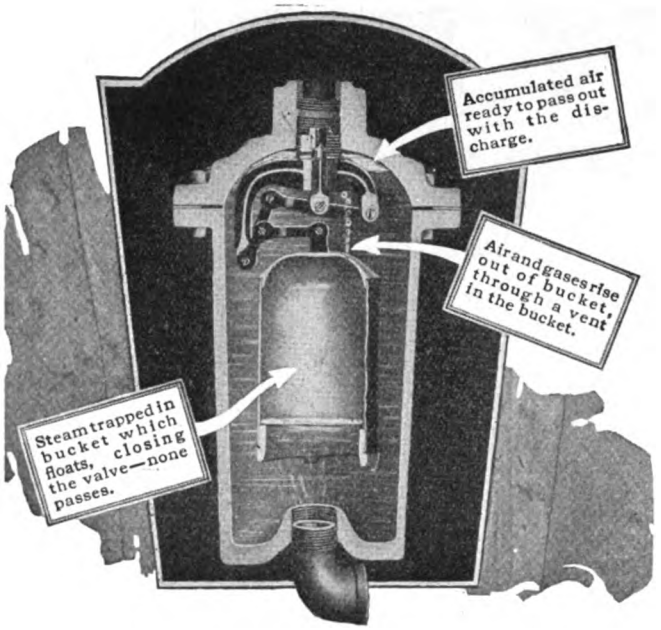
The United States Electrical Tool Company
Cincinnati, Ohio - - - - - - - - - - - - U. S. A.

Export sales representatives
Westinghouse Electric International Co.
150 Broadway, New York, N. Y.

U.S. Portable Electric Drills Grinders–Polishers

Oldest Builders of Electric Drills and Grinders in the World.

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THOUSANDS of Armstrong Steam Traps are in use in hundreds of industries. Each year thousands of new names are added to the long list of Armstrong users—many as a result of acceptance of the 90-day test offer.

We want the few engineers who aren't acquainted with the superiorities and freedom-from-trouble of the Armstrong to know the advantages of its patented and exclusive, inverted submerged bucket principle.

It will please us to send you the details of the 90-day offer, or the big, new catalog.

The Armstrong is different from any other steam trap. Test it out. Prove our claim of superiority.

Please ship prepaid an Armstrong for 90 day test. **It is understood that when test is completed the trap is to be returned collect.**

Size of trap..... Size of pipe connections .....

Maximum pressure.....(Do not neglect to state maximum)

Firm .....

Address .....

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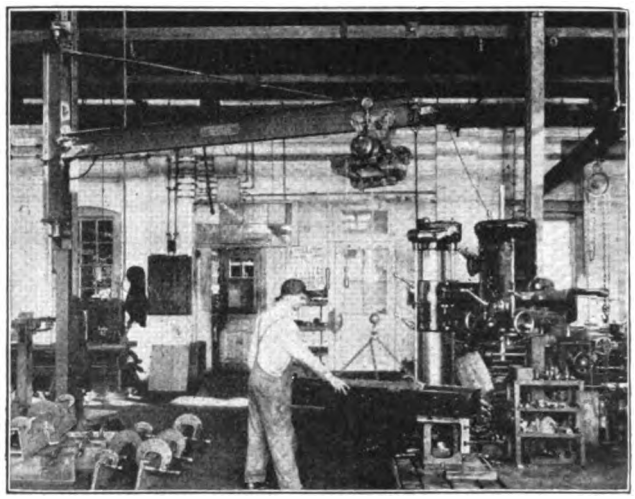
Signed ..... Position .....

.....

☐ *Send the catalog only; send no trap.*

Mail to ARMSTRONG MACHINE WORKS
326 MAPLE STREET, THREE RIVERS, MICHIGAN

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LIGHTEN LABOR
WITH
ROEPER ELECTRIC HOISTS

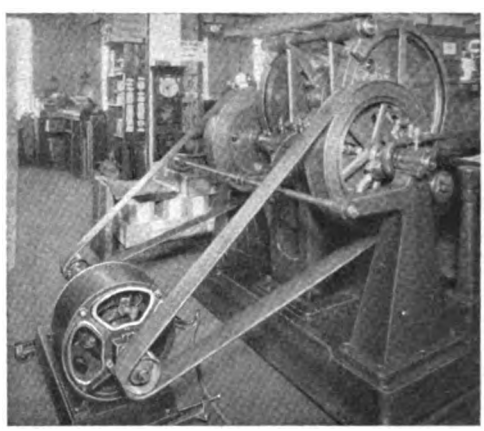
Keep the machines active so they produce the utmost.

The above outfit—Hoist, Trolley and Post Crane—can all be bought for less than $500.00.

Ask for full information.

ROEPER CRANE & HOIST WORKS, Inc.
1728 N. 10th St., Reading, Pa.

Traveling Cranes Electric Hoists Trolleys



DIEHL DIRECT CURRENT MOTOR DOUBLE END DRIVE

A large company in New York City is using a Diehl direct current motor to operate a heavy embossing press. The feature of this installation is the double end shaft drive which has worked out very successfully over a number of years of service. Let Diehl engineers help you with your motor power problems.

Send for descriptive bulletin—now

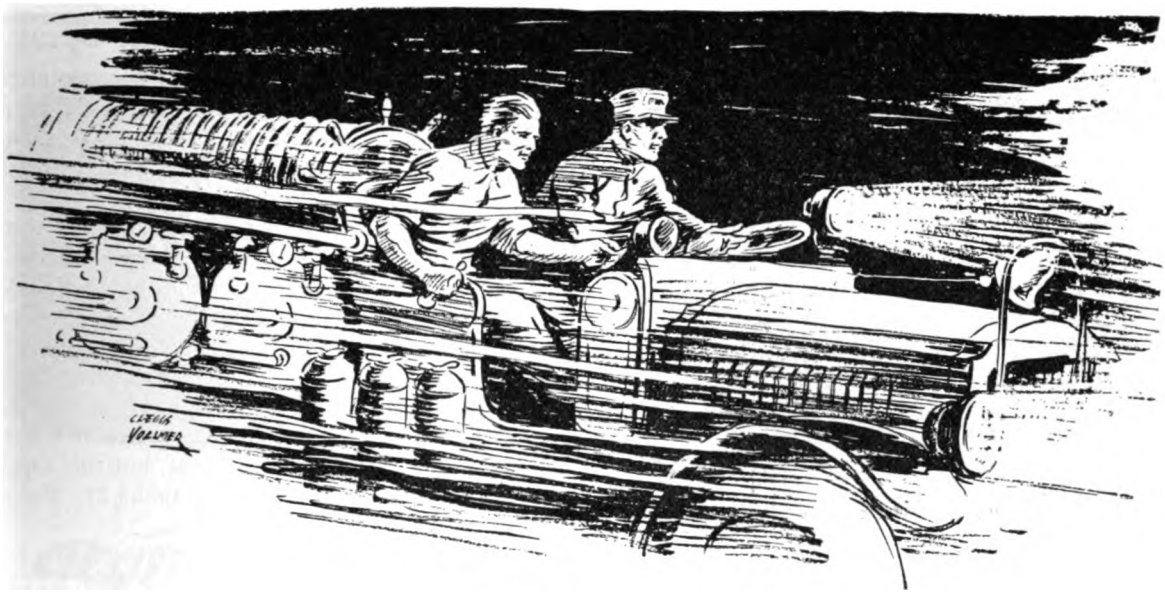
DIEHL MANUFACTURING CO.
ELIZABETH, N. J.
Atlanta Boston Chicago Detroit New York Philadelphia

DIEHL

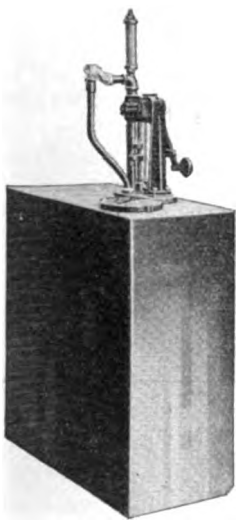
BUILDERS OF ELECTRICAL APPARATUS SINCE 1888

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Are you trying to have a fire?



"HOW long will it be before I have a fire?" ... That's what you invariably think every time you enter that room where your drums and barrels of paint oils are kept. You could hardly say you are *trying* to have a fire—but you do know the inflammability and combustibility of oils, oil-soaked floors, rags, etc.

The best insurance against fire is prevention. The best prevention is the Bowser system of *safe storage*—steel, air-tight tanks.

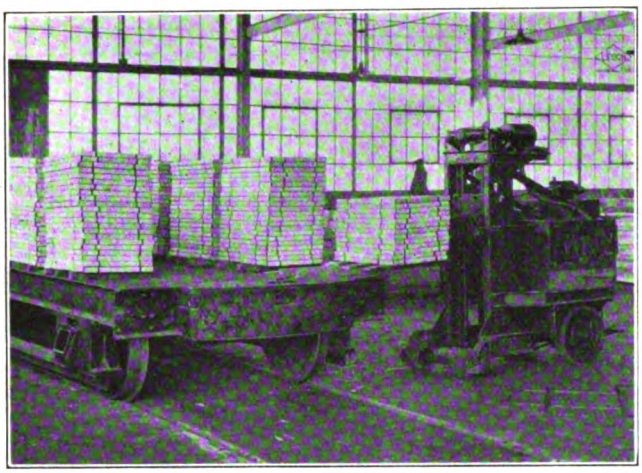
Besides that, Bowser equipment saves 4% to 12% waste on oils—saves your men's time and the danger of accident and keeps the oils in better condition.

Photographs of the right kind of storage systems and complete descriptions thereof are available. Talk to the next Bowser man who calls on you or drop a letter to Dept. 35 and say you are interested in oil storage and in eliminating fire hazards. Write today!

S. F. BOWSER & COMPANY, Inc.
LUBRICATION ENGINEERS AND MANUFACTURERS
FORT WAYNE, INDIANA, U.S.A.

LUBRICATORS-OIL FILTERS-OILING SYSTEMS-ACCESSORIES
OIL STORAGE AND DISTRIBUTION SYSTEMS

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Slide Under the Load and Go!

Slide the fork under sheet metal, tin plate, boxes or barrels, and *travel.* You pick up the load quickly, get there fast and unload easily. No skids required. Just use small strips of wood to give clearance for the fork.

This model No. 706 truck saves a large investment in skids and has many various labor saving uses. It may be fitted with a crane or other attachments to lift special shapes of sizes. And, best of all, these special attachments are used with *standard* Tier-Lifts. You pay no premium for equipment designed for your peculiar needs.

Lakewood Tier-Lifts are made with lifts up to 8 ft. and capacities to 6,000 lbs.

The
LAKEWOOD
Engineering Company
CLEVELAND

THE LAKEWOOD ENGINEERING CO., Cleveland, O.
Please send specification sheet I.T.116.

Company .....

Individual .....

Address .....

The Milburn Paint Spray

PAINT spraying is the modern, economical method of applying paint, varnish, etc., to all surfaces. In painting any character of devices or surfaces, time, material and labor costs are greatly reduced with the utilization of the proper gun or spray.

The ease and simplicity of operation of the Milburn Paint Spray is an outstanding feature. The paint enters a large, annular chamber surrounding the air nozzle from which it is atomized and expanded in a venturi-shape. The atomization is complete and is regulated by a mere turn of the nozzle, from a small to a large spray, or is entirely shut off, bringing into play a stream of air for dusting purposes increasing the speed of the work. A pressure of 40 pounds is excellent, but this can be varied to suit the work. Carbonic gas tanks are also employed with good results.

The thorough, minute atomization of paint results in a complete even coverage of a greater surface with minimum paint consumption. One coat is adequate with the Milburn atomization principle, where two coats are usually required by hair brushing. Air pockets and daubing are eliminated; places impossible to reach by brush, can be painted with the Milburn Spray.



The Milburn Paint Spray is light in weight, compact and extremely efficient, employing a new and greatly simplified principle of construction, which accounts for the absence of moving parts and passages likely to clog. It consists of rugged cover, body, atomizer, and convenient handle. No small parts to get out of order or adjust.

A few of its many uses are painting:
Walls, interior and exterior,
Painting and varnishing woodwork.
Tanks, structural iron work, stacks, etc.

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O.K. on Performance

Bond Commercial Roller Bearing

This Bearing has won a place for itself on the sheer merits of its performance. Its superior design, based upon sound engineering principles, is now accepted as the right construction for a dependable, durable Commercial Roller Bearing.

Examine a Bond Commercial Roller Bearing and you will quickly see the reasons for its increased efficiency and strength:

The Pressed Steel Retainers, or cage ends, are tied, spaced and held rigidly in place by Steel Stay Rods, alternating with hardened and ground solid Steel Rollers. These Stay Rods are shouldered and electrically welded into the Retainers. The Rollers are kept evenly spaced and constantly parallel to the shaft axis. No chance for wabbling or uneven wear—just a smooth flow of power.

It will pay you to know about this superb Bearing. Ask us for your copy of our illustrated catalog showing dimensions, list prices and load tables.

Bond Truck Casters—

Casters with the Quality You Have Been Looking for



DOUBLE BALL RACE TYPE

Wherever there is a need for reliable Truck Casters in the industrial plant, there is a Bond Caster to fit the requirements. The Bond line is complete, including a caster for every specialized service.

The Bond Anti-Friction Swivel Truck Caster is a distinct step in advance. By its scientific construction, every ounce of strain is taken from the king pin and carried by the strong ball races. This feature eliminates broken king pins, sticking and dragging—the commonest sources of caster trouble. The plant equipped with Bond Truck Casters is insured a steady movement of materials without interruption or annoyance.

We can show you some interesting facts about the advantages of Bond Truck Casters. Write for illustrated caster catalog.

BOND FOUNDRY and MACHINE COMPANY

Manufacturers of a Complete Line of Power Transmitting Machinery, Truck Casters, Emery Wheel Stands, Garage Equipment, Etc.

MANHEIM, LANCASTER CO., PA.

New York Office: 256 Broadway

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What About Other Plants In Your Industry?

REEVES PULLEY COMPANY
INCORPORATED 1888
SOLE MANUFACTURERS OF
REEVES
VARIABLE SPEED TRANSMISSION · WOOD SPLIT PULLEY
MOTOR PULLEY · WOOD SPLIT PULLEY CLUTCH
POWER TRANSMISSION APPLIANCES
COLUMBUS, IND., U.S.A.

Dear Sir:

If you were to take an inspection trip through some of the other up-to-date plants in your industry, doubtless you could pick up many useful ideas. Others could do the same in going through your plant. These ideas and methods would be valuable because they had proved their worth in actual operation. You might be able to adopt or adapt them in your own plant with profit.

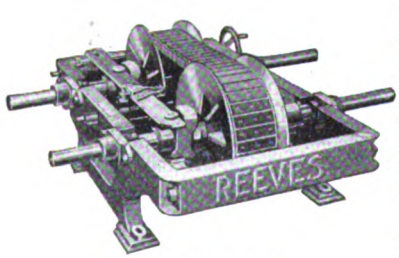
One of the most generally useful devices you would encounter would be the REEVES Variable Speed Transmission. Progressive manufacturers everywhere, in almost every line of industry, have adopted this simple, inexpensive device as the one truly accurate and dependable method of giving speed variation to their production machines and conveyors.

The REEVES Transmission has a universal use, because it is so easily and conveniently applied to any kind of machine.

Modern production methods demand accurate speed control. And with the REEVES Transmission you can get any speed at any time, on any machine. The REEVES gives your machines and conveyors the speed flexibility of an automobile -- it regulates your machines as quickly and easily as the accelerator controls your motor car.

Find out about the uses of the REEVES Transmission in your industry. Let us tell you how REEVES Transmissions have proved profitable for your own fellow manufacturers.

Yours very truly,
REEVES PULLEY COMPANY
By ..... President.



Our Catalog L66
Gives Full Information
Send for It!

The REEVES Transmission is a simple, compact, mechanical device which receives power at a constant speed and delivers it at any speed desired to any machine or group. It will maintain one set speed indefinitely, or may be changed instantly to meet any different operating condition. Force-feed lubricated. Complete ball-bearing. Accurate and dependable, always.

REEVES PULLEY COMPANY
Established 1887
COLUMBUS, INDIANA
REEVES
Variable Speed Transmission

Coating cement floors and walls to prevent cracking, dampness, etc.

Automobiles, mechanical devices, etc.

Cement, brick and stucco.

House appliances, radiators.

Whitewashing.

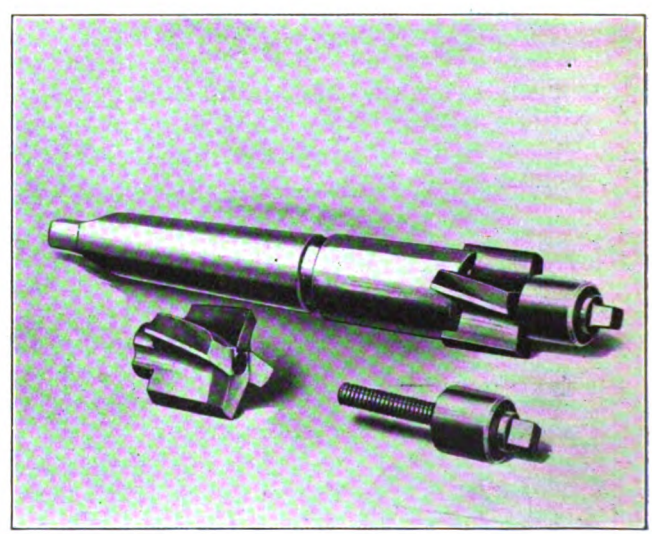
Oiling and parafining motors, steel, baking pans, inaccessible machinery parts.

Applying coatings to surfaces.

A New Type Interchangeable Counterbore

IN announcing a new type of interchangeable counterbore recently put on the market, the Bicknell-Thomas Company, of Greenfield, Mass., make the following comment:

"Christy Counterbores were developed through a long process of designing and testing with the idea of an ideal tool for counterboring work. All the conditions of service that counterbores are subject to were carefully considered: spot-facing where continuous breaking through foundry scale is encountered; depth counterboring, where the depth of cut is greater than the length of the interchange cutter; precision counterboring, where the pilot



hole and counterbore must be kept concentric within close limits; complete interchangeability, giving a number of pilot sizes for each cutter as well as a number of cutters for each holder. And the gruelling service required of a tool in high speed production shops was also carefully considered when designing this counterbore."

Several styles of cutters can be furnished, as follows:

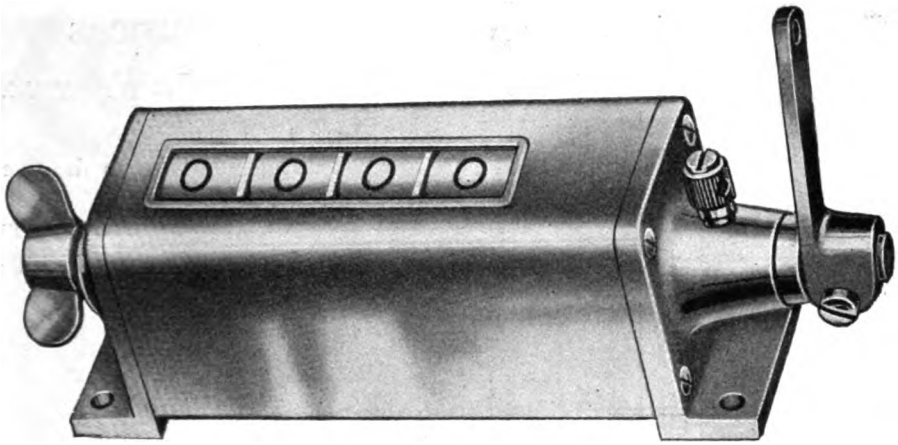
A. Four lipped, for use in spot facing and general counterboring work.

B. Two lipped for use in spot facing where it is desirable to break under the scale immediately in order to save the cutting edge in sandy or poorly cleaned castings.

C. Combination cutters and pilots. These cutters are for use where a high degree of accuracy is required, and where the counterbore and pilot hole must be concentric within very close limits.

D. Countersinks are made up for all sizes of holders in any angle desired.

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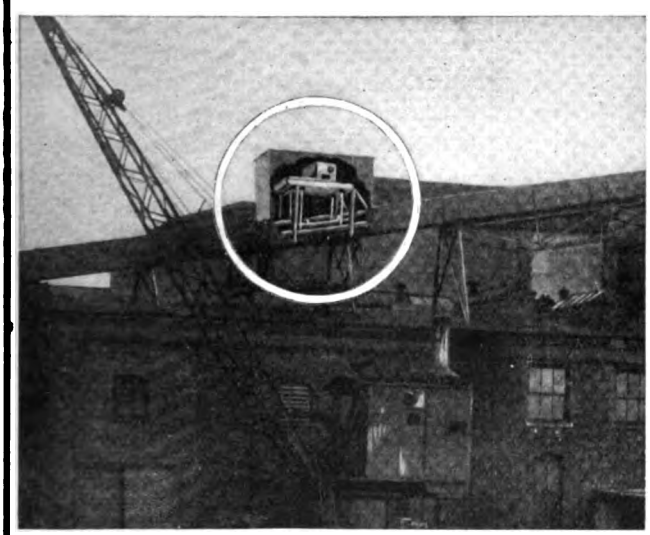
Veeder

Set-Back Counter

Registers reciprocating movements of the lever, as required in counting the product of punch presses. Sets back to zero from any figure by turning knob once 'round. Price, with four figure-wheels, as illustrated, $11.50 (subject to discount). *Cut full size.*

THIS DIAL keeps a moving record of machine's work, and it keeps the *workman* moving to make the record! The figures show the added production from minute to minute:—no minutes lost without *showing* the loss in production. All the time is productive time, till your workman registers a good day's work on the counter. On your *own* part you'll find it productive time to write for the Veeder booklet.

THE VEEDER MFG. CO., 31 Sargeant Street HARTFORD, CONN.



Weigh as You Convey and Eliminate Losses

What check have you on materials handled on conveyors? Your bills of lading are not always correct. The chance for error is always present.

Conveyors equipped with Merrick Weightometers are assured of an accurate check on all conveyor handled materials—99% accuracy guaranteed—ore, sand, stone, gravel, coal, coke, finished cement, etc. The weighing is done while the materials move along and the weights recorded. It is ideal for checking receipts, shipments and interplant movements.

Write for the "Merrick Catalog." It explains how it works.

MERRICK SCALE MFG. CO.

180 Autumn St. Passaic, N. J.



Scrap Handling Hopper Dumps Direct into Car

Industrial Dump Hoppers play an important part in handling materials around our large industries. Great savings in handling bulk material in dump hoppers.

One installation of twenty-four hoppers saved $8,000.00 in one year.

Large demand has made it possible to manufacture on an economical basis.

Manufactured in both Side and End Types.

Made of 3/16 material extremely heavy and rugged.

Hoppers are made separate to be used with any type lift truck.

One lift truck can take care of a great number of Hoppers.

Write today for complete details.

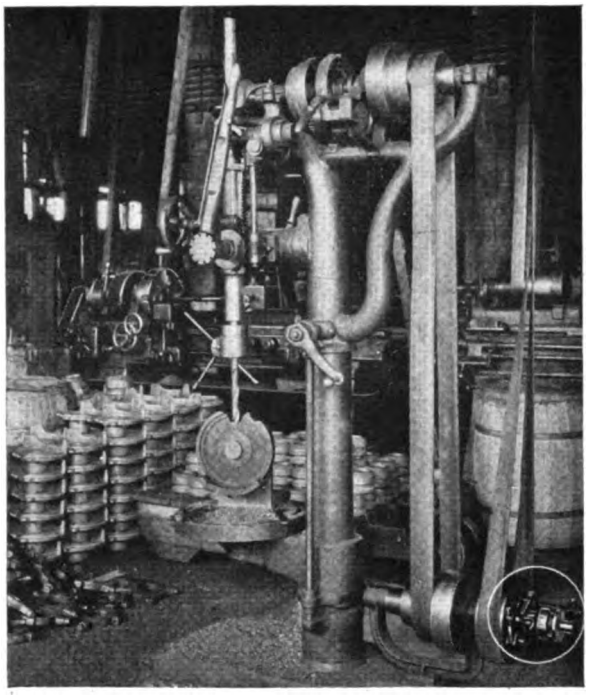
THE ROURA IRON WORKS

1400 Woodland Ave., Detroit, Mich.

—A FEW USERS—

Dodge Bros., Buick, Chevrolet, Temstedt Mfg. Co., National Screw, National Carbon, Central Forge Co., Champion Porcelain Co., and many others.

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"It's

CONWAY CLUTCH *Equipped"*

A Good Selling Point on any Machine

When a machine is equipped with a CONWAY CLUTH you don't have to talk much about performance.
Here's some of the things a CONWAY CLUTCH can do:

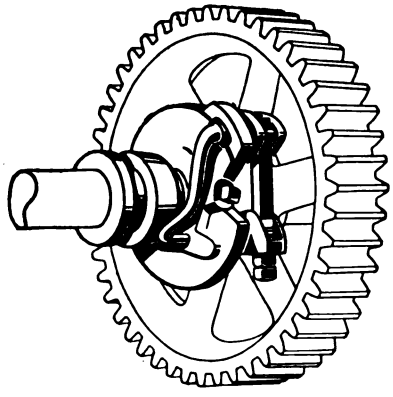
A 2 H.P. CONWAY stalled an 8 H.P. gasoline engine.

A 5 H.P. capacity stopped a 25 H.P. motor.

On a can filling machine, in and out engagement 2,000 times an hour.

These are a few instances of its performance, but they are not unusual for a CONWAY CLUTCH. It's made for hard work. Did you ever see a clutch with these CONWAY advantages?

Floating friction band, one point adjustment, easy engagement, quick release; its enormous power transmission capability and its free and complete idling, come from the Engineering department. Its efficient functioning and long life under the most exasperating conditions, result chiefly from accurate workmanship.



No matter what kind of machinery you operate you need a CONWAY CLUTCH, if the machine must stop and start many times a day. Bulletin No. 35 shows why. May we send you a copy?

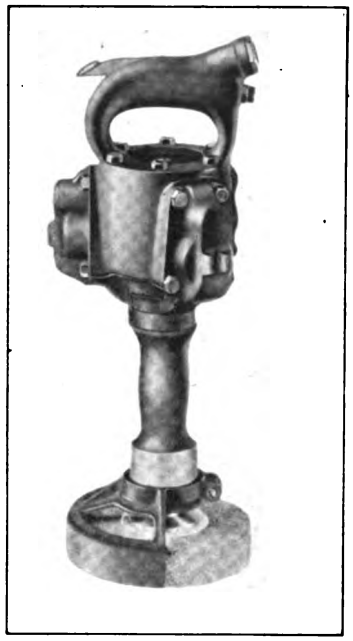
THE CONWAY CLUTCH CO.
1960 Riverside Cincinnati, Ohio

Chicago Pneumatic Tool Company Announces

A New Electric Drill and a Pneumatic Grinder

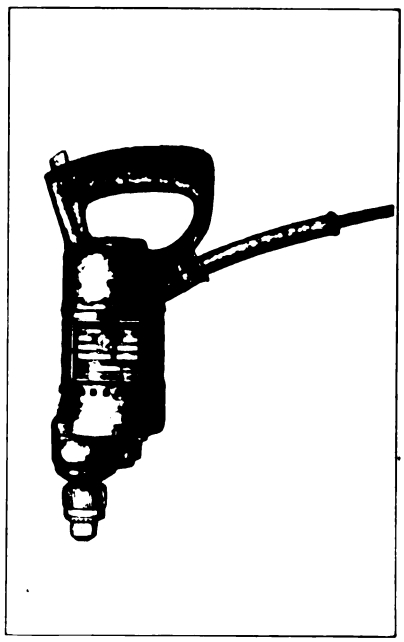
SHOWN here are two recent additions to the line of the Chicago Pneumatic Tool Company.

The Little Giant Grinder No. 33 was produced to meet the modern requirement for a portable grinder capable



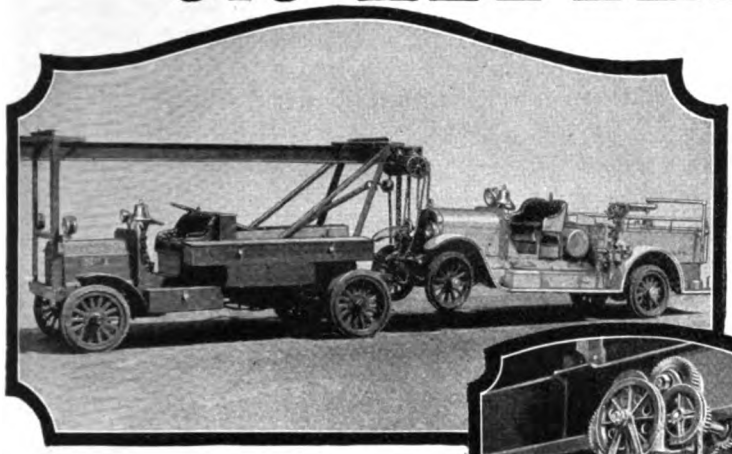
of high speed and continuous service under modern production requirements. Weighing 15½ pounds, this model carries a ⅝" diameter arbor, a 6" by 1" wheel or wire brush, and operates at 4,000 r.p.m.

The No. 25-B Little Giant Universal Electric Drill is equipped with a universal motor which is said to give practically the same speed on either alternating or direct current. Ball bearings are used throughout. The drill weighs 6½ pounds, operates at approximately 1,280 r.p.m., and its three-jaw chuck is adjustable from 0 to ¼".



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Lifting BIG things in LITTLE places



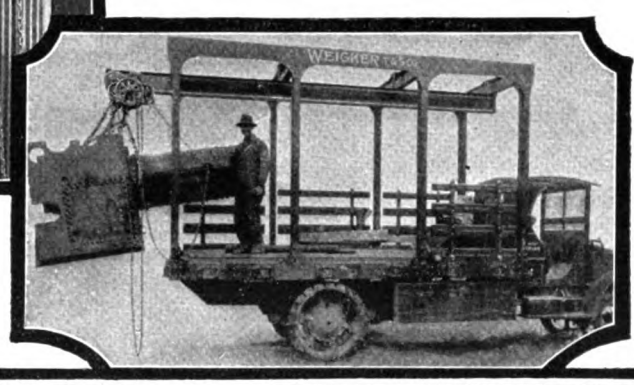


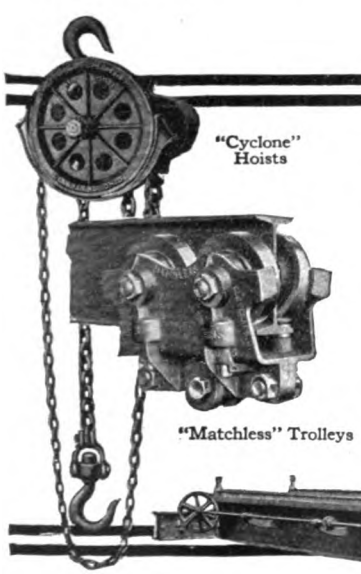
NEVER say "It can't be done" when up against the problem of lifting heavy objects or materials in a limited amount of headroom.

"C-M" Low Headroom Hoists are built for just such jobs. Note the illustrations: At top—the Emergency Truck of the Denver Fire Department, Denver, Colorado, equipped with a "C-M" Low Headroom Hoist. Center view—a substation of the Duquesne Light Company, Pittsburgh, Pa., where a "C-M" Low Headroom Hoist saved $1,000 in the construction of the building and has been effecting big savings ever since. Below—The Weicker Transfer & Storage Company, Denver, Colorado, use "C-M" Low Headroom Hoists for lifting heavy materials on and off their trucks.

These are typical examples that have direct application to any low-headroom lifting job that YOU may have.

Built in a wide range of types and sizes, "C-M" Low Headroom Hoists (hand and electric power) are accurately designed for every unusual hoisting condition, such as—low ceilings; limited floor space; narrow aisles; necessity of raising loads to maximum heights to clear obstacles; and many other conditions.





"Cyclone" Hoists

"Matchless" Trolleys

CHISHOLM-MOORE

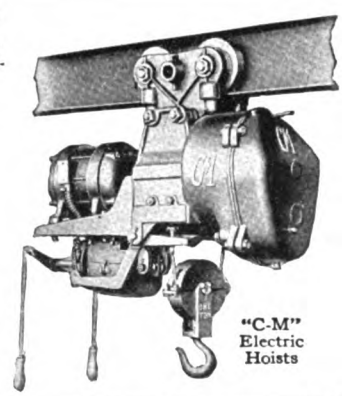
OVERHEAD HOISTS CRANES TROLLEYS TRACK SYSTEMS

"C-M" is the trademark of a complete line of Overhead Material Handling Equipment, backed by an organization ably qualified to apply that equipment correctly to every material handling condition. "C-M" Engineering Service is gratis. The "C-M" policy is based on *"Facts* to show YOU a way to MORE PROFIT." Write for particulars.

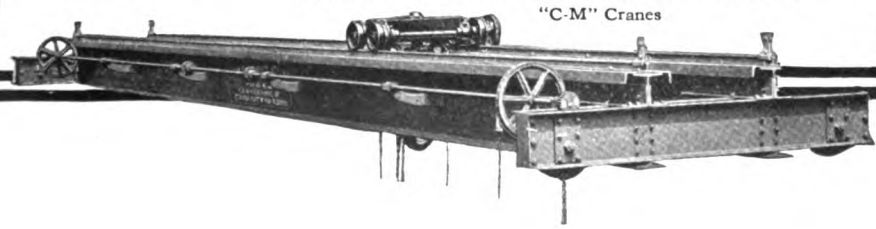
THE CHISHOLM-MOORE MFG. CO., Cleveland, O.

Branches: New York, Chicago, Pittsburgh

Representatives in All Territories for Immediate Service



"C-M" Electric Hoists



"C-M" Cranes

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Uniform Quality of Product Demands *Uniform* Temperature

You can't expect accurate results from your process work if you guess at the temperatures being carried or even attempt to regulate them by hand.

Where exacting specifications must be met, or the quality of your product must be kept up to a fixed standard, you cannot afford to take chances.

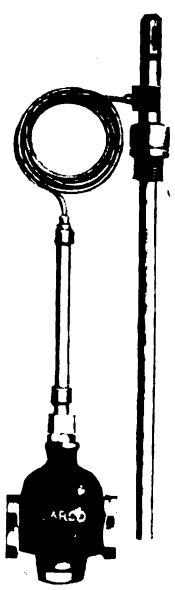
SARCO

Temperature Regulator

will relieve you of all doubt or worry.

Once set, it will automatically maintain the correct temperature of steam, hot water or a gas burner.

The SARCO Temperature regulator is entirely self-contained and needs no outside attachments or operating medium such as compressed air, water pressure or electricity. So simple and composed of so few parts that there is no danger of it getting out of order.



Sold on 30 days' free trial and returnable if it doesn't meet our guarantee.

Tell us your requirements and we will respond with practical recommendations. Write for Booklet No. R-88.

SARCO COMPANY, INC.

183 Madison Avenue, New York

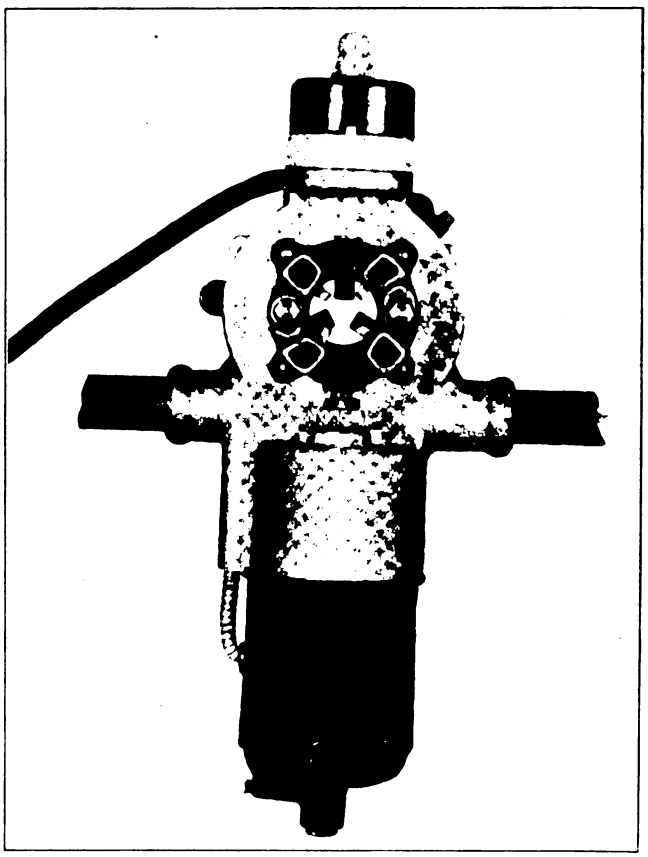
Boston Detroit Cleveland Buffalo
Chicago Philadelphia

Peacock Bros., Limited - - - - Montreal

A New Portable Electric Pipe Threading Tool

AN electrically operated die stock for threading ⅜, ½, and ¾" pipe has recently been developed by the Oster Manufacturing Co. of Cleveland, Ohio. The die head is actuated by a fully enclosed, universal motor which operates from any lamp socket on either direct or alternating current of 110 volts in any cycle between 25 and 60, inclusive. An aluminum alloy housing that covers the gear reduction from motor to die head reduces the weight to less than thirty-five pounds.

The tool is placed on the end of a stationary length of pipe in the same manner as though the operator were



going to thread the pipe by hand. It is centered by means of a universal chuck.

A separate die head is furnished for each size of pipe; the change from one size to another being made by pulling out a pawl which holds the die head to the rotating sleeve, thus disengaging the head from the sleeve and allowing another to be inserted in its place.

Although there is a different die head for each size pipe, the manufacturer points out that the dies are fully adjustable, so that over- and under-size threads can be cut as easily as standard threads.

The switch is conveniently located at the top of the tool, under the fingers of the operator. A quarter turn of this switch rotates the die head so that the dies will cut the thread. Another quarter turn stops the motor, while a further quarter turn reverses it and backs the dies off the thread.

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ALL STEEL Schick FIREPROOF **Balers**

Hand or Power Types

An economic necessity in every business with a daily accumulation of waste paper or other scrap material, or whose product involves a problem of baling to prepare it for marketing.

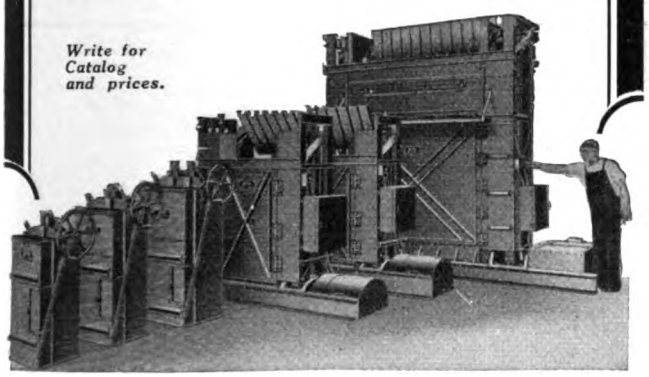
A size for every need

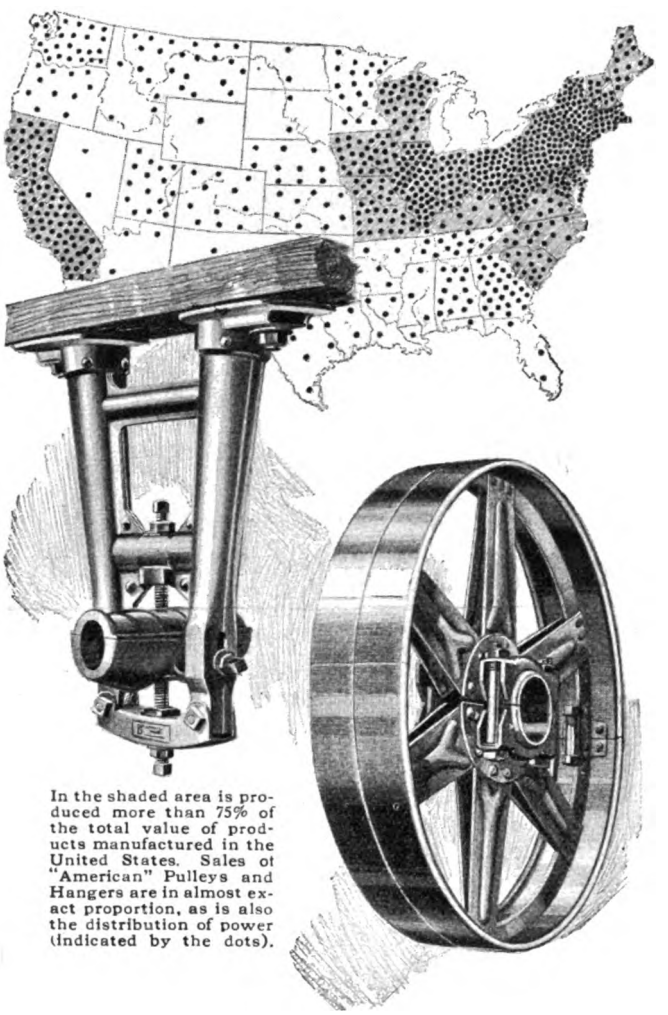
Regardless of requirements, there are Schick Balers to exactly meet the needs. Indispensable for handling waste paper, rags, cloth clippings, excelsior, wood or steel shavings, clothing, overalls, blankets, etc. All steel construction; fireproof and fool-proof; indestructible and positive in operation. Power balers 350 to 1,500 pounds capacity; hand balers 125 to 375 pounds.

DAVENPORT MFG. CO., INC.

Dept. R Davenport, Iowa

Write for Catalog and prices.





In the shaded area is produced more than 75% of the total value of products manufactured in the United States. Sales of "American" Pulleys and Hangers are in almost exact proportion, as is also the distribution of power (indicated by the dots).

Where There's Power There Are "Americans"

AS "commerce follows the flag," so are American Pressed Steel Hangers and American Steel Split Pulleys found wherever power is used in industry.

Where commerce and industry flourish, you will find the greatest number of "Americans" delivering power at a rating more economical than was thought possible thirty years ago; before the first American Steel Split Pulley was made.

There are additional advantages to the use of American Steel Split Pulleys and American Pressed Steel Hangers — advantages you should know more about.

The story is told more fully, but briefly in "Worthy Companions." Write for a copy.

The American Pulley Co.

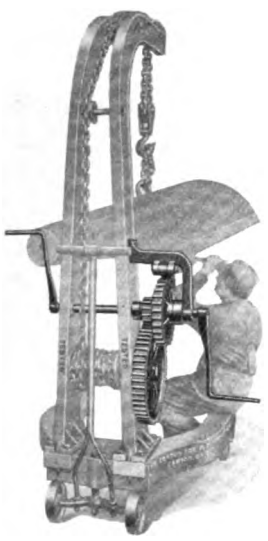
Manufacturers of Steel Split Transmission Pulleys Pressed Steel Shaft Hangers Pressed Steel Hand Trucks and Pressed Steel Shapes

4200 Wissahickon Ave. Philadelphia

AMERICAN PRESSED STEEL HANGERS PATENTED | STEEL SPLIT PULLEYS PATENTED

The "CANTON" PORTABLE CRANE

Does the work of six men, and in less time, too



The "Canton" Portable Crane, known as the "Handiest Tool in the Shop," is indispensable for the quick and economical handling of those heavy and awkward loads. It's an easily handled Hoist that goes quickly to parts of your shop where nothing else can reach.

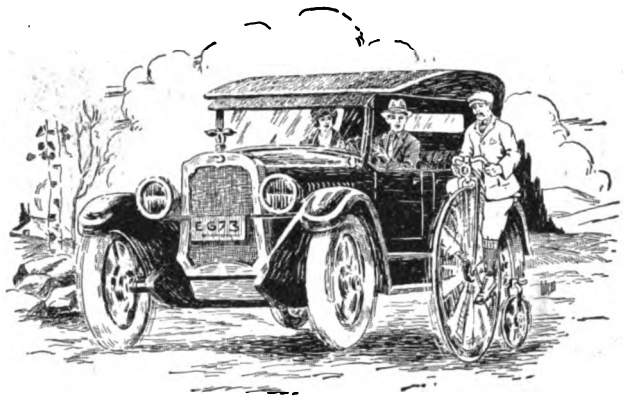
Those who are using it tell us this "Handy Tool" does away with the six and eight man job—it saves them no end of time and labor—and that they wouldn't be without it for many times the cost.

These Cranes are made in various sizes and capacities and when desired, can now be furnished with the NEW SAFETY FRICTION LOAD BRAKE shown on illustration.

Shipped on thirty days' trial.
All good jobbers handle them.
Write for price and descriptive catalog IN.

THE CANTON FOUNDRY & MACHINE CO.
CANTON, OHIO
New York Office, 203 E. 15th Street

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From the Days of the High Wheel Bike—

TUCKED away in the heart of Maryland is a factory that for half a century has been keeping in step with American industrial progress. From the days of the "high wheeled bike" to the present era of de luxe motor cars, this factory has been producing quality products—products of the motive sort that have contributed much towards the pleasure and relaxation of all classes.

Through successive steps, from the manufacture of the ancient, high wheeled bicycle, the pneumatic tired "two wheeler," to the production of a present day quality motor car, this plant has used T. B. Wood's Power Transmission Machinery.

Installed years and years ago, Wood's Products are still performing efficiently and satisfactorily. And they will continue to perform in that manner, for Wood's Power Transmission Appliances are built to endure.

When you install Wood's Cast Iron Hangers and Pulleys you assure your factory a life time of dependable power transmission performance.

T. B. Wood Sons Co.
Chambersburg, Pa.

NEW ENGLAND BRANCH: Cambridge, Mass.
SOUTHERN BRANCH: Greenville, S.C.

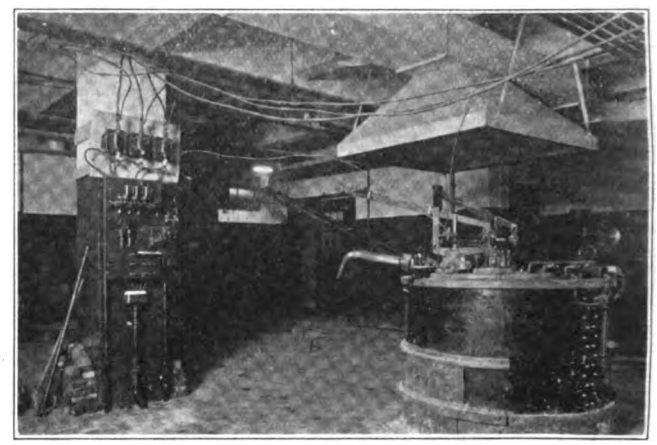
Makers of Power Transmission Machinery Since 1857

Shafting, Hangers, Pulleys, Flexible Couplings, Friction Clutches and the U. G. Short Center Belt Contactor.

An Electric Melting Pot for Stereotype Metal

SUBSTANTIAL economies and simplification of melting and casting are said to have followed the adoption of an electrically heated pot for melting stereotype metal in the new plant of the Waterbury Republican-American, Waterbury, Conn.

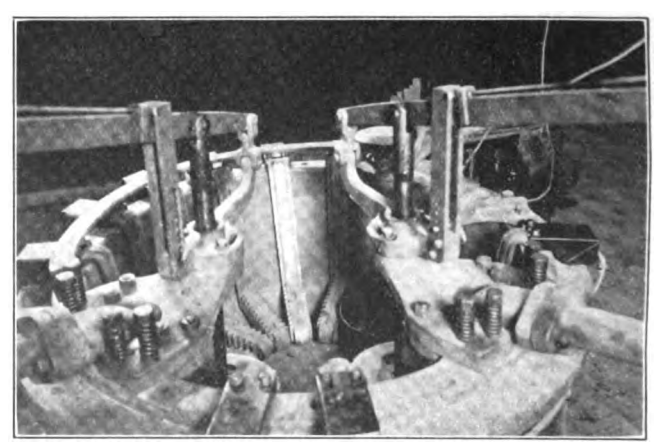
The electric pot has a capacity of five tons and heat is furnished by nine General Electric cast-in heating elements of the sheath wire type, each rated 5 kilowatts at 220 volts. Accurate temperature is maintained at all



times by means of an automatic control panel and a thermostat with a sensitive bulb in a well in the pot.

A gas-heated pot, superseded by the electric melting pot, consumed approximately 131,000 cubic feet of gas per month at a cost of $1 per thousand cubic feet, making a total of $131 per month for fuel. Against this, the electric pot uses an average of 8,000 kilowatt-hours per month costing at the rate of 1¼c per kilowatt hour, or a total of $100 per month for electricity.

Little more than a half hour is needed to bring the

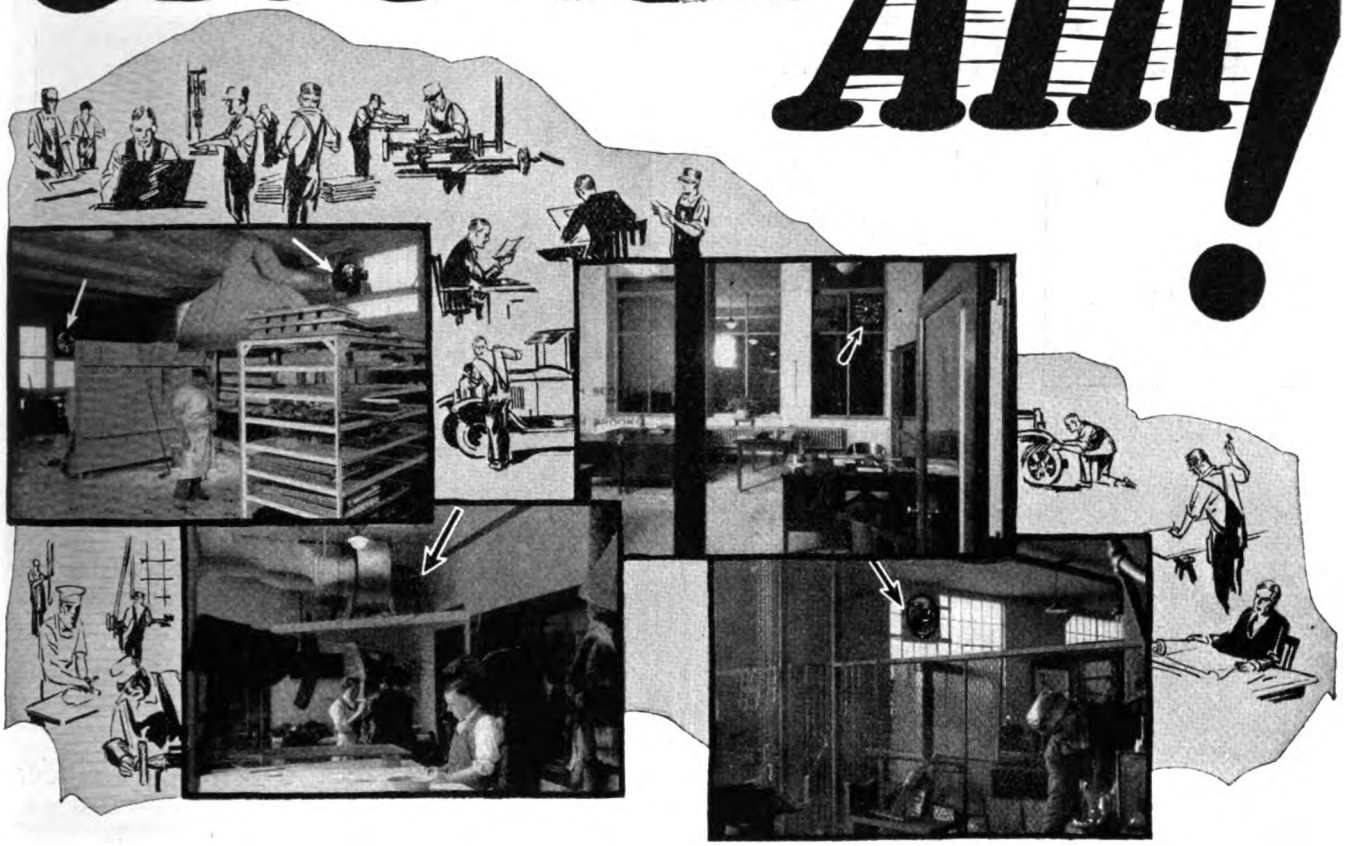


metal from the stand-by temperature of 450° F. to the operating temperature of 620° when charging is begun. After the pot is charged it is brought back up to operating temperature again in from 30 to 45 minutes. Plant operators find the necessity for a close watch on the temperature of the metal is no longer necessary, as this temperature is automatically held constant.

Both interior and exterior views of the melting pot are shown here.

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Give 'em AIR!



—the Greatest Efficiency Booster Ever Discovered



Men can't live without it!
They surely work better with it!

What is the annual cost of stale air to your business? You have never measured it, of course, but if you could see the staggering total on your balance sheet you would be genuinely amazed and alarmed!

Every man and woman in your establishment—yourself included—suffers a loss in efficiency because it is impossible without special equipment to provide fresh air in proper quantities all day long, the year around.

Drowsiness, "afternoon fatigue," headaches, mistakes, all kinds of minor illnesses—dulled brains and sharpened tempers—all of these are directly traceable to inadequate ventilation. We are all human; therefore we all need pure air and plenty of it.

Supply it—easily, efficiently and economically—with American Blower Ventilating Fans—carried in stock by leading electrical jobbers in all parts of the country.

American Blower Ventilating equipment is installed by Electrical and Ventilating Contractors everywhere.

AMERICAN BLOWER COMPANY, DETROIT
BRANCH OFFICES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONTARIO

(536)

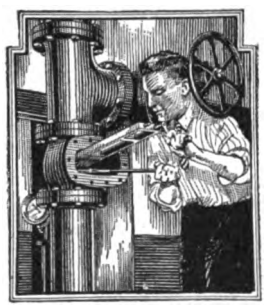
American Blower

"Sirocco" VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT

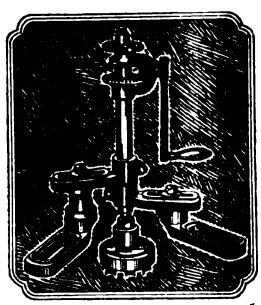
MANUFACTURERS OF ALL TYPES OF AIR HANDLING EQUIPMENT SINCE 1881

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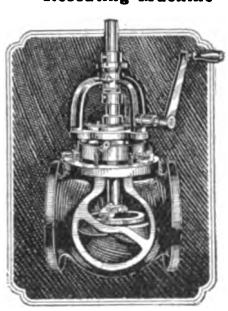
DEXTER VALVE RESEATING MACHINES



Dexter
Gate Valve
Reseating Machine



Dexter
Pump Valve
Reseating Machine



Dexter
Globe Valve
Reseating Machine

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Dexter Valve Reseating Machines quickly make worn, leaky valves steam or fluid tight.

By making the valve seats and discs true and smooth, Dexter Machines prevent steam waste, reduce valve replacements and repair expense 90% or more, and make the valves last years longer.

The savings pay for a complete Dexter Outfit many times over. Can you afford to overlook them?

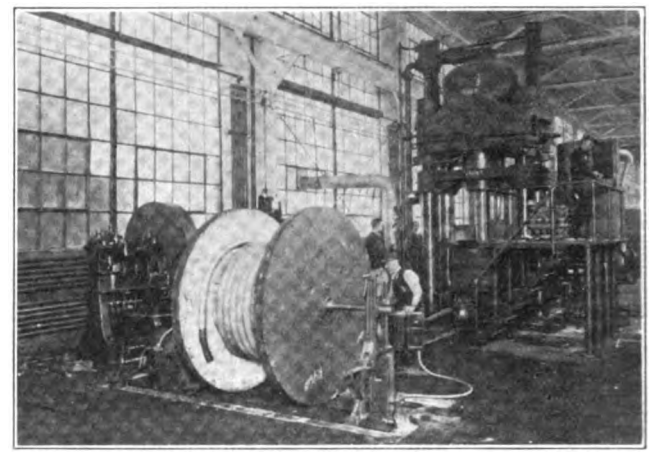
Let us send you Catalog 23 containing complete information and prices.

THE LEAVITT MACHINE CO.
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Canadian Agency: Darling Bros., Ltd., 120 Prince St., Montreal.
British Agency: Cromil Engineering Co., E. Floor, Milburn House, Newcastle-on-Tyne.
9100

Valve Reseating Dexter Machines

Lead-Sheathing Cables with a 2,600-Ton Hydraulic Press

THE accompanying illustration shows a 2,600-ton hydraulic press for lead-sheathing cable at the Schenectady plant of the General Electric Company. It



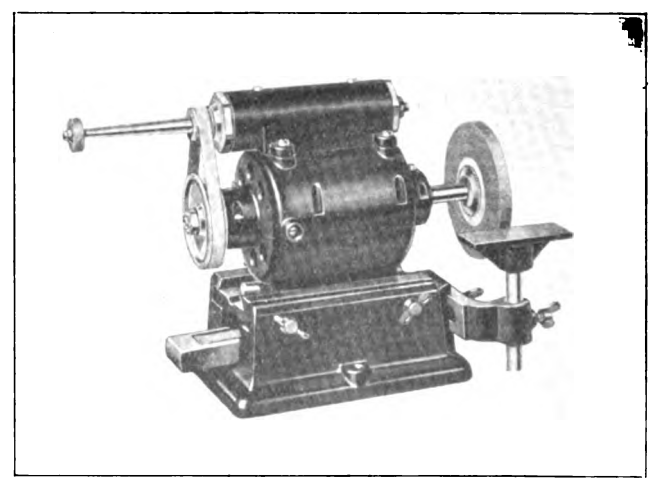
is the largest hydraulic press for this work in operation in this country.

The press operates at pressures as high as 7,000 pounds per square inch on the water. A specially designed pump is required to secure these high pressures and the quantity of water necessary.

A New Base for the "Dumore" Grinder

THE Wisconsin Electric Company announces production of a new base which has been designed for use with its No. 2 Dumore Grinders. The illustration shows it with grinder in place.

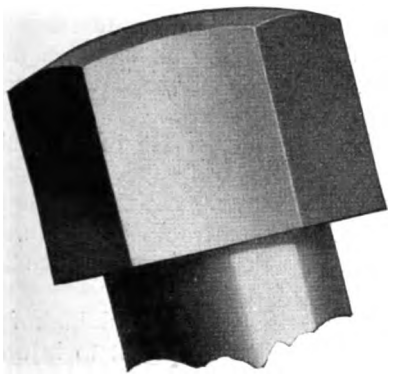
This base has been designed so these grinders can be used more extensively. They are made to be bolted on to the work bench, where they are always ready to receive



the grinder when not in use on the lathe. The grinder sets in the base and is secured by tightening two wing-screws. When in place it is said to make a very satisfactory bench grinder for small grinding jobs such as sharpening drills, cutters, etc., and where accuracy is desired.

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A Perfect Hexagon Head



*"If it's upset—
it must be heat-treated"*

Each face clean cut, smooth and true. Made by the Ferry Patented Die Compression Principle—

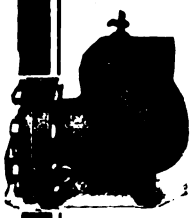
That's a distinguishing feature of Ferry Cap Screws.

Be sure you specify Ferry Heat-Treated, Bright-Finished Cap Screws. They will eliminate trouble and will save you money.

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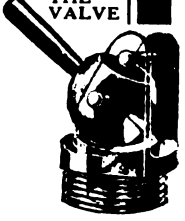
You run no risk as to error in judgment when you buy Paracoil Steam Traps — for they are sold with a 2-year guarantee against repairs.

No repairs for 2 years—4 years—many years—is industry's experience with Paracoils.

Many of industry's largest and most discriminating buyers have switched to Paracoil Traps and are repeating their orders again and again. A trial in your plant will make you a regular Paracoil user, too.

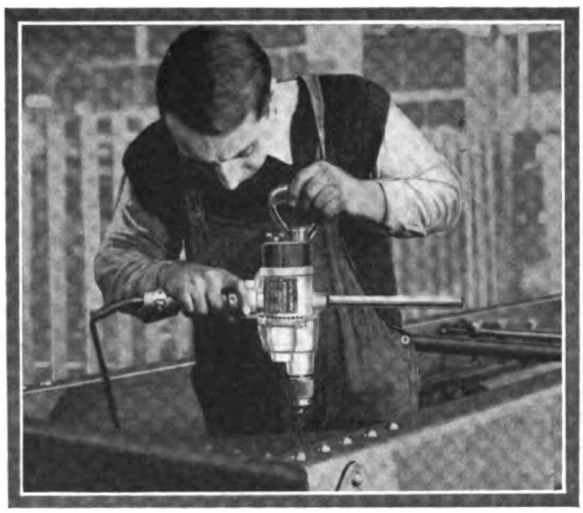
Write for Catalog A-12

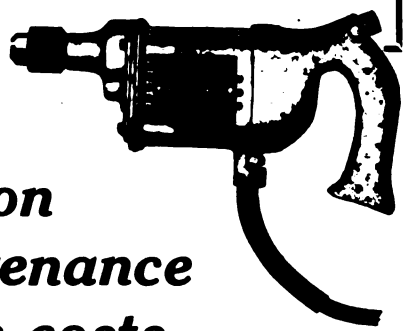
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Paracoil
STEAM TRAP

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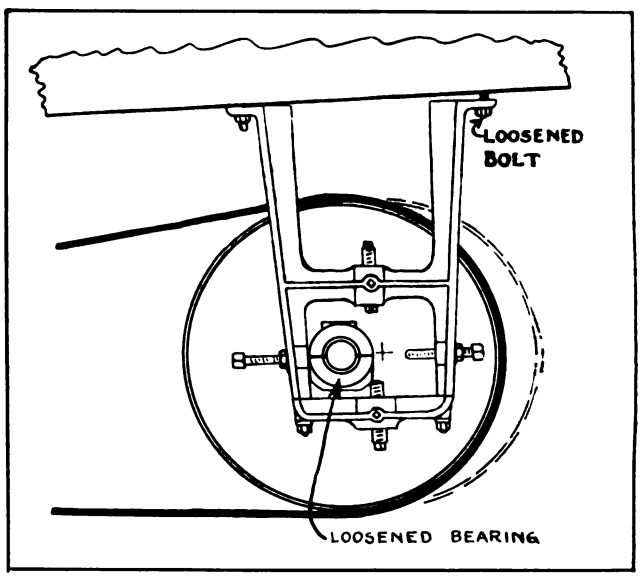
An Idea That Saves the Belt

By W. F. Schaphorst

ALL millwrights agree that it is bad practice to run a large belt onto a pulley by first forcing one of the edges to catch and then running the belt on either by hand or by power. It is well known that this is liable to cause the belt to stretch more on one side than on the other. The belt is thereby permanently injured. This holds true for belts of all kinds.

To avoid this condition we are often glibly told to make leather belts endless, while they are on the pulleys, by means of belt clamps, etc. But that method may not always be practical and sometimes it is impossible, particularly if the belt has already been made endless by the manufacturers, as is often the case.

Where conditions allow it, a good kink for putting large belts onto the pulleys so as not to injure them, is to loosen the adjusting screws on the hangers as shown



in the sketch herewith. This permits the shaft to move over a considerable distance, temporarily shortening the distance between shaft centers. Sometimes the shaft may be moved inward two inches or even more, thus making it possible to put the belt on easily. Shortening the center distance two inches virtually adds 4 inches to the belt's length. Also, to further assist, one of the hanger bolts for bolting the hanger to the overhead beam may be loosened so as to allow the hanger to swing inward still more. Where patented overhead beams are employed, it is sometimes possible to slide the entire hanger forward without touching the adjusting screws. All of these methods are possible, yet they are seldom used because they are not thought of. The writer has never seen one of them mentioned in print in any magazine or book.

Then, after the belt is on the pulleys, bring the hanger back to its normal position. This is a simple thing to do, by turning the nuts, where the first and second methods mentioned above are employed. The original position of the hanger should always be marked before moving, to avoid tedious realigning. Turn the bearing adjusting screws back to their original positions. These positions are easily found because the screw on the opposite side

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When your trucks need extra power is extra power always there?

Some electric industrial trucks not only go along all right on smooth, level pavement, but ***when faced with a steep grade, rough going, or an extra-heavy load, they also have the extra power with which to meet the emergency. On this page you will read about the peculiar ability of one storage battery to come through with extra power in a pinch.***

Steep grades, rough surfaces, heavy loads—these things won't stop your industrial trucks if they are equipped with Exide-Ironclad Batteries

WHEN an Exide-Ironclad Battery is faced with an emergency that demands more power than usual, this battery is always able to deliver the extra power. For among other sterling qualities that the Exide-Ironclad has is the ability to deliver current many times faster than the normal rate.

Full of pep and speed

Not only is the Exide-Ironclad packed with power, but it is chock-full of pep and speed, too. The voltage of this battery keeps high right up to the end of discharge; hence its speed holds up well right down to the day's end.

On charge the Exide-Ironclad is equally efficient. It takes current in quickly, easily and with little waste. It is also so ruggedly built that it stays on the job month after month and year after year without losing any time out of service for repairs.

A long-lived battery

And finally, the life of the Exide-Ironclad is long and its first cost reasonable. It will pay you well to know more about this remarkable battery that has cut handling costs in leading plants all over the country. The names of just a few of these plants appear on this page. Send today for a copy of our new booklet, "Facts for Consideration in Selecting a Storage Battery."



The long-life, trouble-free, power-full battery.

Exide
IRONCLAD
BATTERIES

A few of the many manufacturers that use Exide-Ironclads

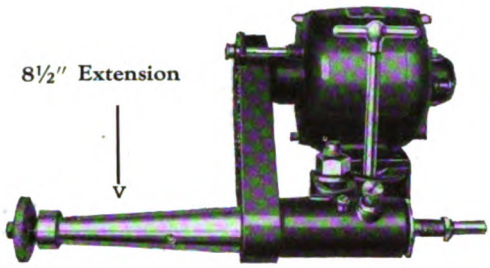
Buick Motor Co., Flint, Mich.
Dodge Bros., Inc., Detroit, Mich.
Cadillac Motor Co., Detroit, Mich.
Fisher Body Co., Detroit, Mich.
J. G. Brill Company, Philadelphia, Pa.
American Motor Body Co. Philadelphia, Pa.
Delco-Light Co., Dayton, Ohio
Crane Company, Chicago, Ill.
E. G. Budd Mfg. Co., Philadelphia, Pa.
National Cash Register Co., Dayton, O.
Remington Arms Co. Bridgeport, Conn.
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and the top screw need not be moved at all, as indicated in the sketch.

In the sketch, which is drawn slightly exaggerated to emphasize these points, the cross lines indicate where the center of the shaft will be after the beam bolt is retightened and after the adjusting screws are back to their original positions. The dotted curved lines show where the pulley rim will be after everything is retightened and back to normal.

To be sure this method is not always practical where there are belts running in both directions as on a common line shaft, but where it can be employed it is well worth while. It is a quick and simple method and the saving effected in large expensive belts surely makes it worth remembering and putting into practice.

A New Two-Wheel Hand Truck

A NEW type of two-wheel hand truck, made of pressed steel, has recently been brought out by the American Pulley Company, of Philadelphia.

Every part is said to be designed to give the greatest strength for its weight. The side members are so shaped as to make a beam whose section is greatest where the heaviest load is imposed. Cross pieces are flanged to make them stronger and more rigid.

The manufacturer states that months were spent in



analyzing and studying truck service, and that the result has been a series of trucks, light as wood, yet of truly remarkable strength. Painted a bright red with tough enamel, the truck is easy to identify, handsome, and well protected.

It is the claim of the maker that loose bolts, splintering and cracking are entirely eliminated and further, that quick and easy replacement can be made of parts injured by accident.

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Five Proved Ways

to cut your maintenance costs

1 Protect your concrete floors against dusting and wearing. You can do this easily with Lapidolith, the original concrete-floor hardener described below.

2 Keep your wood floors from splintering, rotting, or drying out. A treatment of Lignophol will do the trick. See the complete description below.

3 Protect your roofs against leaks. Stormtight, a rubber-like, adhesive liquid, stops leaks instantly and permanently. A further description is given below.

4 Damp-proof your walls with a treatment of Hydrocide Colorless. It will permanently waterproof and damp-proof your buildings. See full description below.

5 Cut down your painting bills. Cemcoat is a paint that sticks to brick, wood, or concrete. It stays white long after other paints turn yellow, and may be washed again and again. Further details are below.



LAPIDOLITH

a liquid, chemical compound, is the original concrete-floor hardener. It may be applied like water. A floor treated at night is ready for use by morning. Lapidolith penetrates the porous cement, binds the loose particles together, and fills up the voids. The result is a fine, close-grained surface that will not dust or wear.



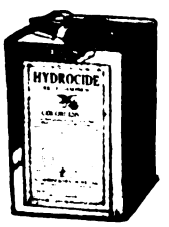
LIGNOPHOL

is very easily applied to wood floors. It penetrates the wood fibres and restores the natural gum and oil. It gives you a wood floor that is hard, smooth, and sanitary. It does away with the use of floor oils that only lay the dust and have to be applied again and again. One treatment will last for years.



STORMTIGHT

is an adhesive, rubber-like liquid, ten times thicker than paint. It will protect your roof against leaks quickly and permanently. Stormtight quickly stops leaks that have already started. It is very easy to apply. It is not a temporary makeshift, but has saved the cost of new roofs again and again.



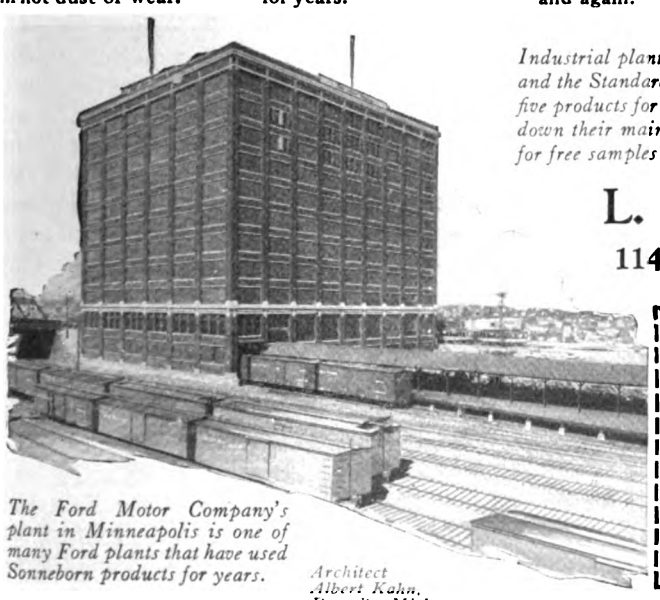
HYDROCIDE COLORLESS

applied to the exterior of a building, penetrates the brick and effectively keeps out all moisture. As it contains no paraffin it will not run in hot weather. It will permanently water- and damp-proof your buildings, and yet since it is invisible it does not detract from the natural beauty of the walls.



CEMCOAT

a gloss, eggshell, or flat enamel paint, comes in white and colors. It may be used on exteriors as well as interiors. Because of its heavy body it usually requires one coat less than other paints. Even on brick or concrete walls it will not crack or peel. Cemcoat is especially noted for its remarkable wearing qualities.



The Ford Motor Company's plant in Minneapolis is one of many Ford plants that have used Sonneborn products for years.

Architect Albert Kahn, Detroit, Mich.

Industrial plants such as the Ford Motor Co., Bethlehem Steel Co., Swift & Co., and the Standard Oil Co. of New York have been using some or all of the above five products for years. They have learned the value of these products in keeping down their maintenance costs. These products can save you money, too. Send for free samples and complete information. Use the coupon below.

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Manufacturers' Bulletins and Catalogs

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Centrifugal Pumps and Pump Heads

Bulletin No. 203, illustrating and describing Horizontal Single Suction Centrifugal Pumps, and Bulletin No. 1501, illustrating and describing Reciprocating Deep Well Pump Heads, has been issued by the Dean Hill Pump Co., of Anderson, Ind.

Tachometers for Recording and Indicating

Bristol's Tachometers for Recording and Indicating the Speed of Rotation of any piece of revolving machinery are illustrated and described in Catalog No. 1700 which has been issued by The Bristol Co., Waterbury, Conn.

Embossing Machines

Catalog No. 102, containing 21 pages of illustrations and description of Waldron Embossing Machines for embossing, printing paper and textiles, abrasive, gummed, and other processed papers, carpet, floor coverings, drying systems for paper, etc., has been issued by the John Waldron Corp., of New Brunswick, N. J.

Condulets

Condulets for grounding service wire and conduit systems are described in an illustrated folder, which has been issued by the Crouse-Hinds Co., Syracuse, N. Y.

Steam Economy

Catalog No. S-33, containing 56 pages of illustrations and description of Republic Flow Meters, most of this being a compilation of the experience of the company's engineering force covering a period of five or ten years on the subject of methods for reducing steam costs, has been issued by the Republic Flow Meters Co., 2240 Diversey Parkway, Chicago.

Rotary Positive Blowers

Bulletin 21B illustrating and describing Victor Rotary Positive Blowers for pressure, vacuum, or wherever air is to be moved at pressures between ½ and 5 pounds, or vacuums up to 10" mercury column, has been issued by The Connersville Blower Co., of Connersville, Ind.

Portable Car Hoists, Cranes for Freight Handling, etc.

Four illustrated circulars describing Whiting Portable Car Hoists; Cranes for electric and hand-power travelers, bucket and magnet handling cranes; Cranes for freight handling; and the fourth one entitled "Meehanite Metal —What Is It?" have been issued by the Whiting Corp., of Harvey, Ill.

Water Softener

Bulletin No. 509, illustrating and describing the Graver Zeolite Water Softener which uses the downflow method of softening with a natural zeolite mineral supported by a strainer plate, has been issued by the Graver Corp., of East Chicago, Ind.

Machine Tool Drives

A 36-page illustrated booklet which describes how chain-driven machine tools increase output, produce better quality, consume less power, and decrease tool maintenance, has been issued by the Link-Belt Co., 910 So. Michigan Ave., Chicago, Ill. This is known as Book No. 812.

Chuck Work and Portable Pneumatic Tools

Book III containing Section Two in the series on Modern Tooling Methods for Turret Lathes, on the subject of Chuck Work, concludes the series which has been written by M. E. Lange, production engineer of the Warner & Swasey Co., Cleveland, Ohio. This booklet takes up the discussion of Piloting, the treatment of the Permanent Set-up, and a definite comparison of the value and the cost of Tooling Equipment. Another booklet issued is one of 16 pages of illustrations and description of W & S Portable Pneumatic Tools.

Drinking Fountains, Ice-Cooled Fountains, and Specialties

Catalog M containing 32 pages of illustrations and description of Century Regulators, Bubblers, Self-closing Stop Cocks, Combination Fixtures, Ice-Cooled Fountains, etc., has been issued by the Century Brass Works, Inc., Belleville, Ill.

"There's Money in This for You"

is the title of a 16-page booklet describing the advantages of the endless belt, which has been issued by the Chas. A. Schieren Co., 30-38 Ferry St., New York.

Resistance Starters and Starting Switches

Bulletins 600 and 710, illustrating and describing various types of Resistance Starters for squirrel-cage motors, and Across-the-Line Starting Switches equipped with Inducto-Therm Relays, respectively, have been issued by the Allen-Bradley Co., Milwaukee, Wis.

Compressors, Air Hoists, etc.

A loose-leaf catalog containing illustrations and description of Curtis Air Compressors, Air Cylinders, I-Beam Trolleys, Portable Compressors for Fordson tractors, etc., has been issued by the Curtis Pneumatic Machinery Co., St. Louis, Mo. Another catalog issued is known as C-72 and describes and illustrates in its 36 pages, Curtis Air Compressors of the single and two-stage types.

Oil Circuit-Breakers, Switches and Silent Gears

Publication 1643-A, describing the application of oil circuit-breakers; F-4506-B, containing Salient Facts on Silent Gears, information which is in accordance with the latest recommendations of the American Gear Manufacturers' Association; and Bulletins L 25404 and L 25408 describing Type RV and Type RH Air-Break Disconnecting Switches, respectively, have all been issued by the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Diesel Engine

The Foos Type "L" Diesel Engine is described and illustrated in a four-page bulletin which has been issued by The Foos Gas Engine Co., of Springfield, Ohio.

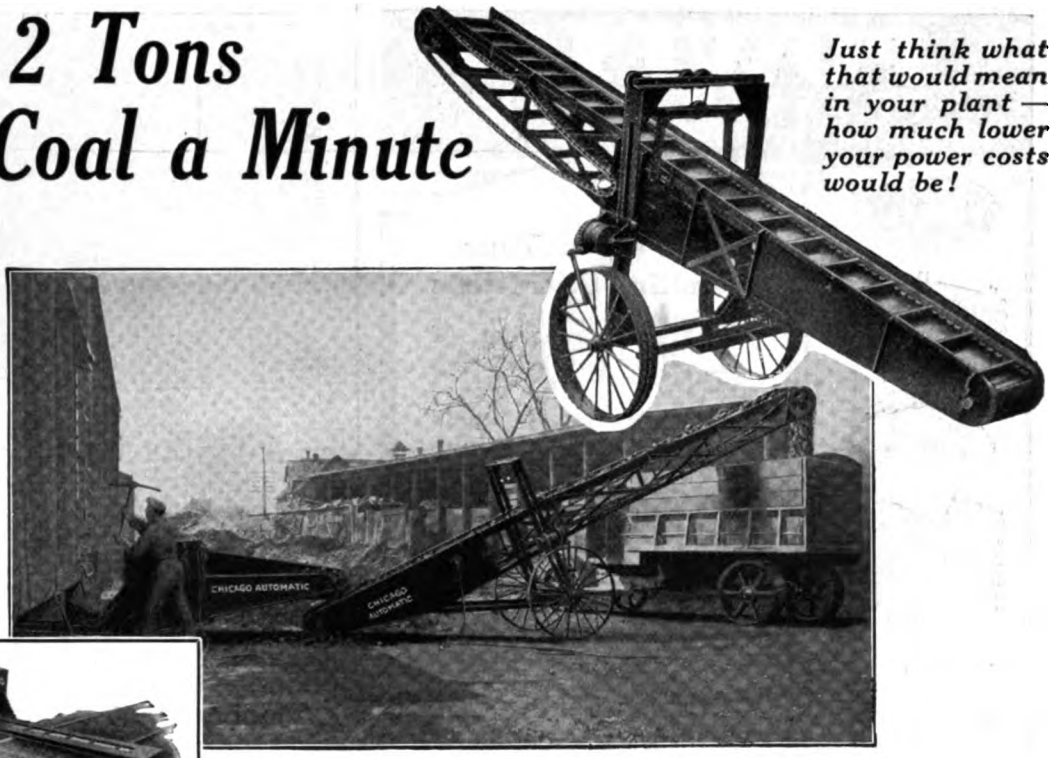
Ventilator and Permanent Wall Fixture

Descriptive literature which illustrates the Reversible Ventura Ventilator and Permanent Wall Fixture has been issued by the American Blower Co., of Detroit, Mich.

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See Data A.S.M.E. Condensed Catalogue of Mechanical Equipment. Also Hendricks' Sweets Engineering, and Thomas Catalogues.

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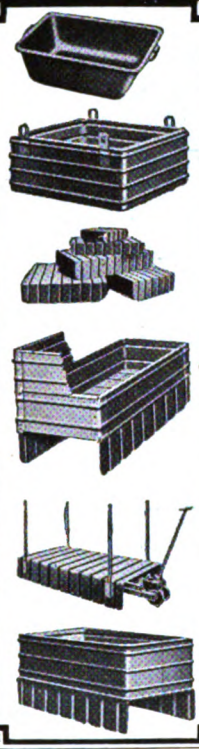
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One unit permits any number of watchmen (up to 60) to register simultaneously, *on one record*.

A supervisor or foreman of watchmen can tell by a glance at the record just where any or all the watchmen are at any time—or annunciators can easily be connected which indicate registration without opening the clock.

There is nothing for a watchman to carry but a small crank. There are no batteries, transformers nor current, except what is generated to make the record when the watchman turns the crank.

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24 Beach Street, BOSTON

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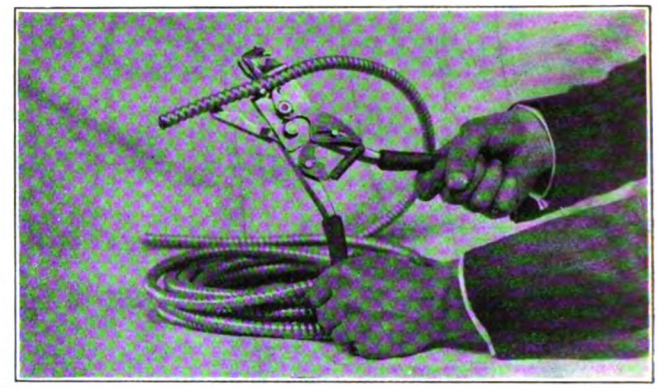
Other DETEX Watchclock Systems

PATROL Portable—The latest and most versatile of all portable watchclock systems. Equally satisfactory for 1 or 100 stations.

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ALERT Portable—Ideal for plants requiring up to 30 stations. Initial cost moderate—maintenance extremely low.

ECO Portable—Most accurate watchclock; records practically to the minute. Important in some cases. 1 to 20 stations.

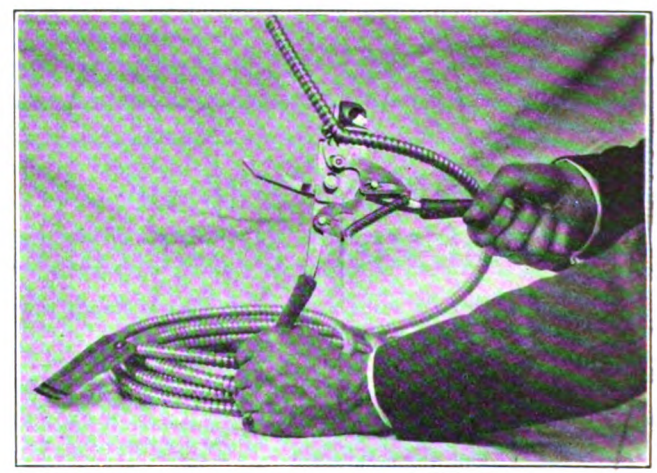


A Utility Tool for Armored Cable

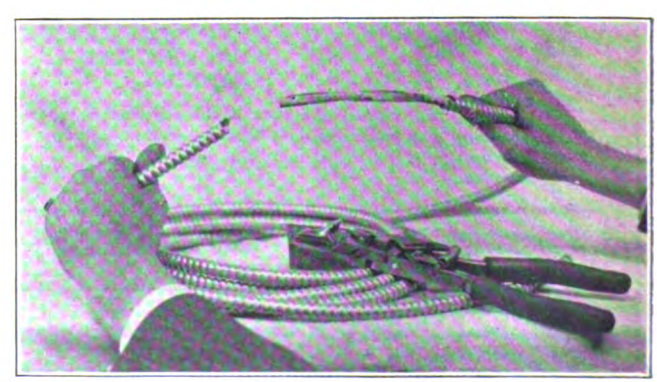
THE Triangle Conduit Company, of Brooklyn, N. Y., and Chicago, Ill., has recently put on the market the Triangle Armored Cable Tool, shown in the accompanying illustrations. To anyone who has had experience in working with armored cable, these views of the application of the new tool will prove of interest.

The manufacturer describes his product as follows:

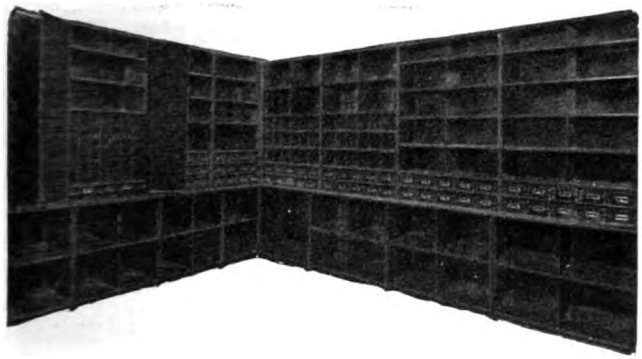
"The tool is a pair of steel pliers, eleven and one-half inches in length, and weighing two pounds. It will strip any single strip armored cable, in sizes 14/2, 14/3, or 12/2, without adjustment. The wireman slips the tool



on the cable, as shown in the first illustration, opens and closes the handles, and all that remains is to slide off the armor. The tool also has an auxiliary pair of wide mouth pliers which function as gas pliers, a cutting device for wire, cable, or non-metallic conduit up to ½" outside diameter, and has extra heavy leverage."



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Durand steel shelving is constructed to permit any change time or conditions may bring. Shelves are quickly and easily removed, raised or lowered, boxes inserted or additional units added. Re-arrangement of any shelf is made without disturbing other shelves. No cutting or fitting is necessary. The ready adaptability of Durand shelving assures permanency of use. Durand shelving and racks are made to provide for every storage purpose.

DURAND STEEL LOCKER CO. INC.

1539 Ft. Dearborn Bank Bldg., Chicago, Ill.

BRANCH OFFICES:

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Easy Adjustability

The Key to Storeroom Economy

Just as wooden shelving and racks are antiquated by modern space saving, durable, steel equipment, so has Durand easily adjustable shelving made other types obsolete. Ease of adjustability is an important factor in selection of steel storage equipment. Constantly changing stocks, closing out of certain items, making room for new material, makes changes necessary.

Our catalog No. 21 describes and illustrates Durand steel lockers and shelving. Specifications, material, method of construction, adjustable and interchangeable features are clearly explained. This book tells you about Durand Steel Racks and Durand steel lockers, and the use to which they may be applied. Your copy is ready. All it lacks is your address on the label. Your request will bring your copy. Why not write today?



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UNIQUE *THIN LEAD* Colored Pencils

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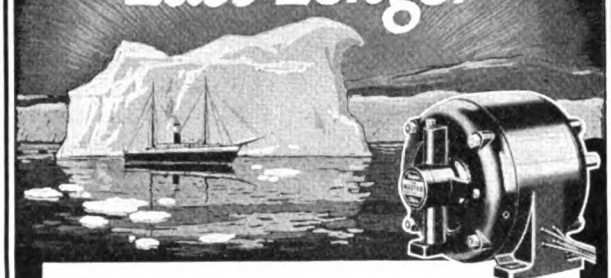
An absolute necessity for making fine lines in color on charts and plans—something never achieved before. The 12 colors also enable each executive to have his own color symbol.

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MASTER MOTORS because of their liberal design, are exceptionally cool running under continuous rated load — a feature which adds *years* to the motor life.

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BEARINGS. Transmission and Line Shaft

Anti-Friction Bearings, that permit higher speed at the lowest friction loss. See page 41, The New Departure Mfg. Co.

An Average Power Saving of 15 per cent. is shown on page 6 by Hyatt Roller Bearing Co.

A Factor in Preventing Shut Downs, Depreciations, and Power Losses in Machinery. See page 5. Timken Roller Bearing Co.

A Catalog on Commercial Roller Bearings, dependable and durable. Bond Foundry & Machine Co. See page 81.

An Oilless Bearing is described on page 8 by the Arguto Oilless Bearing Co.

ELECTRICAL EQUIPMENT. (Motors, Generators, Buffers, Polishers, Grinders, etc.)

Engineering Service on Industrial Application of Fractional Horse Power Motors, offered by the Domestic Electric Co. See page 75.

Descriptive Booklet, describing Ball Bearing Motors. The Valley Electric Co. Page 104.

"Industry's Electrical Progress" is a story of savings through modern motor control of machinery and equipment, and can be obtained from The Cutler-Hammer Mfg. Co. See page 103.

Information on Portable Electric Lighting that aids in better work. See page 111. Appleton Electric Company.

Catalog "E" very interestingly describes an adjustable speed grinder that saves its cost in one year. See page 77. The U. S. Electrical Tool Co.

Tap Drill Chart Cards useful for designers and builders of machinery are being issued by Wisconsin Electric Co. See page 45.

Complete Details can be obtained on a Motor that gives long service. See page 99. Master Electric Company.

Descriptive Matter on a Portable Precision Grinder that is used for external, internal, surface, thread, and extra-deep-hole grinding. See page 96. J. E. Gilbert Grinder Co.

An Illustrated Catalog on Electric Drills may be obtained by writing to the Independent Pneumatic Tool Co. See page 84.

Electric Motors up to 100 H. P. for every industrial purpose. Data and engineering service offered. See page 12, Star Electric Motor Co.

A Nation Wide Electric Motor Service. For the nearest address see Howell Electric Motors Company, on page 69.

Bulletin on Direct Current Motors that are used in industrial operations. See page 78. Diehl Mfg. Co.

Information on Lighting Fixtures, adjustable for any operation, is given in the catalog offered by the American Fixture Co. See page 97.

MAINTENANCE

An Illustrated Booklet, "More Light" on the use of factory paint is offered by the U. S. Gutta Percha Paint Co. See page 9.

Coatings that Cut Down Upkeep on Roofs, Floors and Walls. Choice of samples offered by L. Sonneborn Sons, Inc. See page 95.

The Proper Handling and Storage of Lubricating Oils. See page 79. S. F. Bowser & Co., Inc.

Long Wearing Brushes for every industrial purpose are described on page 11. The Osborn Mfg. Co.

An Interesting Booklet on a Waterproof, Acid, Alkali, and Brine resisting paint. American Asphalt Paint Co. See page 57.

A Generous Free Sample of Skyco No-Glare, is offered by The Skybryte Company. Look on page 48.

A Sample of FROSTINE that kills Glare of the Sun's rays is offered by the Gerson-Stewart Mfg. Co. See page 67.

An Oily Waste Can that outwears 3 to 5 of the ordinary kind is described on page 62 by The Witt Cornice Company.

Metal Case Brooms for every industrial purpose. For illustrated booklet and price list see Joseph Lay Co. advertisement on page 68.

Descriptive Bulletins on Industrial Paints can be had by writing to the Nitrose Company. See page 74.

Tested Coatings for Concrete is part of the engineering service offered by the Goheen Corpn. of N. J. See Inside Back Cover.

A Ten-Day Trial is offered on a Ball Bearing Portable Blower for cleaning all kinds of industrial machines and equipment. See page 67. Electric Blower Co.

MATERIALS HANDLING EQUIPMENT

Factory Certified Wire Rope for use as crane cable. See page 7. Williamsport Wire Rope Co.

Fifty Years of Conveyor Service, the record of the Logan Company. Details on page 1.

Handling Methods that Cut Production Costs are shown on page 112 by the Link-Belt Company.

Catalog describing a new type of elevating truck. See page 107. Baker-Raulang Company.

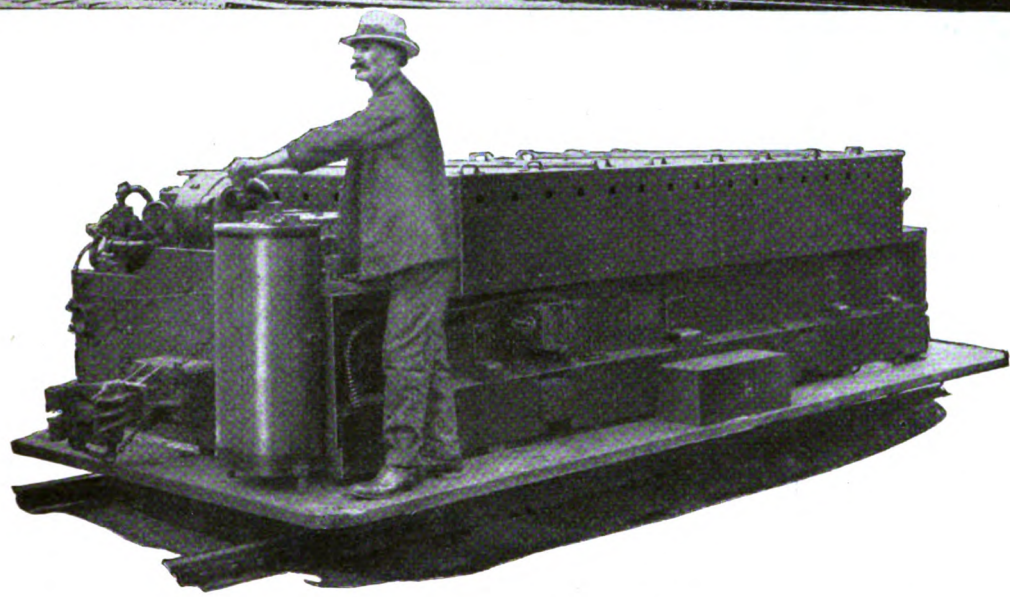
Information on Overhead Materials Handling Equipment is offered by The Chisholm-Moore Mfg. Company, on page 85.

Illustrations Describing the Economical Handling of Ma-

Catalogs and Information on any of the above furnished without obligation.

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A G-E Electric Locomotive placed in an industrial plant is a tremendous saver. Small and compact, it can run in, out, and around buildings with ease. A husky little worker of good, sound construction and few wearing parts, it has a very low maintenance. It is always ready to go at the turn of a handle, consumes power only when running, and requires but one operator—of ordinary intelligence.

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Get one of these new booklets for your belt man. Each of the 16 pages details a fine point in the operation of repairing and making belts endless, just as it is done by *Schieren* workmen.

If you haven't already adopted this method of belt care send for the booklet now. It will assist in putting your belting on a more rigidly economical basis. Literally, there's money in this booklet for you. Send for it now.

Sixbay Belting Trade Mark

Chas. A. Schieren Company Established 1865

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Belt Manufacturers
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terials are shown on page 13. The Jeffrey Manufacturing Co.

Equipment that Minimizes the Handling of Products. The Powell Pressed Steel Co. Page 98.

Industrial Railway Cars for Every Purpose also portable track, switches and turntables. Easton Car and Construction Co. See page 109.

Complete Facts on boxes and platforms constructed for efficient handling. See page 3. Truscon Steel Co.

A Booklet "Facts for Consideration in Selecting a Storage Battery" is offered by the Electric Sorage Battery Co. See page 93.

Factory Trucks That Are Built for Severe Service. These are described on page 105 by the Lansing Company.

Applications of I-Beam Cranes. See Back Cover. Shepard Electric Crane & Hoist Co.

Hundreds of Executives Now Realize the Economy of the "tractor-trailer method." See pages 14-15. Mercury Manufacturing Co.

A New Model K-24 Electric Truck with advanced engineering principles. See page 43. Yale & Towne Mfg. Co.

Information on electric hoists, trolleys and post cranes. Roeper Crane and Hoist Works, Inc. See page 78.

Information on Equipment that lowers handling costs in the yard or plant is contained in the booklet, "Mr. Barber's Scrapbook." See page 39, Barber-Greene Co.

A New Crane Catalog showing the exceptional features of the Whiting Crane is offered by the Whiting Corpn. See page 51.

A New Track Unloader that fits right on to the coal car is described on page 97 by the Chicago Automatic Conveyor Company.

Engineering Service on the operation of industrial Electric Locomotives is offered by the General Electric Co. See page 101.

Any Type of Truck or Caster can be equipped with the new Floor Saving Wood Wheels made by the Metzgar Company, Inc. See page 52.

A Scrap Handling Dump Bucket that can be applied to any industrial lift-truck. See page 83. The Roura Iron Works.

A Tier-Lift Truck with more than a hundred uses is described by the Lakewood Engineering Co. See page 80.

A Booklet Describing Steel Bound Hand Trucks. See page 53. Fairbanks Co.

A Thirty Day Trial Offer on a Portable Crane that is known as the handiest tool in the shop. For information see page 87. Canton Foundry and Machine Co.

POWER PLANT EQUIPMENT AND AUXILIARIES

Bulletins on Jennings Heating Pumps, containing valuable information on heating system installations. Nash Engineering Co. on page 16.

Very Interesting Bulletins on Boiler Room Economies are offered by the Wickes Boiler Co. See page 109.

A Steam Trap on a 90 Day Trial also catalog. Offered by the Armstrong Machine Wks. See page 78

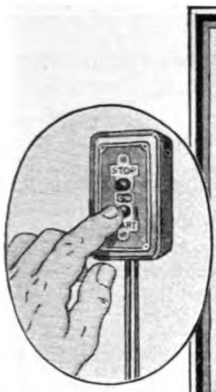
Catalog on a Gas-Fuel Boiler Governor can be obtained from the Chaplin-Fulton Mfg. Co. See page 74.

Catalog A-12 shows the correct way to choose a Steam Trap. See page 91. Davis Eng. Corpn.

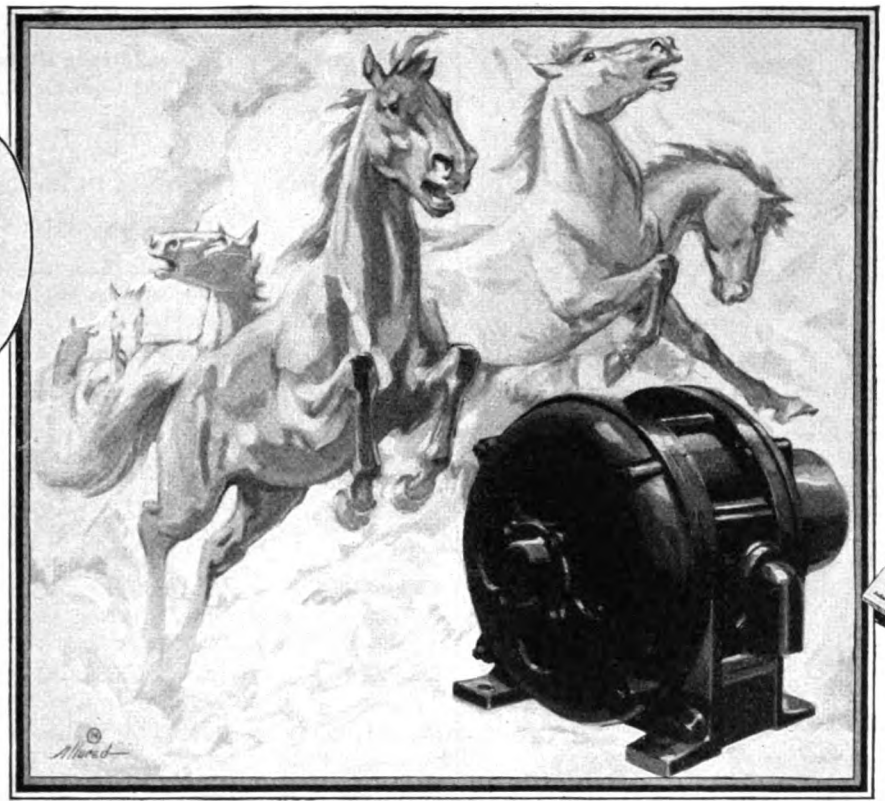
Information on packing for every industrial need. See page 61. U. S. Rubber Co.

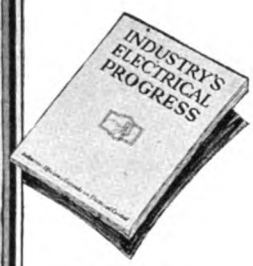
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The trend of industry is decidedly toward Cutler-Hammer Push Button Control. Merely a touch of the proper button right at the machine starts, accelerates, decelerates, regulates the speed or stops the motor as required. The controller is placed in any safe, convenient location. Saves time, affords better control and provides greater safety—a logical step in advance.





This booklet "Industry's Electrical Progress" puts into concise, interesting form the story of savings through modern motor control. Write for your copy today.

Motors by themselves are only brute force

The economies that electric power brings to industry depend on correct motor control

IT seems so simple—and yet in so many plants this basic truth is often neglected.

Motors by themselves are only brute force!

Engrave it on the minds of the men who design *your* equipment. Burn it into the memory of those who specify—those who buy. For today it is the battle cry in the fight to reduce manufacturing costs!

Every motor you put into service offers the opportunity of minimum operating expense. It can save in power costs. It can speed up production. It can save in labor—that major item of manufacturing burden. But you are trifling with opportunity if you leave these possible economies to chance—these economies that result not from the mere installation of motors, but from the production efficiency you are able to obtain through the perfect control of their brute force.

Competitive conditions today demand the accurate powering of equipment. Plan your drives considering the work to be done. That means the choice of motor control equipment first—choice of the type of control equipment that affords maximum speed of production—that ties in closest with the manual operations involved. The proper type of motor can *then* be selected to give maximum results.

Carry this story to the men of your plant! Have them check the motors you have in service. Like many other plants, you will find that modern motor control on many existing drives will pay for itself in a few months—and then add steadily to profits.

If you desire, Cutler-Hammer field engineers will gladly counsel with your plant men or consulting engineers to determine where savings may be obtained—to show them the latest control equipment available for every need. Their recommendations are based on more than thirty years' experience. This service is also offered for the planning of new drives, and their co-operation does not place you under any expense or obligation.

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Clay and Brick Dust Have Not Stopped Them

A COMPLETE installation of Valley Ball Bearing Motors in one of the plants of the Superior Pressed Brick Company, Saint Louis, operates brick machines, compressors, elevators, molds, rollers, hoists, mixers, and other machinery.

In the two years which these motors have been in service, the Company has not lost a minute's production or incurred any maintenance cost for these motors.

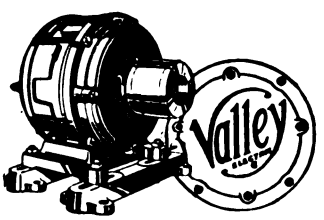
Although these motors are regular stock motors not provided with any special covered housing, the clay and brick dust which fill the air at this plant have not interfered with their performance.

The management does not even bother to blow them out periodically. The only attention which they get is lubrication service.

This is just another demonstration of the fact that the delivery of continuous power with unusual operating economy under adverse conditions is all in the day's work for Valley Ball Bearing Motors.

Before you buy or recommend another installation of motors, it will pay you to get all the facts about Valley Ball Bearing Motors. Write for descriptive booklet.

Motor Division
VALLEY ELECTRIC CO., ST. LOUIS, U. S. A.
Branches in Principal Cities



Valley Electric

A Steam Trap on 30 Days' Free Trial offered by the Sarco Company, Inc. Page 86.

Catalog and Price Lists on Steam Unions that prevent loss of steam, can be obtained from the E. M. Dart Mfg. Company. See page 68.

TOOLS. Shop Tools, Saws, Files, Chucks, Etc.

Chrome Vanadium Wrench Kits for Millwrights, Loom-fixers and other Shop Mechanics. See Inside Front Cover. Bonney Forge and Tool Works.

Details on Pipe Threading Equipment is offered by the Oster Mfg. Co. See page 55.

Vises that are noted for their strength and ability to stand up under hard work. Prentiss Vise Co. See page 72.

Catalog on files. Simonds Saw and Steel Co. See page 66.

A Bending Tool that bends angles, flats, squares, rounds, copper tubes, steel pipe, etc. See page 63. Buffalo Forge Co.

Catalog No. 23 contains information on valve reseating machines, useful in any power plant and factory. The Leavitt Machine Co., page 90.

Catalog No. 15 describes a Clutch that can tackle the harder jobs. See page 92, Conway Clutch Co.

Sample Blades are Offered by Victor Saw Works. See page 63.

Heavy Duty Unbreakable Chisel Steel can be obtained from Ludlum Steel Co. Page 91.

Catalog H describes a high grade Swiss File backed by 112 years of manufacturing experience. See page 63. Grobet File Corpn. of America.

Catalog No. 30 on Small Tools can be obtained from Brown & Sharpe Mfg. Co. See page 58.

High Speed Forge Type Drills. Morse Twist Drill and Machine Co. See page 2.

Details of the Ettco Keyless Drill Chuck can be seen on page 76. Eastern Tube and Tool Company, Inc.

Drill Chucks with exceptional strength and Arbors ground with extreme accuracy are shown on page 106. Jacobs Mfg. Co.

High Speed Drills for high speed production. See page 49. The Cleveland Twist Drill Co.

Hacksaw Blades that tear and rip their way through the toughest job. American Saw & Mfg. Co. See page 56.

A Free Trial Offer on an exceptionally efficient Portable Saw for various purposes. For complete information see page 53. D. W. Onan & Sons.

The Cap Screw with the perfect hexagon head. See page 91 Ferry Cap & Set Screw Co.

TRANSMISSION EQUIPMENT. Including Belting

Booklet on Pulleys, Gears and Sheaves is being offered by the Pyott Foundry Company, makers of Pyott Red Face Pulleys. Look on page 74.

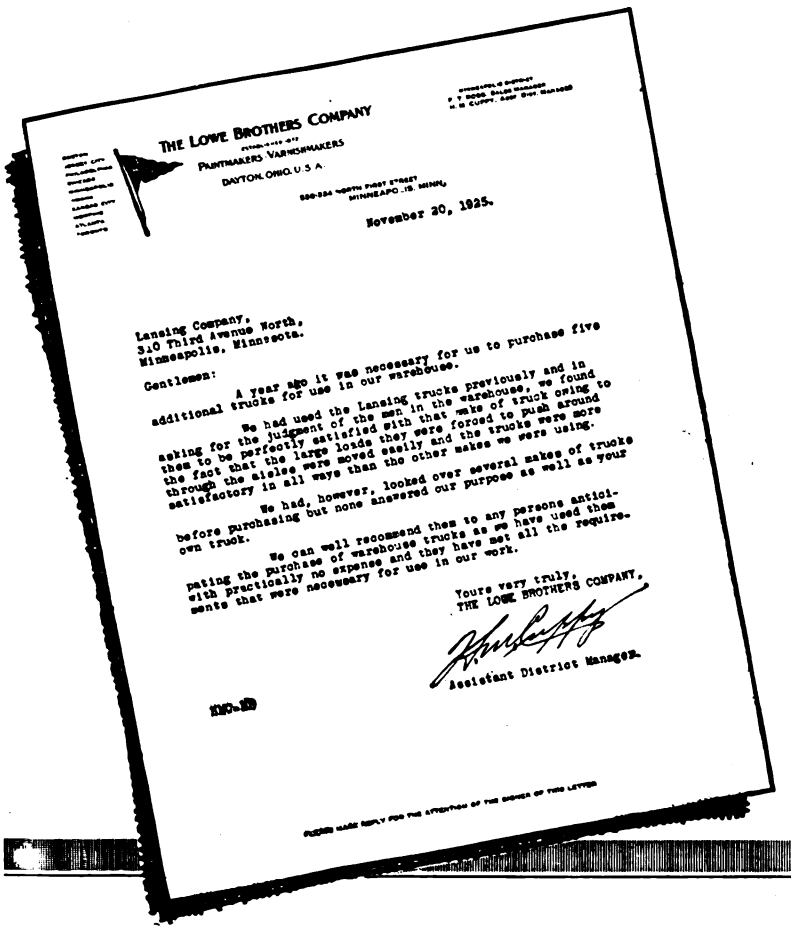
A Self-Aligning Ball Bearing Hanger that solves the lubrication problem. SKF Industries, Inc. See page 4.

Literature that Explains the Advantages of Pulleys and Pressed Steel Hangers is offered by the American Pulley Co. See page 87.

Catalog 43 Issued by the Medart Company affords a simple method of concentrating transmission machinery purchases. See page 46.

Catalogs and Information on any of the above furnished without obligation

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THE LOWE BROTHERS COMPANY
PAINTMAKERS VARNISHMAKERS
DAYTON, OHIO, U.S.A.

November 20, 1925.

Lansing Company,
310 Third Avenue North,
Minneapolis, Minnesota.

Gentlemen:

A year ago it was necessary for us to purchase five additional trucks for use in our warehouse.

We had used the Lansing trucks previously and in asking for the judgment of the men in the warehouse, we found them to be perfectly satisfied with that make of truck owing to the fact that the large loads they were forced to push around through the aisles were moved easily and the trucks were more satisfactory in all ways than the other makes we were using.

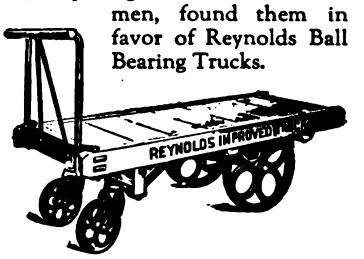
We had, however, looked over several makes of trucks before purchasing but none answered our purpose as well as your own truck.

We can well recommend them to any persons anticipating the purchase of warehouse trucks as we have used them with practically no expense and they have met all the requirements that were necessary for use in our work.

Yours very truly,
THE LOWE BROTHERS COMPANY,

Assistant District Manager.

Learn the real value of any article by asking the people who use it. Lowe Bros., paint makers of Dayton, Ohio, inquiring of their warehousemen, found them in favor of Reynolds Ball Bearing Trucks.



The Reynolds Truck, Fig. 40

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Chicago Boston New York
Minneapolis San Francisco Kansas City
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Send me on ten days' approval one copy of Emerson's "Twelve Principles of Efficiency." If I keep it, I shall remit $3.

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Type MP 5
¼ H. P. Motor



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Flexible Shafts and Equipments

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and
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1/10 to 2 H. P.

Several Types and Sizes

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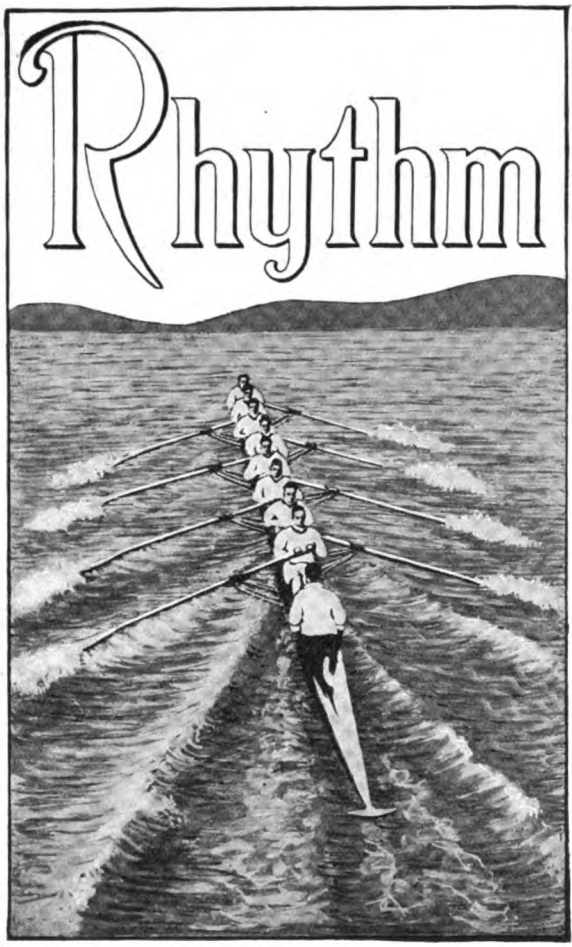
Catalog Upon Request.

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N. A. Strand & Co.

5001 NO. LINCOLN STREET CHICAGO

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With perfect rhythm and co-ordination, a college crew pulls 30 to 40 strokes a minute for miles at a time—only with such absolute co-ordination can a crew win a race. So it is when fitting a drill chuck to the machine—an infinitesimal error of one ten thousandths of an inch in the taper of an inferior arbor may cause the most accurate drill chuck in the world to be inaccurate by several thousandths.

Jacobs Arbors



are exact, ground with extreme accuracy and gauged for use with

Jacobs Chucks

One is as important to the other as a coxswain to a winning crew.

The Jacobs Manufacturing Co.

HARTFORD, CONN.

The World's Largest Producers of "Drill Chucks"

Bulletin No. CE719 Describes a Steel Belt Lacing that is quickly joined. See page 53. The Bristol Co.

A Book that Answers Questions on belt care and operation can be obtained from Chas. A. Schieren Co. Pages 50-102.

The New Wood-Fafnir Line of Power Transmission Appliances has many time, money and labor-saving advantages. They are described on page 88 by T. B. Wood Sons Co.

Catalog L-66 gives information on variable speed control. For a copy see page 82. Reeves Pulley Co.

A Catalog on Flexible Shafting for tool room, machine shop, pattern shop and foundry. See page 105. N. A. Strand & Co.

Belt Lacers that result in greater transmission efficiency. See pages 64-65. Clipper Belt Lacer Co.

A 60-Day Trial on a Belt Preservative. See page 76. Cling-Surface Company.

MISCELLANEOUS

A New Catalog M-28 gives complete information and data on Blue Printing. C. F. Pease Co. See page 73.

Information on Stopping the Losses Resulting from Human and Mechanical Errors in the measurement of material is offered by The Toledo Scale Co. See page 71.

An Economical Means of Cleaning Parts is shown on page 70. Oakley Chemical Co.

The Latest System in Watchclocks. Literature describing this is offered on page 98 by the Detex Watchclock Corp.

New Book on Air Moving is offered by the New York Blower Co. See page 96.

Seventeen Degrees of Black and Three for Copying is the choice offered by the Venus Pencil on page 99. American Lead Pencil Co.

A 62-Page Catalog Describing the Various Types of Scales, that indicate weights, while material is on the move, is offered by The American Kron Scale Co. See page 60.

Man Cooling Fans that prevent delays caused by excessive heat. See page 89. American Blower Company.

Catalog No. 24 describes an improved oven for cores. See page 47. Young Brothers Company.

Information on a Perpetual Inventory System that keeps a check on thousands of parts and assemblies, is described on page 54. The McCaskey Register Company.

Booklets Describing Temperature Control are offered by Taylor Instrument Companies. See page 10.

A Booklet Describing Counters for rate setting and production work. See page 83. The Veeder Mfg. Co.

A New Catalog on sanitary ice cooled drinking fountains. See page 67. Century Brass Works.

Illustrated Folders on the Hallowell Pressed Steel Bench Legs and Workbenches should interest every industrial executive. See page 59. Standard Pressed Steel Company.

The "Merrick Catalog" shows how bulk materials can be weighed while conveyor handled. The Merrick-Scale Co. See page 83.

A Service to Industry that Aids in the selection of the right doors for every purpose. See page 33. Richards-Wilcox Mfg. Co.

A Catalog Showing some Valuable Suggestions for Steel Lockers, Bins, Racks and Shelving. See page 99. Durand Steel Locker Co.

Literature Describing a Power Baler that saves waste storage space and is fire-proof is offered by Davenport Mfg. Co. See page 87.

Bulletin No. 1219 gives complete information on a full line of the New Britain Machine Company shop furniture. See page 37.

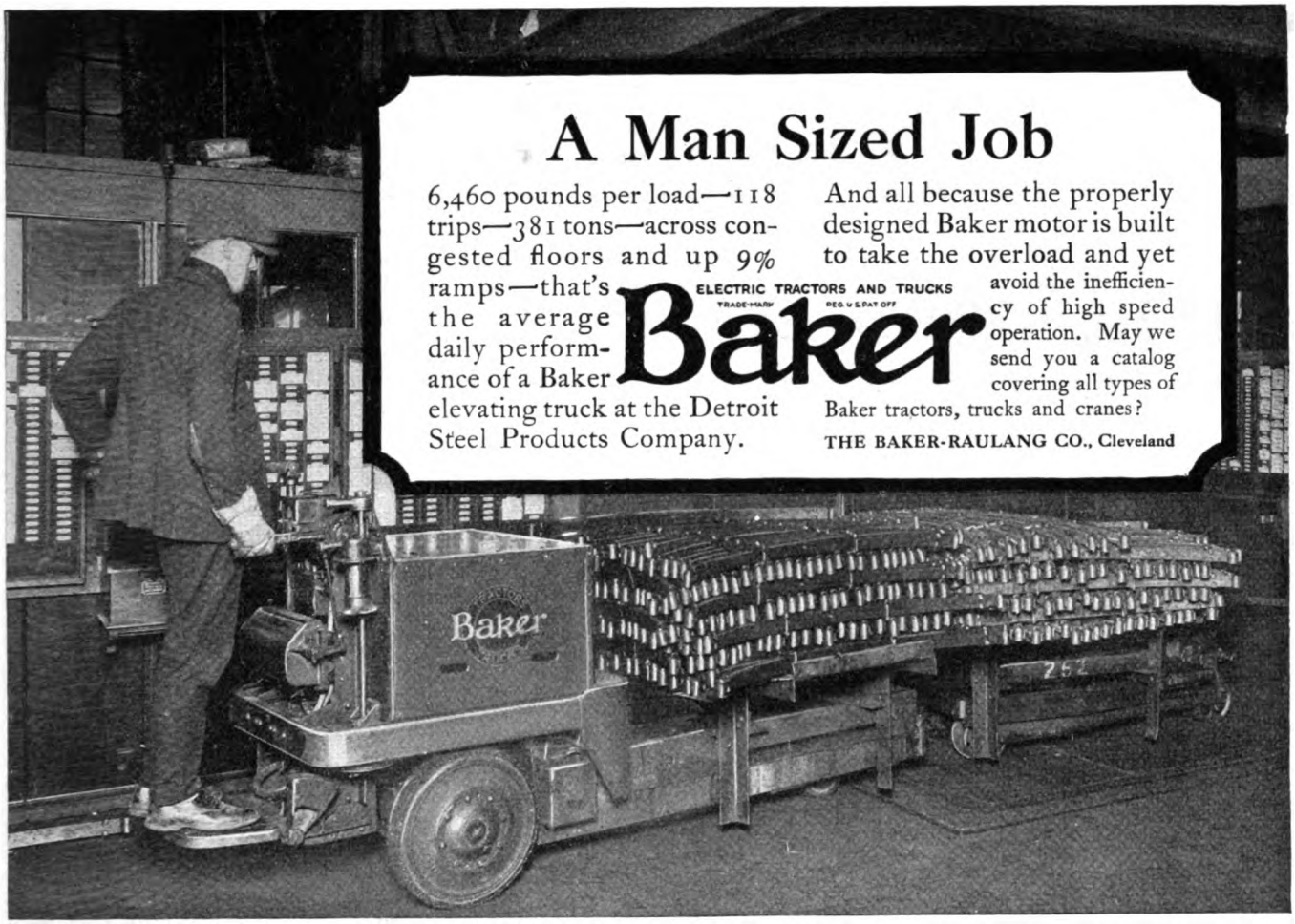
Catalog Describing 275 Styles and sizes of oilers for all types of machinery. Gits Bros. Mfg. Co., page 107.

Descriptive Circulars Illustrating Steel Fabricated Buildings for every industrial requirement can be obtained from the Martin Steel Products Co. See page 107.

Fabricated Sheet Metal Parts. An engineering service offered by The Breese Bros. Co. See page 97.

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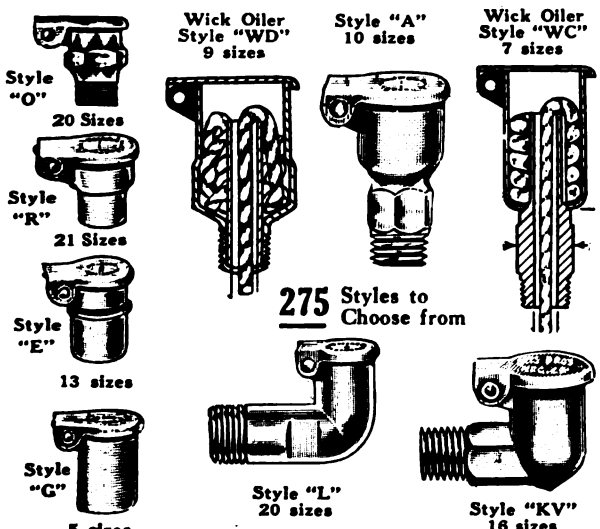
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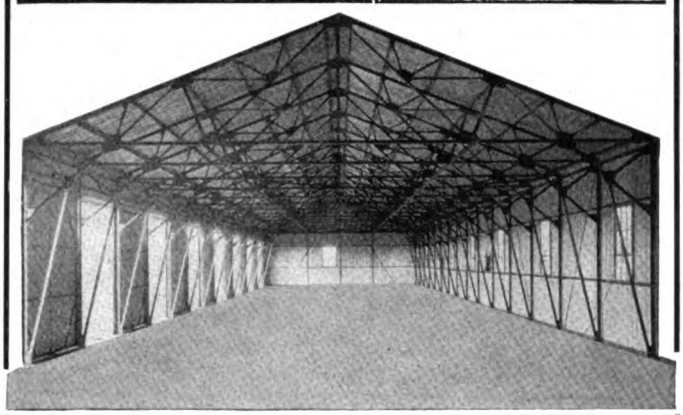


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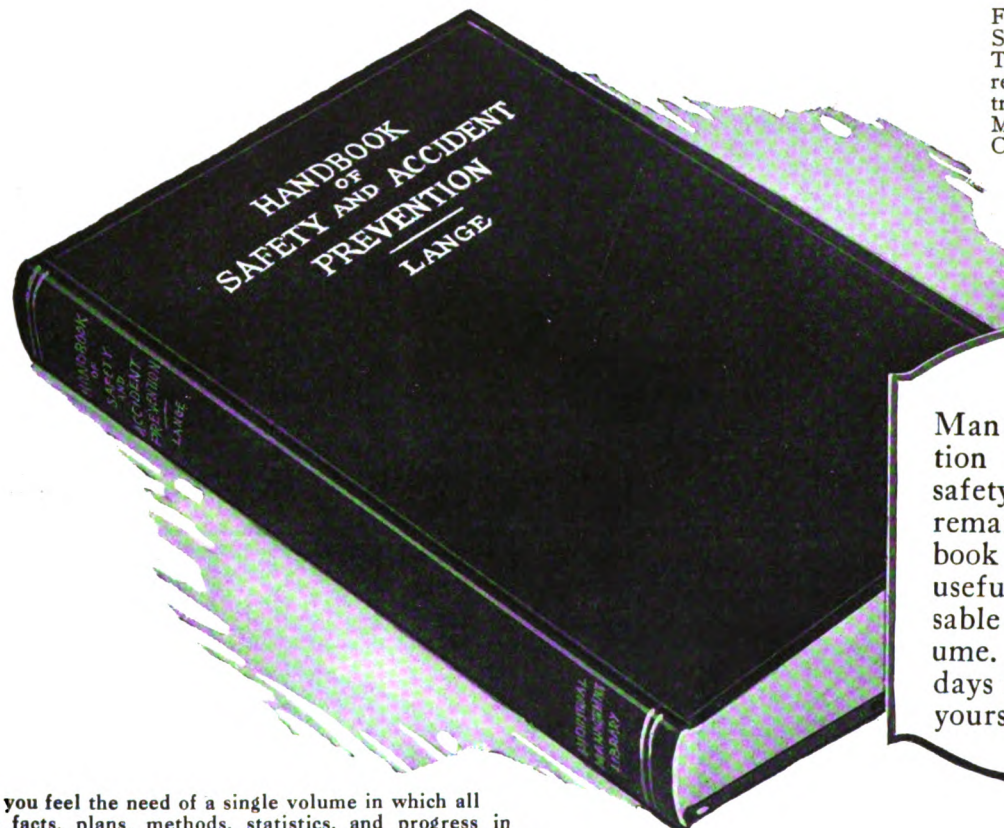
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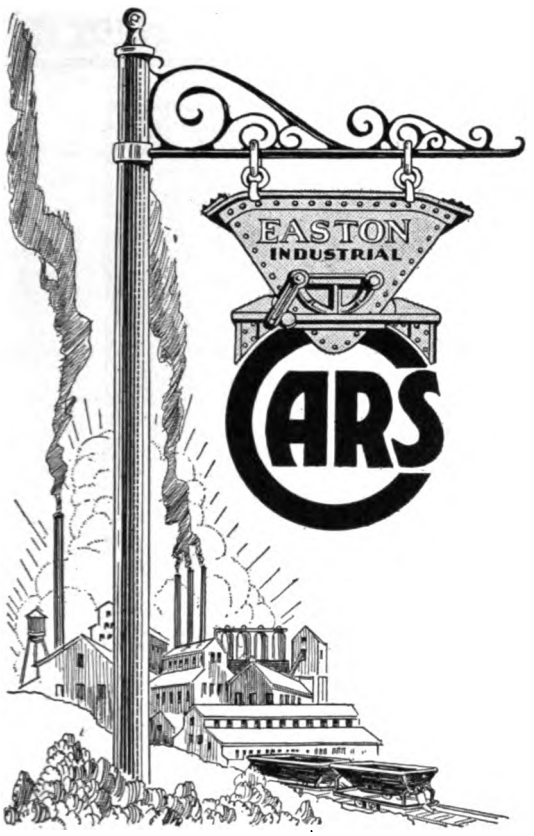
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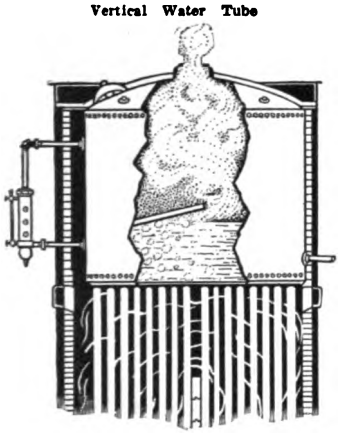
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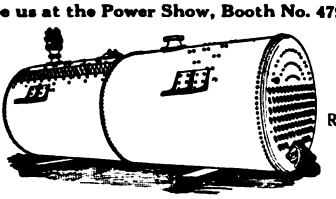


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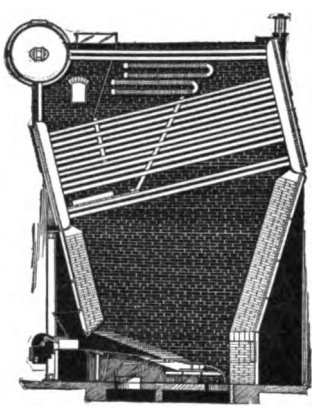
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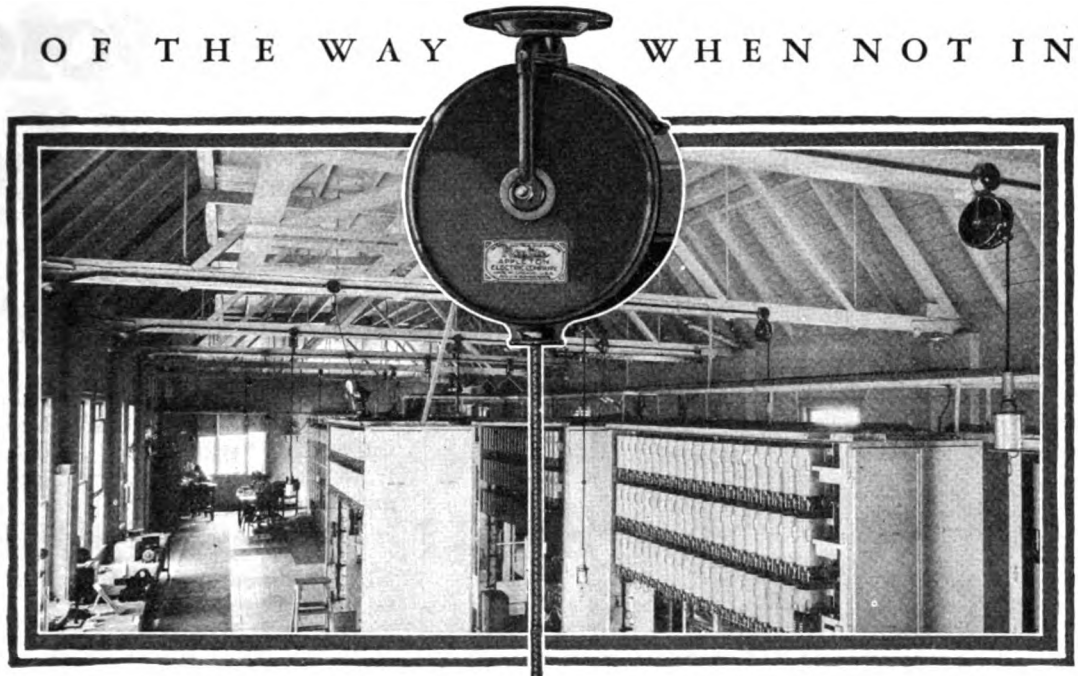
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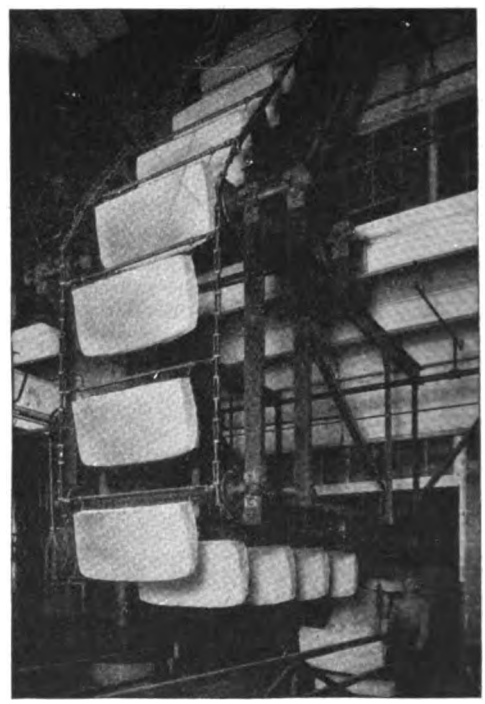
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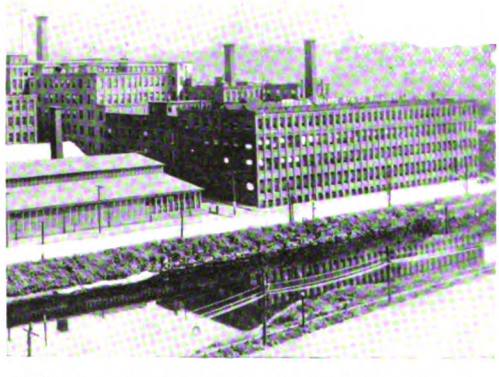
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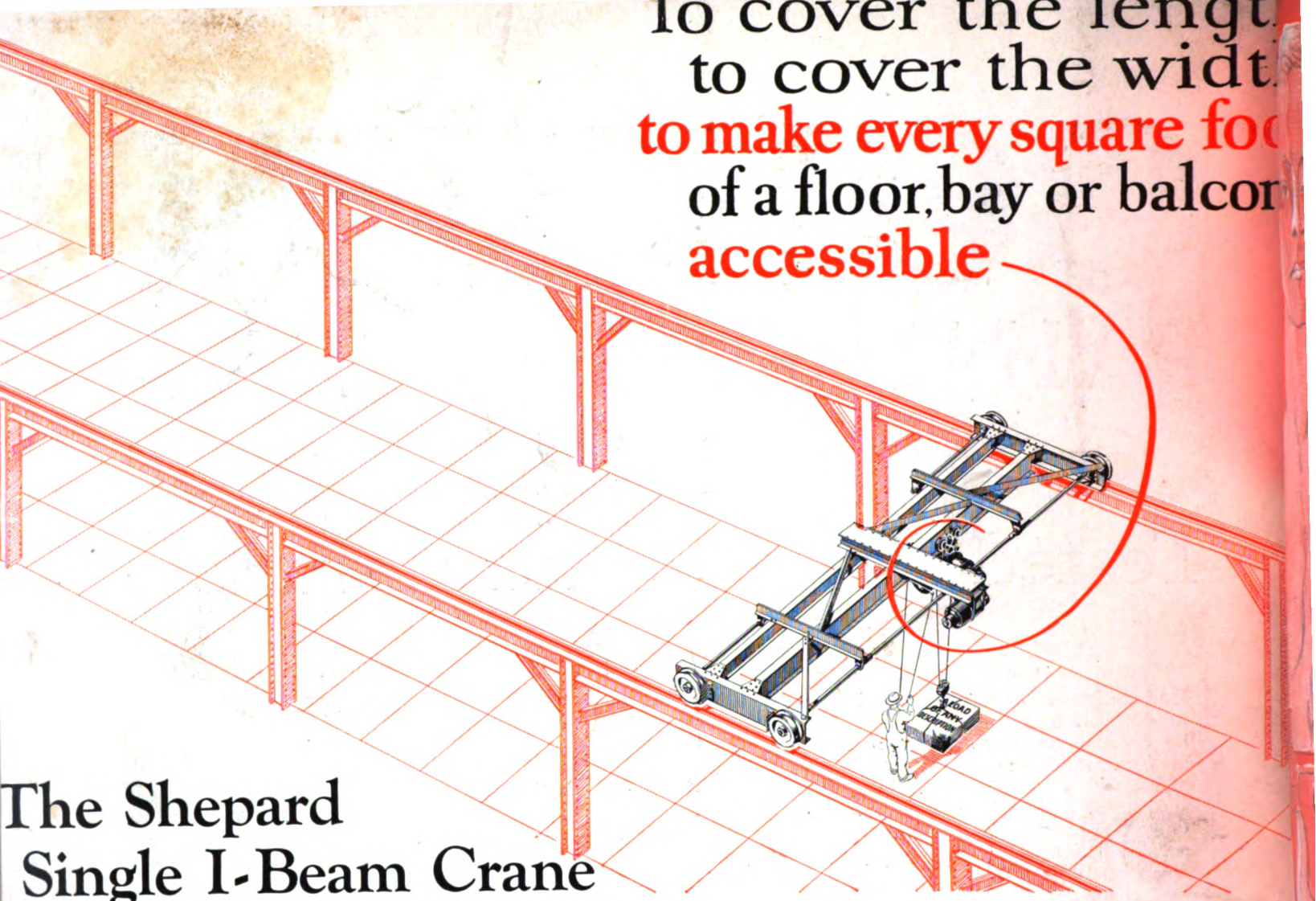
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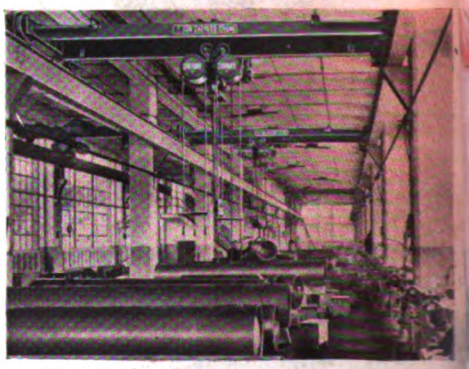
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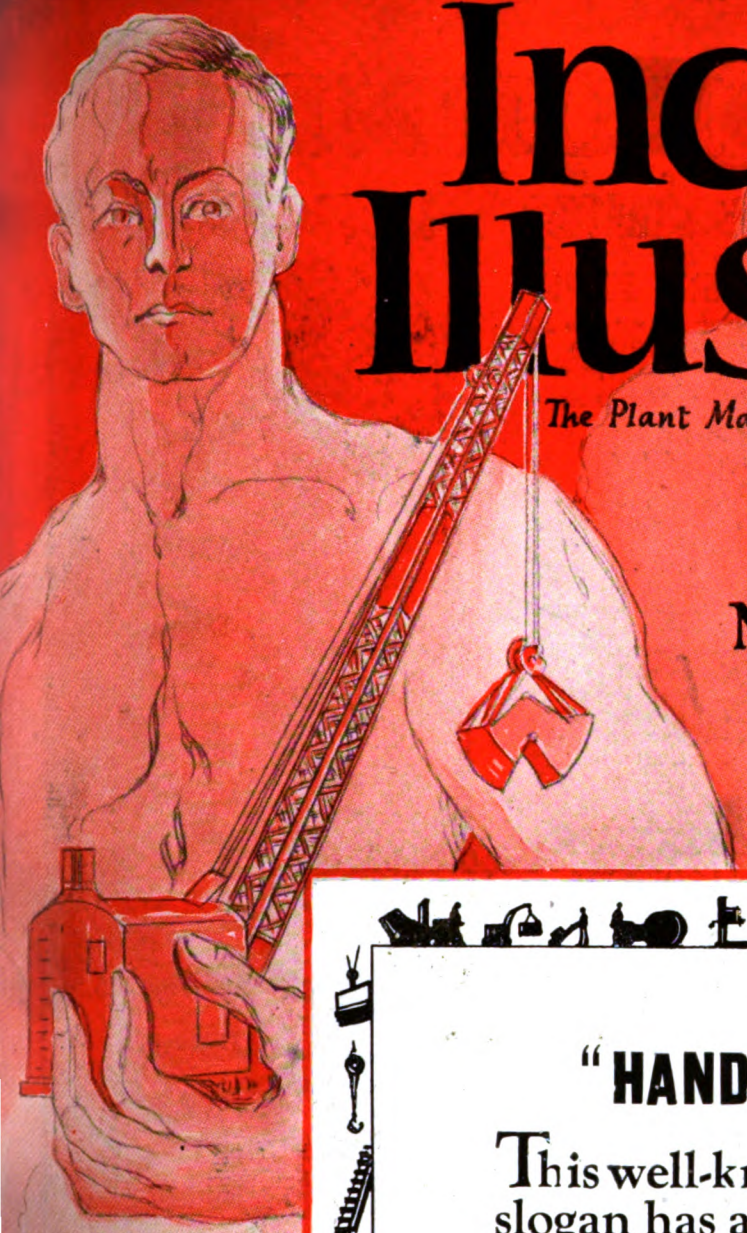
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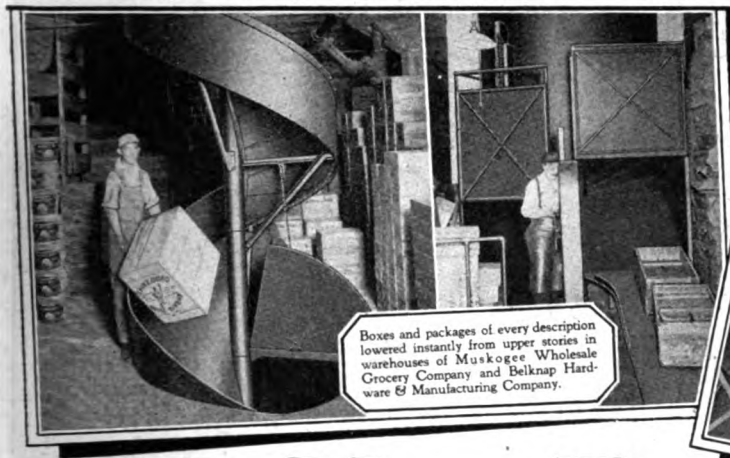
BONNEY Chrome "CV" Vanadium WRENCHES

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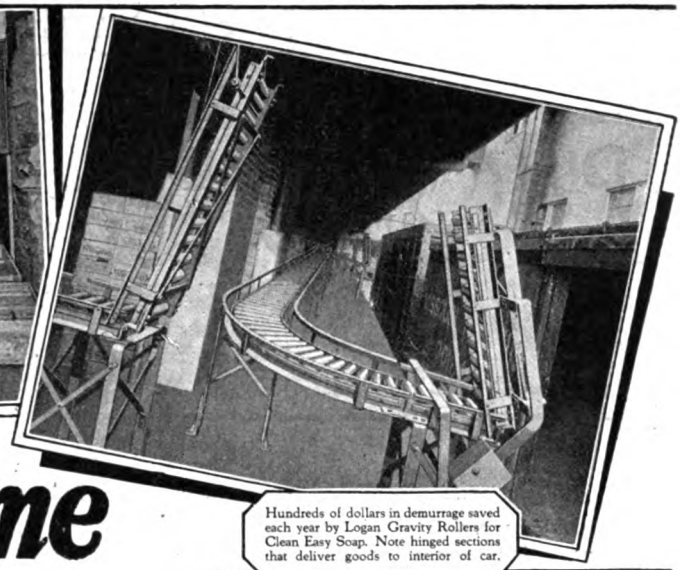
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50 YEARS OF SERVICE ~ OUR GOLDEN ANNIVERSARY



Boxes and packages of every description lowered instantly from upper stories in warehouses of Muskogee Wholesale Grocery Company and Belknap Hardware & Manufacturing Company.



Hundreds of dollars in demurrage saved each year by Logan Gravity Rollers for Clean Easy Soap. Note hinged sections that deliver goods to interior of car.

2 More Time Can't Be Bought ~



Above: Through every operation Black Horse Ale travels on Logan Conveyors. Gravity Rollers, Spirals, Steel Chutes, Inclined Elevators and Barrel Lifts are used.

Below: Speedy unloading of coconuts from ocean steamers — just one of the time-saving functions of Logan Conveyors at Franklin Baker Company's plant. A Logan Portable Conveyor is shown.

SAVE WHAT YOU HAVE!

Time is one asset that every manufacturer has in common. More of it can't be bought at any price. And yet, through the use of Logan Conveyors, manufacturers in practically every industry are investing their time to yield far greater profits than have ever before been possible. *Doing the same work in less time* is just as much a function of Logan Conveyors as doing the same work with less men.

Whatever you manufacture, Logan engineers will be glad to show you how and where a permanent, trouble-proof, time-saving system of Logan Conveyors can probably maintain your production with fewer men and machines or increase it with your present equipment and personnel. *Use the coupon.*

No. 1 Featured Savings in Labor

This is the second of a series of seven announcements describing seven distinct savings of Logan Conveyors, any one of which may pay for an installation in your plant. The remaining five will follow in consecutive issues.



LOGAN CO.
Louisville, Ky. Date.....

We are interested in conveyors. Send catalog ☐
Without obligating us, have your representative call ☐

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Logan Co. INCORPORATED 1881

LOUISVILLE, KY. *Offices in Principal Cities*

Logan Conveyors
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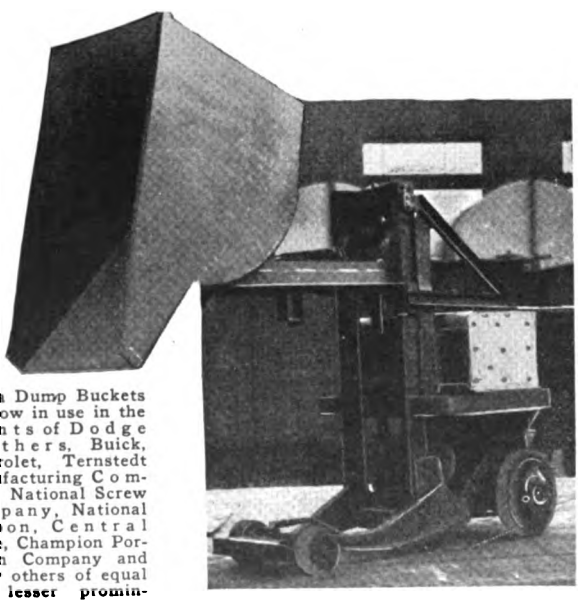
Saves! $8000 in Handling Costs

ROURA DUMP BUCKETS

facilitate the handling of all materials

A Roura Dump Bucket will fit any lift truck or hand truck, and with it you have a complete transportation system for handling hundreds of small parts or bulky materials which must be moved and dumped.

A well-known Detroit manufacturer (name on request) found that by using Roura Dump Buckets he could save $8,000.00 annually over former handling costs. This plant uses 50 Roura Dump Buckets. Part of them are being filled while other loads are being dumped. With Roura Dump Buckets, trucks are kept going all the time, production is speeded, and no idle stock need be stored to increase stock-in-process investment charges.



Roura Dump Buckets are now in use in the plants of Dodge Brothers, Buick, Chevrolet, Ternstedt Manufacturing Company, National Screw Company, National Carbon, Central Forge, Champion Porcelain Company and many others of equal and lesser prominence.

Put one or two Roura Dump Buckets to work in your plant and watch your handling costs drop. May we send you descriptive circulars?

THE ROURA IRON WORKS

1400 Woodland Ave., Detroit, Mich.



The Publisher's Column

MANKIND has always been confronted with the problem of handling and transporting materials—from the time when prehistoric man killed his first big meat animal and had to find a way to bring the carcass to his home.

In modern industry, with its demand for quick production at low cost, materials handling has become recognized as one of the major problems to be solved. "Moving costs more than making"—in other words, actual productive operations consume less in time, payroll and investment, than does the non-productive operation of getting materials and parts moved through their departments. This has been true of the vast majority of our industrial production—but it is becoming less true as we learn to apply more and more the principles of mechanical handling.

Materials handling is not something to be studied once, and then forgotten. It is a function of good management, to be kept up-to-date, month in and month out. Like with every other function, it is worth while to "take stock" periodically, to check up on results and to compare notes.

It is with this thought in mind, that we have made it a practice, each year, to devote one entire issue of INDUSTRY ILLUSTRATED to this most modern cost-cutting tool. Throughout the eleven other months of the year, materials handling receives its full measure of editorial attention, and in this one issue we present a symposium of the year's progress, that you may study and compare, and take stock of the progress in your own plant.

Industry Illustrated

Published Monthly by

THE ENGINEERING MAGAZINE CO.

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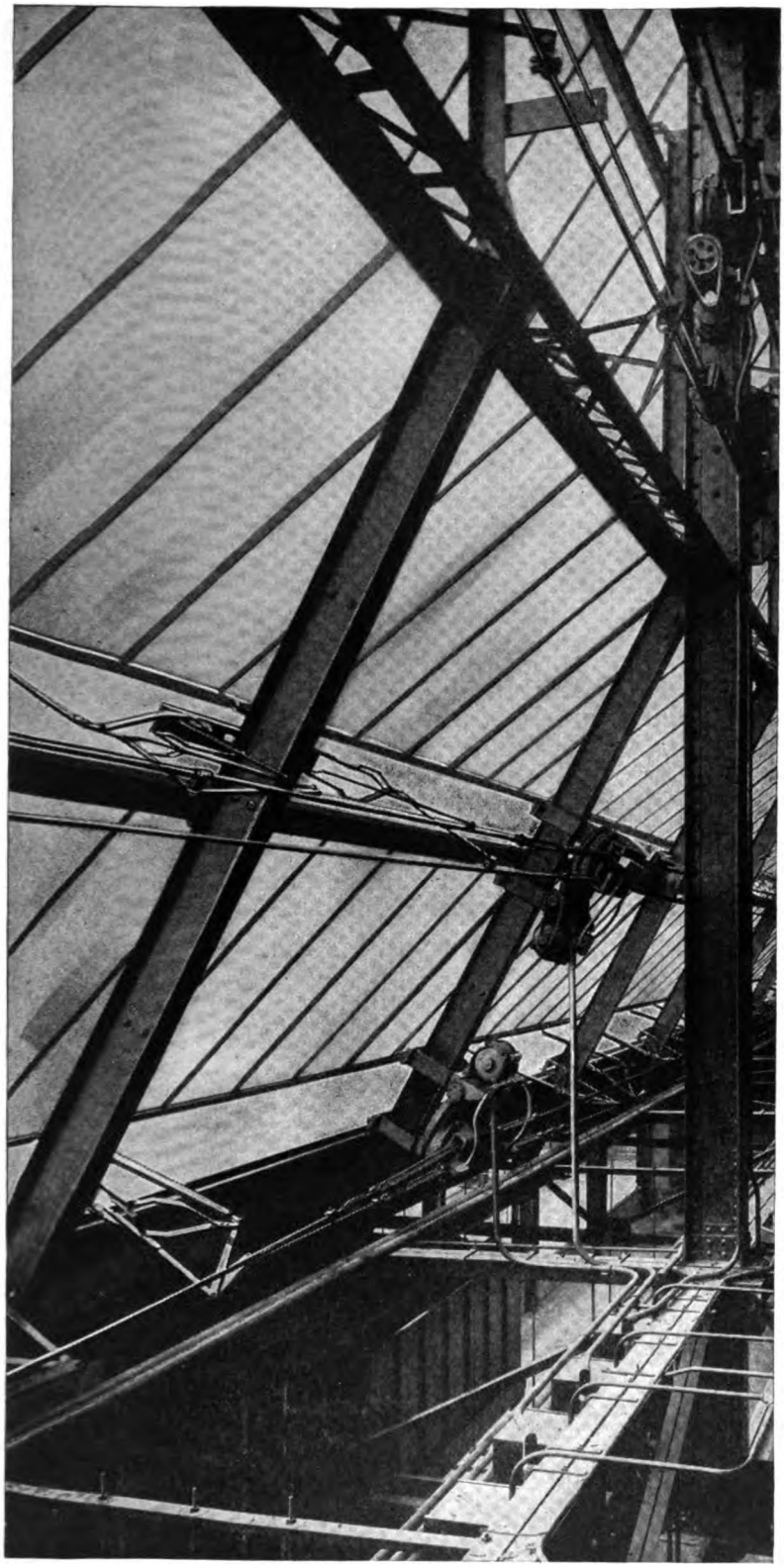
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Re: Daylight and Ventilation

Truscon offers maximum requirements

Modern industry with its gigantic plants and tremendous programs of production employ fresh air and daylight as the two greatest aids to efficient operation. Truscon, specialists in the design and manufacture of all types of Steel Sash and Mechanical Operators for industrial buildings, has provided daylighting and natural ventilating facilities to thousands of plants. Today there are hundreds of acres of glass in Truscon Steel Sash daylighting representative industrial plants the country over. And hundreds of miles of sash open and close with Truscon Mechanical operators, furnishing necessary natural ventilation. Truscon offers you an experience and service unobtainable elsewhere. Truscon specialists in Steel Window and Mechanical Operator installations will confer with you gladly and without obligation.

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A Chain of Service Stocks Circling the Nation

IN Dallas or Detroit—in Connecticut or California—wherever pulleys are needed—you will find Rockwood Service Stocks waiting to supply you instantly from the 2194 different paper pulley sizes (1½ to 14 inch diameters) which Rockwood makes in quantity.

A messenger or a phone call—a telegram or a letter—will start the pulley you want on its way to you without a minutes delay. And so complete is the chain of Rockwood service that you are at most only a few hours away from the nearest Rockwood stock.

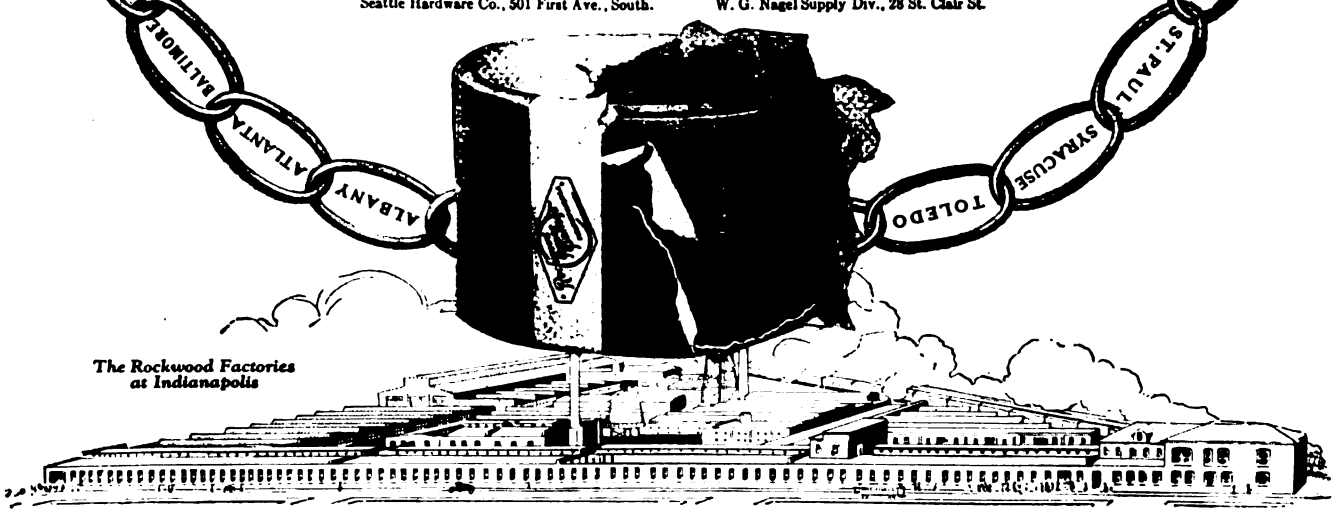
Rockwood Paper Pulleys are the accepted standard of the motor industry. More than 90 per cent of all belted electric motors are equipped at the factory with Rockwoods—because Rockwoods grip the belt hardest and slip the least, and therefore transmit more power.

Order from the nearest Rockwood service stock, giving diameter of pulley wanted, width of belt to be used, size of shaft and dimensions of keyway in shaft.

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Power, belt and lubrication savings that may pay for an entire conveyor installation are made possible by Timken Tapered Roller Bearings.

Timken-mounted idlers are free of excess friction, though running for months or years on each greasing. Timkens keep pulleys in line, without risk of sticking or flat spots, because Timken steel, Timken Tapered design, and *TIMKEN POSITIVELY ALIGNED ROLLS* resist every form of wear, including thrust.

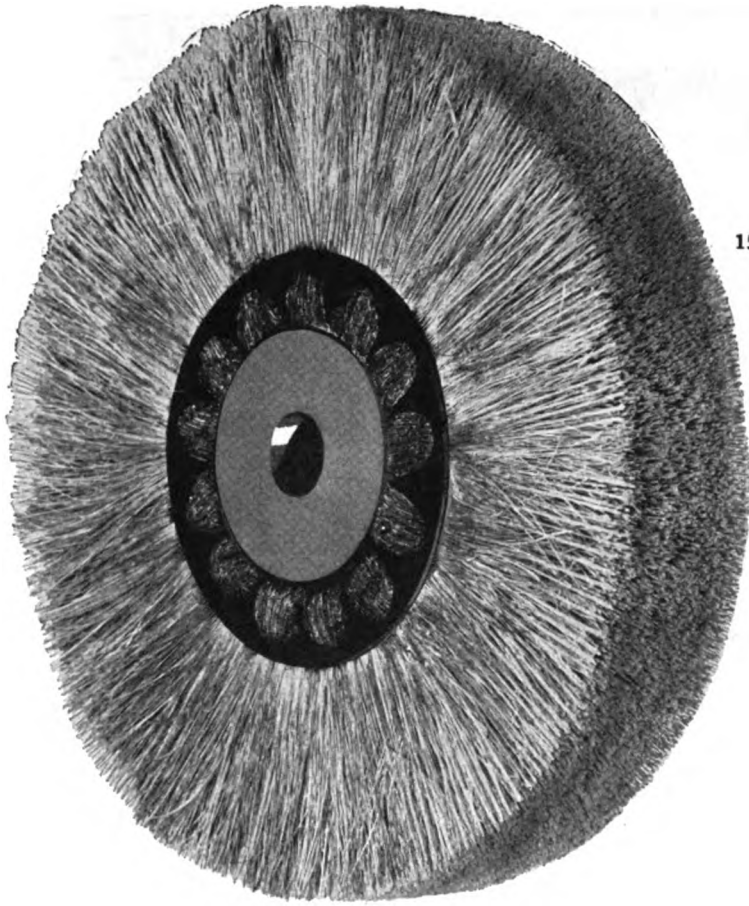
The reduced drag means lighter belts and smaller power units, as well as lower operating costs. Get the grand totals of Timken economy from any of the leading conveyor manufacturers, or call in a Timken Industrial Engineer.

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Tapered
ROLLER BEARINGS

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1501 — 8"—"Solid-Triumph" Tampico Wheels. Also available in 10" and 12" sizes. Arbor hole may be any size desired.

Better Wearing Tampico Wheels

The Osborn complete line of Tampico Wheels enables you to choose a brush that is right for any kind of work. Two distinct types are available.

"Solid-Triumph" Tampico Wheels are built up with more than the average weight of White Tampico Fibre, held firmly in the center stamping.

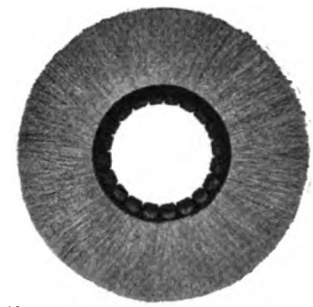
"Riehl-Triumph" Wheels are mounted on two-piece, adjustable and self-locking aluminum hubs, which can be refilled with new sections when the original brush parts are worn out.

The economy of these tools is wholly a matter of durability and uniform wear, which Osborn Tampico Wheels provide in fullest measure.

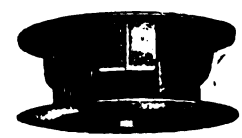
THE OSBORN MANUFACTURING COMPANY
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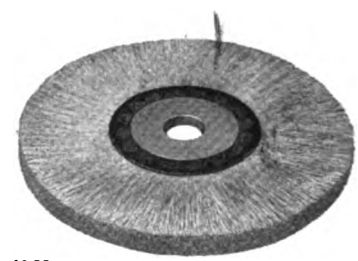
Osborn Brushes



1518—"Triumph" White Tampico Section. Designed for use with "Riehl" hubs. Furnished in fine or coarse grades of Tampico Fibre and in diameters from 6" to 10".



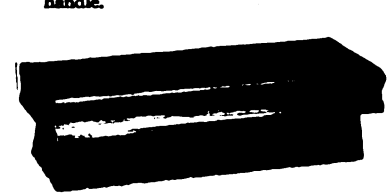
"Riehl" Aluminum Hub. Light in weight and designed to compress Tampico sections into a compact brushing face. Face widths 1½" to 3". Arbor holes any size desired.



4068—Monarch Tampico Sections are designed to meet the need for individual sectional units which can be used without a hub, and built up to any width face desired. Sizes 8" to 12".



263A—Plater's Brush. Tampico fibre, staple-set in solid block with curved handle.



635 — Plater's Scouring Brush. Heavily filled with 1" Tampico fibre. Block 2⅝" x 6½".

OSBORN

A BETTER WEARING BRUSH FOR EVERY USE

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"HALLOWELL" Steel Bench Legs

Make Cheaper and Stronger Benches!



Patented and Patents Pending

The NEW "Hallowell" Home Work Bench (shipped knocked down in 3 packages) is the thing you've been wanting for your own home.

"HALLOWELL"

Steel Bench Legs and Steel Bench Drawers

Build your benches on "Hallowell" Steel Bench Legs and they'll last almost forever. The wide base pyramid effect of the feet often saves fastening to the floor. "Hallowell"—legged Benches are easy to move—they are rigid and can't come apart or get wobbly.

It actually costs less to build benches with "Hallowell" Steel Bench Legs and besides, they can be picked up from stock exactly as wanted and just when needed.

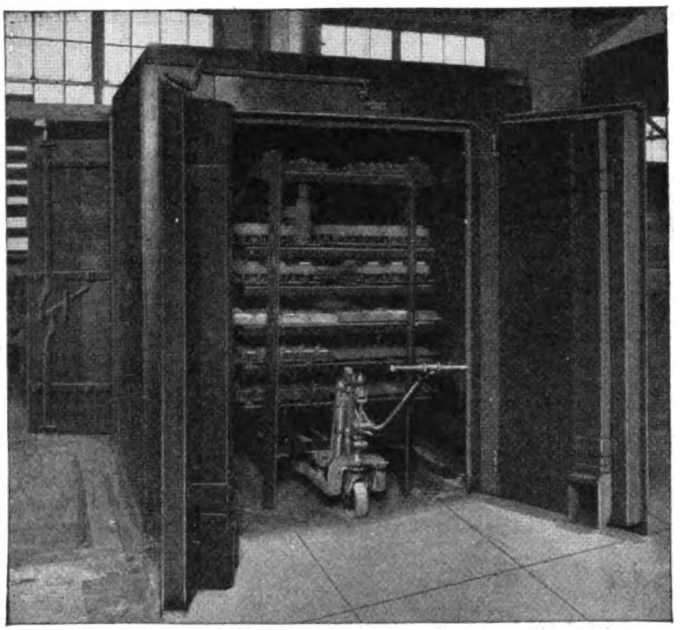
"Hallowell" Steel Bench Drawers are dust-proof and come equipped with lock and if desired special sliding Tray. Every bench should have one.

Standard Pressed Steel Co.

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The OVEN that increased CORE OUTPUT 50% with same FUEL COSTS

Mr. Wm. J. Grede, President of the Liberty Foundry, Wauwatosa, Wisc., in commenting on Young Brothers Ovens says:—

"We assure you we have found your ovens very sasisfactory in every respect and find that we can bake 50% more cores with the same amount of coke and with a considerable saving of time than we were able to bake formerly."

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Adapted to all methods of heating.

INDUSTRIAL OVENS

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Where interiors are painted with this



Washing removes the dirt but not the paint—

TRY to wash ordinary white paint. Does the dirt come off? Does the paint stay on?

You can wash Barreled Sunlight clean any number of times without the least injury to its lustrous white surface.

This is because Barreled Sunlight is so satin-smooth that dirt can find no foothold —and so durable that repeated washings will not wear it away.

Made by the exclusive Rice Process, Barreled Sunlight is guaranteed to remain white longer than any gloss paint or enamel, domestic or foreign, applied under the same conditions—also, not to flake or scale if properly applied. It is economical in application, too, flowing on freely with brush or spray at the ***lowest cost per square foot of surface covered.***

These are the practical reasons why thousands of industrial plants prefer Barreled Sunlight to any other paint for their ceilings and walls.

Sold in 55- and 30-gallon churn-equipped steel drums, and in cans from ½ pint to 5 gallons. Where more than one coat is required, use Barreled Sunlight Undercoat first.

The coupon will bring you an illustrated booklet and a painted sample of Barreled Sunlight.

U. S. GUTTA PERCHA PAINT CO.
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Barreled
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Sunlight

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5 Dudley Street, Providence, R. I.

Please send us your booklet "More Light", and a painted sample of Barreled Sunlight.

Name.....

Street.....

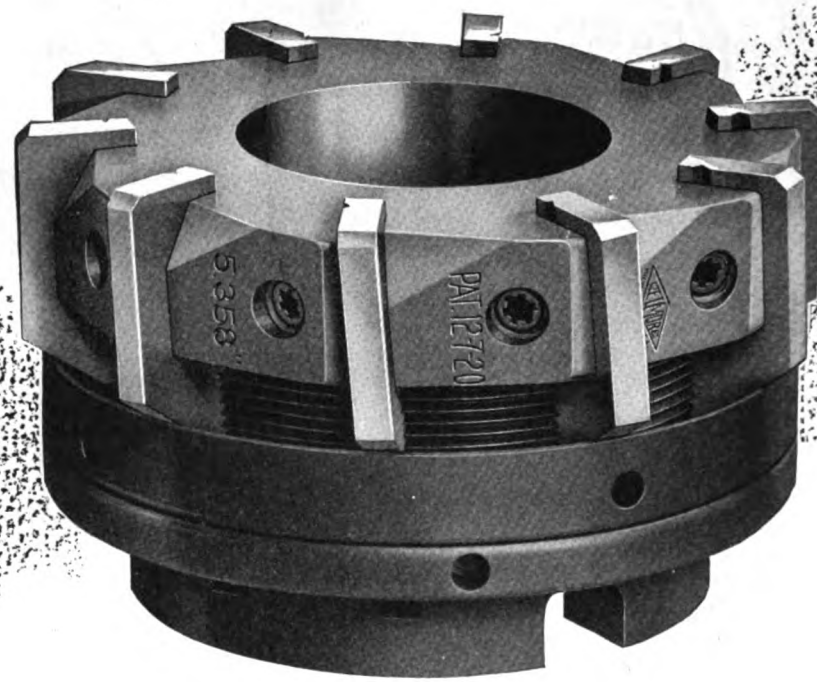
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5/8" to 12"



Wetmore adjustable small machine reamers—5/8 in. to 31/32 in. straight or taper shank



—and any size in-between!

No matter how small or how large a reamer you need, get a WETMORE ADJUSTABLE REAMER. This famous reamer—now standard equipment in many of America's largest plants—ranges in size by thirty-seconds from 5/8 in. to 12 in. diameter. If the size you want isn't in stock, we will make it for you.

Here are four reasons why Wetmore Reamers cut production costs—do faster, more accurate work and stand up longer in service:

Adjustments to the thousandth of an inch can be made in less than a minute. In fact, the Wetmore is the quickest and easiest adjusting reamer made.

Solid, alloy steel body, heat-treated, guaranteed against breakage.

Left Hand Angle Cutting Blades that prevent digging in, chattering and scoring while backing out. Shearing effect of blades increases life of cutting edge.

No grinding arbor required for regrinding. Wetmore Reamers can be reground on their original centers.

Let us prove these Wetmore advantages in your shop.

NEW CATALOG

Write for Wetmore Catalog No. 26 of standard, heavy-duty, shell, small machine and cylinder reamers. Also arbors and replacement blades. New, reduced prices.

WETMORE REAMER COMPANY
62—27th St., Milwaukee, Wisconsin

WETMORE ADJUSTABLE REAMERS
"THE BETTER REAMER"

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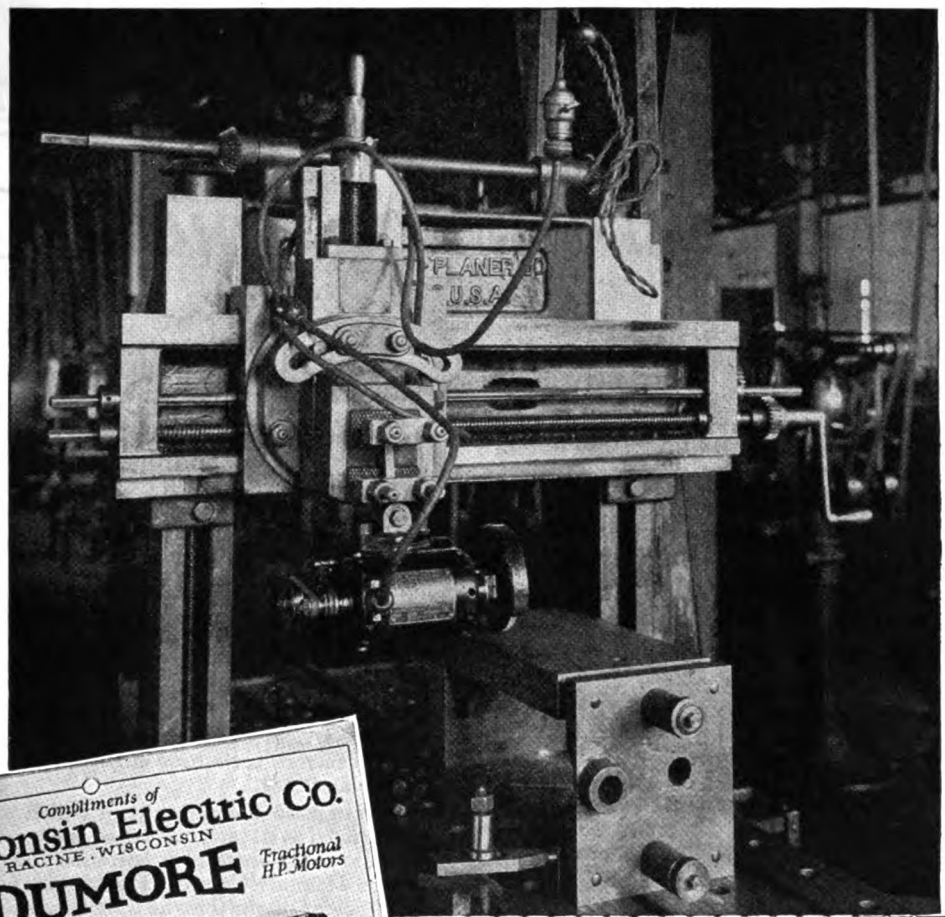
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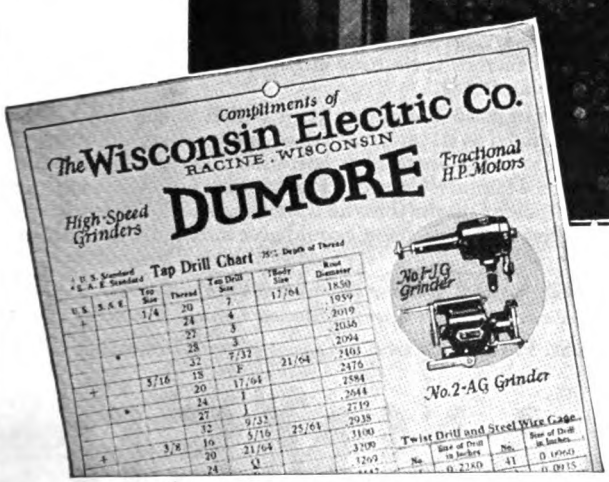
FINISHED—at one setting

WHEN specifications call for finish by grinding to close tolerance limits, a Dumore Grinder proves its value. On almost any machine tool—planer, shaper, lathe or milling machine—the Dumore can be used to finish any surface—flat, round, eccentric or irregular, to the required dimensions—usually without changing or disturbing the original set-up.

Six styles, all vibrationless, cover all requirements for fine external or internal grinding, at prices ranging from $50 to $180. Write for our new exchange offer.

Have you a Dumore Tap Drill Chart? If not, let us send you one. It's free. Mail the coupon.





Wisconsin Electric Company,
70 Sixteenth St., Racine, Wis.

Please send me, free of charge, one of your Tap Drill Charts, a catalogue of Dumore Grinders, and details of your new exchange offer.

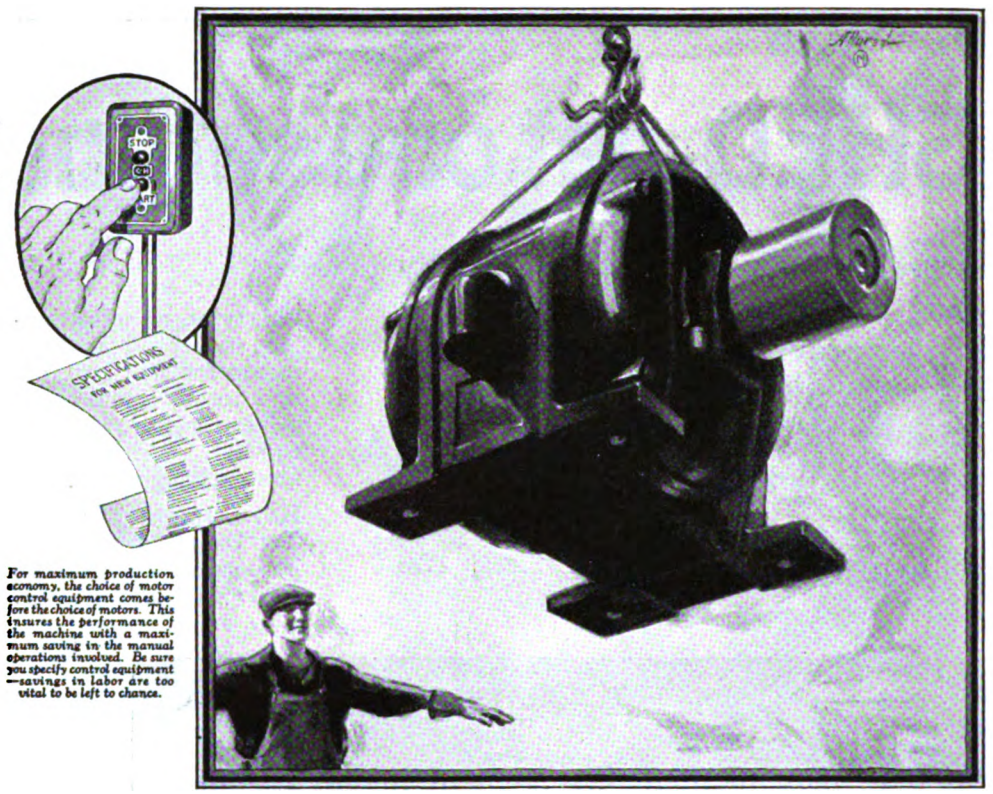
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Wisconsin Electric Company 70 Sixteenth St., Racine, Wis.

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For maximum production economy, the choice of motor control equipment comes before the choice of motors. This insures the performance of the machine with a maximum saving in the manual operations involved. Be sure you specify control equipment—savings in labor are too vital to be left to chance.



This booklet "Industry's Electrical Progress" puts into concise, interesting form the story of savings through modern motor control. Write for your copy today.

Of course with motors - but HOW ?

THERE is not much question about equipment going into industry today. Quite naturally, it will be powered with electric motors.

For electric motors have proven their worth—their universal use testifies to that. Electric power with its flexibility, its ease of control, has brought a new standard of operating economy.

But when you plan new motor drives, when you purchase new equipment—even before you order motors—remember *why* you are using motors. Remember *why* they have become the universal motive power of industry.

Remember that motors by themselves are only brute force! The savings in labor that you expect—the savings that add substantially to industrial profits—the savings that are the basic reason for the wide use of motors today—these savings come through the effectiveness of correct motor control.

Is the effectiveness of your motor drives left to chance?

So HOW do you use motors? Do you make sure that you get the proper motor for every drive? Do you insist on the most modern control available to afford the maximum time saving in the operation of the machine? Or do you, like they still do in some plants, just order motors and trust to luck that the proper control equipment is supplied?

Competitive conditions today demand the accurate powering of equipment. Your plant cannot afford to leave to chance the labor saving that motors can bring. Plan your drives considering the work to be done—that means the choice of control equipment first—the choice of control equipment that affords maximum speed of production—that ties in closest with the manual operations involved. The proper type of motor can *then* be chosen to give maximum results.

Motor control experience as old as motors themselves

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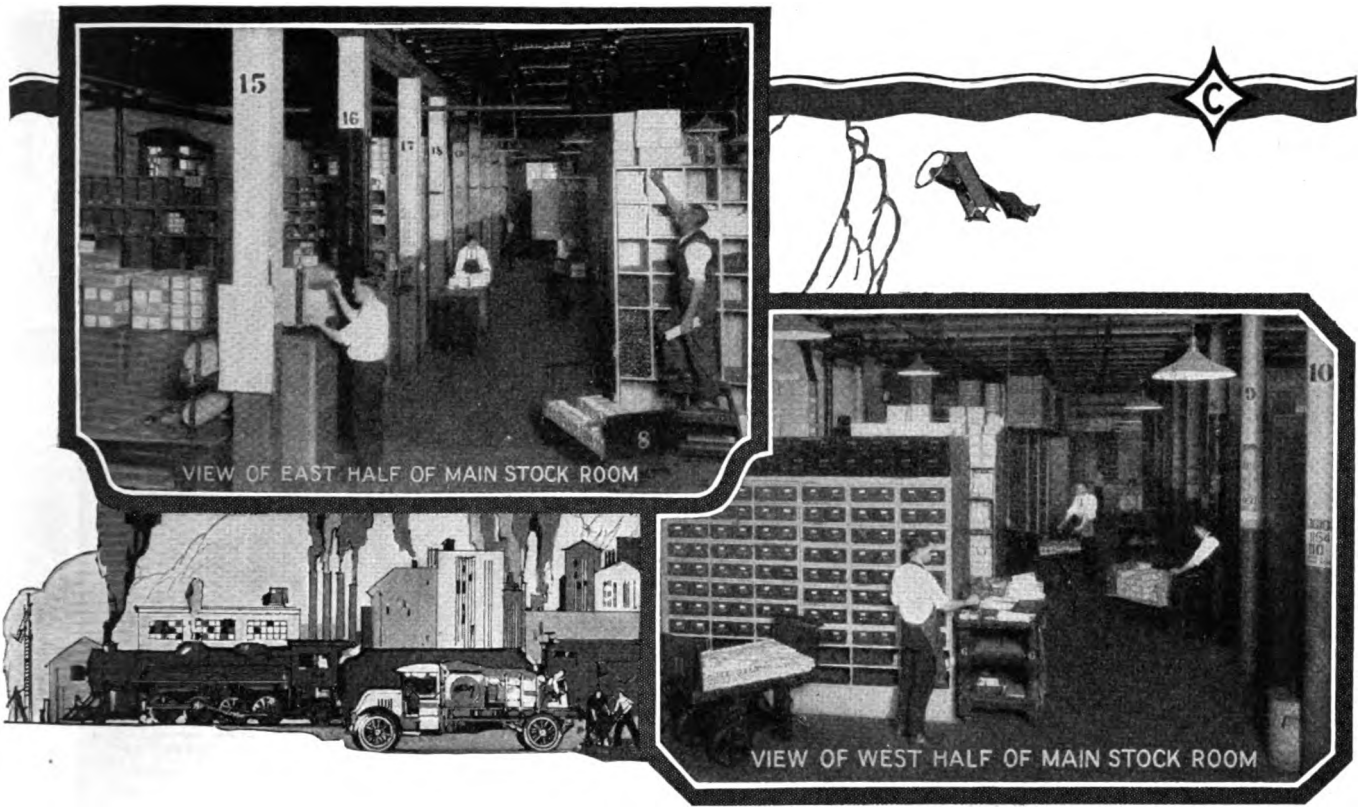
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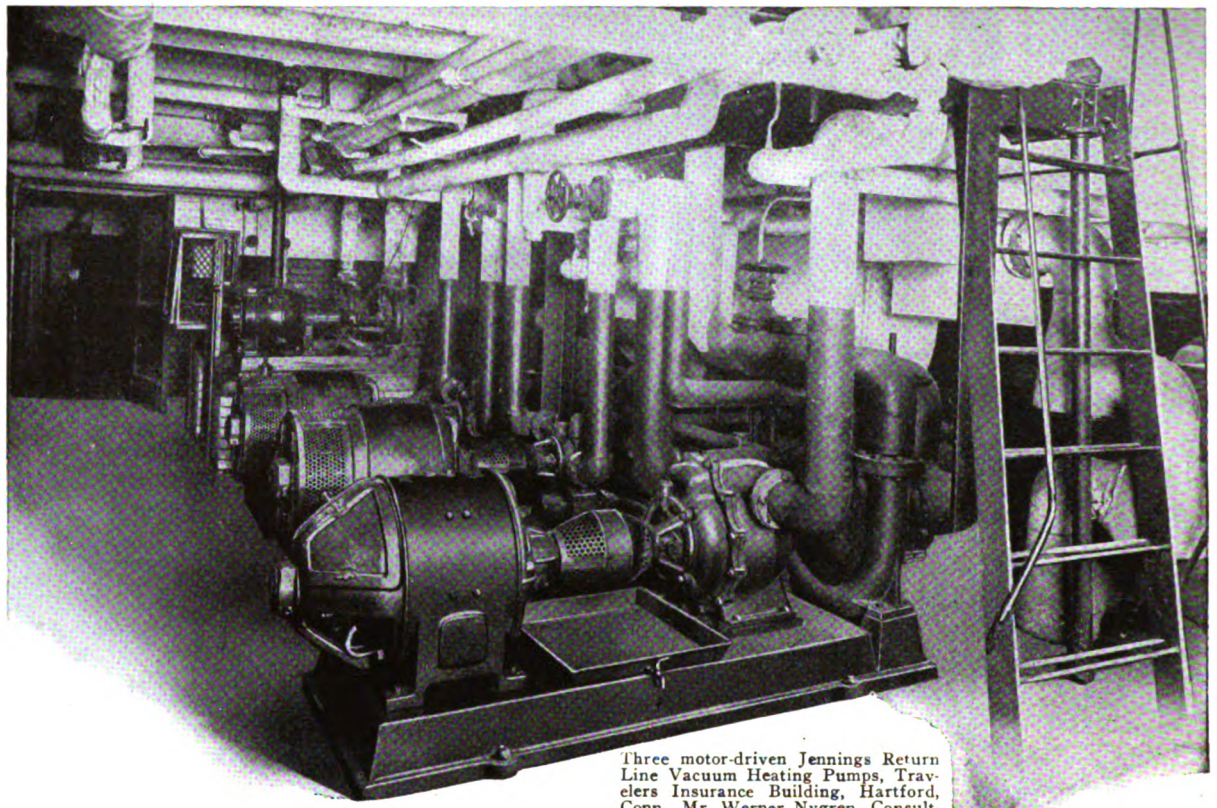
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Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures

JOHN H. VAN DEVENTER, *EDITOR*

W. THOMSON LEES
Associate Editor

ADOLF SCHILDKRAUT
Art Director

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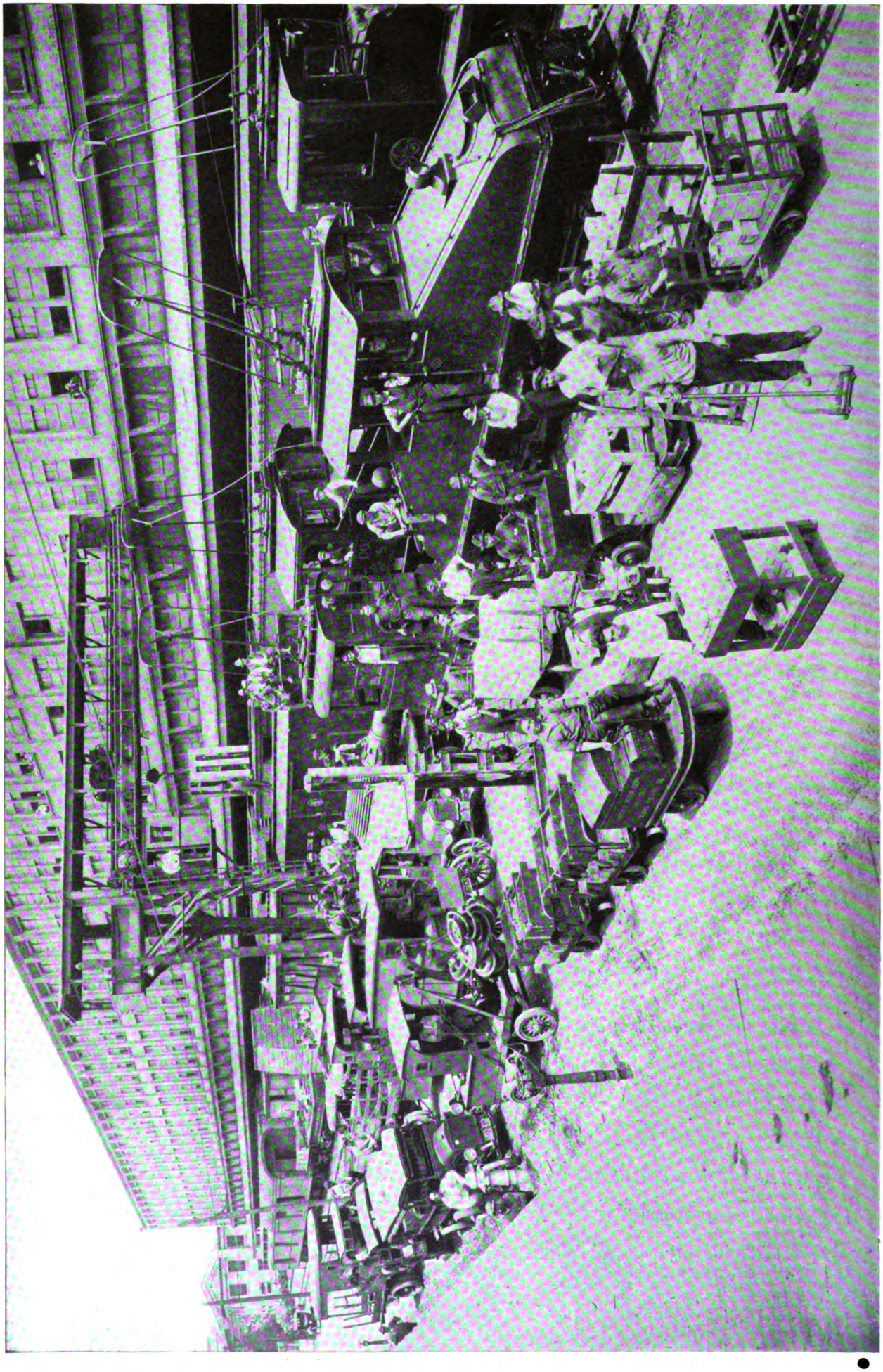
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How many different kinds of materials handling equipment can you identify in this photograph? The General Electric Company, Schenectady Works, assembled this group for the special purpose of showing in a single photograph the wide variety of such equipment used there. Incidentally, it would be interesting to know what it cost, merely to assemble the equipment in one place for photographing.

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AUGUST 1926

Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures

JOHN H. VAN DEVENTER, *EDITOR*

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Moving is Ninety Per Cent of Making

Actual *production* time, in these days of highly developed machinery, is measured in seconds rather than hours per operation.

But what a great discrepancy there is between the total product cost and the sum of the costs of the purely productive operations timed at the individual machines!

This discrepancy between *actual* and *ideal* costs is apparent, in every industry, to keen-minded and observant executives.

Did you ever stop to consider what a large part of this margin is due to handling?

Part of this extra handling margin is concealed in the factory "overhead." Another part of it is cleverly hidden in "productive labor."

A large share of factory "overhead" is made up of the handling of raw materials, the transportation to and from the machines, the handling of semi-finished work between departments, and in and out of storage.

Handling even affects the "interest on investment" charges against product, because it determines the output per square foot of factory floor space.

Time studies also reveal that even the so-called productive operations contain from forty to sixty per cent. of handling time in the nature of moving, picking up and putting down the product by the operator. Big savings have been made by a knowledge and appreciation of this fact.

Altogether in most industries time studies will show that moving is actually ninety per cent. of making.

In this ninety per cent. handling margin lies a most productive field for waste elimination and profit building.

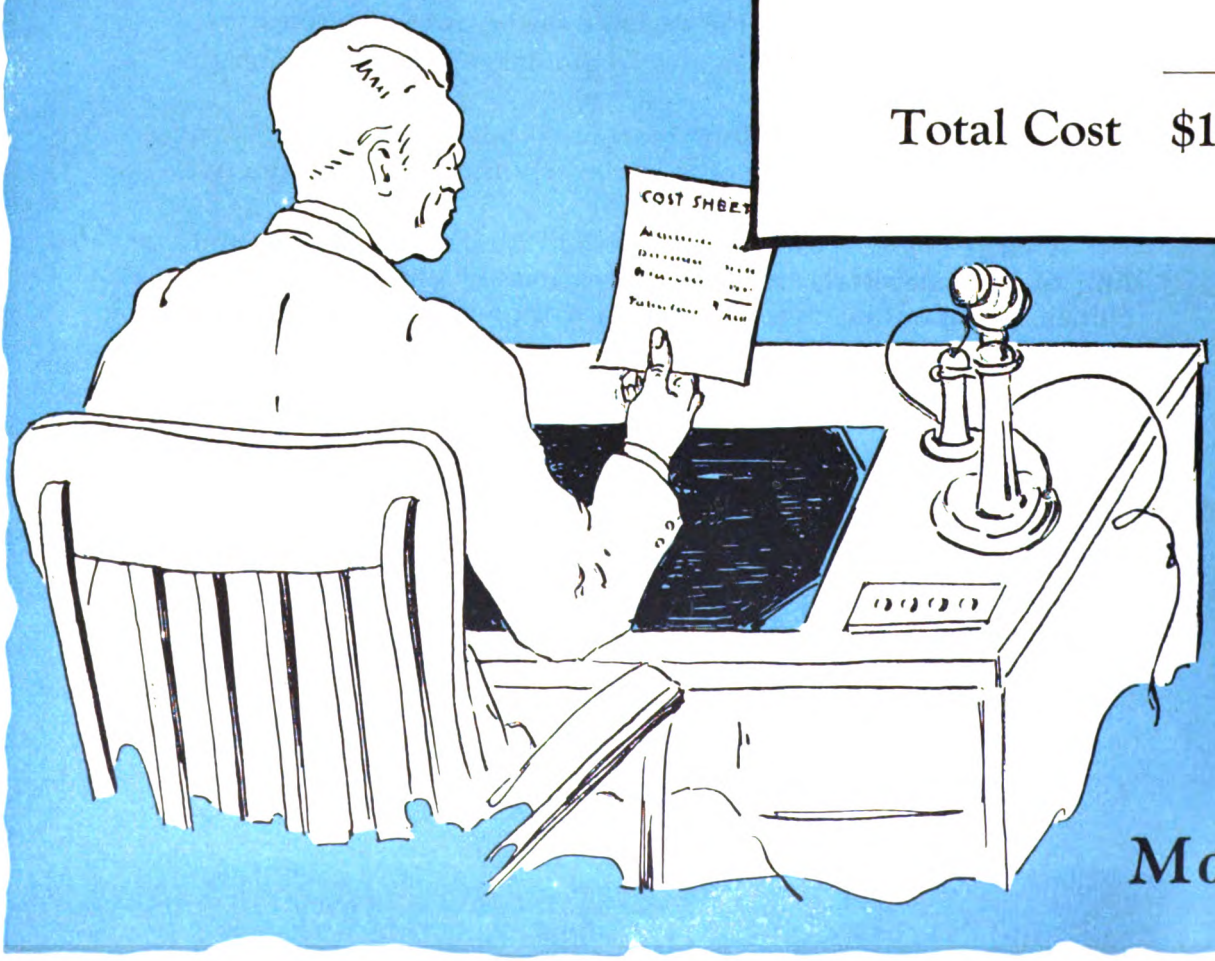
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Here is the Cost Sheet they handed the factory manager

Cost Sheet

Automatic Press No. 1

Material	$60.47
Direct Labor	45.20
Overhead	53.35
Total Cost	$159.02



Moving i

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But it did not reveal the hidden charges of poor handling methods

Direct Labor Losses Due to Poor Handling

Unnecessary non-productive handlings by operators	$6.85
"Soldiering" of operators	4.38
Loss due to waiting for materials	7.85
Loss due to fatigue from lifting	3.96
Total "productive" loss due to poor handling	**$23.04**

Overhead Losses Due to Poor Handling

Restricted output per sq. ft. of floor space	$6.45
Excessive supervision eliminable by mechanical pace-making	5.80
High cost of hand labor in moving materials	7.16
Loss due to restricted size of production unit	3.25
Total "overhead" loss due to poor handling	**$22.66**

Ninety Per Cent of Making

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16 Cost Cutting Qualities

Some of Them Can be Utilized in All Plants

How Many of them

1 Cuts the cost of transportation of all industrial materials and product parts, by applying the time and labor-saving qualities of machinery.

2 Reduces the investment in stock-in-process by shortening the production cycle and thus largely reducing the inventory.

3 Increases the size of the production unit by getting away from a man's ability to lift or carry.

4 Reduces the investment in floor space per unit of production by enabling a given area to produce from two to four times as much as formerly.

5 Reduces the margin between actual and minimum costs by removing the slack due to unnecessary movements by operators.

6 Largely eliminates the need of time-keeping and greatly reduces its cost because production is predetermined and assumes a constant flow.

7 Secures from twice to six times the output per employee because the conveying system acts as an automatic pace-maker.

8 Reduces the cost of direct or productive labor by concentrating the operator on actual production and eliminating many unnecessary motions.

Moving is Ninety

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of Mechanical Handling

All of Them can be Utilized in Some Plants

are you Using?

9 Overcomes the shortage and high price of unskilled labor by substituting reliable and efficient machinery for unreliable and inefficient human effort.

10 Reduces the cost and amount of supervision by simplifying operations and encouraging standardized practice.

11 Enables the utilization of overhead areas for storage and transportation, thus economizing on building structures and reducing investment charges.

12 Simplifies the tracing of product parts and thus prevents tie-up due to shortages.

13 Enables the closer grouping of machines and thus reduces the factory overhead per employee and per square foot.

14 Minimizes physical strain and thus makes for labor interchangeability eliminating special physical requirements.

15 Largely eliminates industrial fatigue due to lifting and carrying and thus enables workers to put more "pep" into production.

16 Shortens the necessary training period for new employees because most of the work is done by machinery.

Per Cent of Making

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Productive Operations Contain Many Handling Charges

Here is an actual time study of a drop forging operation. Note the small percentage of actual production, or fabrication.

Time Study Sheet

Drop Forging from 1" x 86"—3.5% Nickel Steel Bars

		Time, Min.
1.	Carry bar to Bradley Trip Hammer 6 Ft	.038
2.	Place and Adjust, Trip and Allow Hammer to Attain Full Motion	.03
3.	DRAW (Ave. No. of blows Struck 33) 200 lb. Hammer	.10
4.	Re-insert Bar in Fire 6 Ft	.038
5.	Carry Bar from Furnace to Dies 4 Ft. and Trip	.034
6.	FORM 2 Blows 1000 lb. Drop	.05
7.	Place piece on Die and Trip after Forming	.03
8.	DROP 5 Blows 1000 lb. Drop	.08
9.	Carry Bar to Trimmer 7 Ft	.041
10.	Place Bar under Trimmer, Adjust and Trip	.02
11.	Trim	.015
12.	Clear Trim	.05
13.	Brush off Scale with Brush (Wire)	.07
14.	Carry Bar back to Dies 7 Ft	.041
15.	Knock off Scale with poker, if necessary .07 x ¼	.018
16.	DROP 3 Blows	.06
17.	CARRY Bar to Trimmer 7 Ft	.041
18.	Place under Trimmer, Adjust and Trip	.02
19.	TRIM	.015
20.	Clear Trim	.05
21.	Move Bar and place under Cut-Off Trip	.03
22.	CUT-OFF	.015
23.	Return Bar to Fire 8 Ft	.044
	Total Operation Time	0.930

Actual Fabrication 0.335 Min.

Total Operation Time 0.930 Min.

64 per cent of the total time of this one operation is handling. This does not include transportation to and from the machine, handling of the raw material, handling in and out of storage and transportation between departments.

Time study your operations from this standpoint and you will find that

Moving is Ninety Per Cent of Making

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One Hundred Per Cent Efficiency is Not Enough!

For example, under the process formerly employed, a standard cost on this product of $10 represented 100% efficiency. Actual costs averaged $12, or 83.3%.

Actual Cost $12.00	83.3% Efficiency
Standard Cost $10.00	100% Efficiency

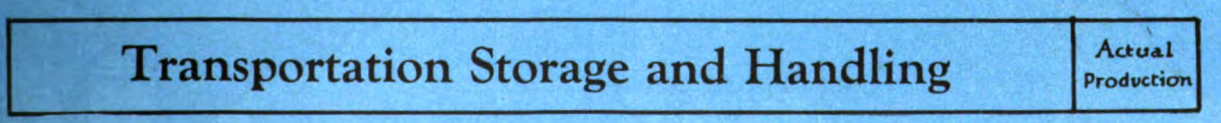
But Along Comes an Engineer who Develops a New Process of Making the same thing—

This superior process enables the actual cost to be reduced to $8 per unit. As compared with the old standard cost, the efficiency is now 125 per cent.

Old Standard Cost $10.00	100% Efficiency
New Actual Cost $8.00	125% Efficiency

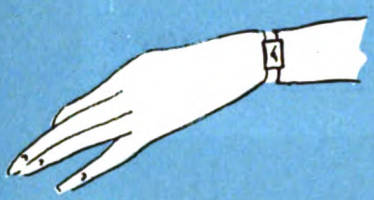
Most of the profitable changes in processes of production are today based on superior methods of handling the product. The productive operations are fitted into the handling scheme, instead of handling being fitted to the existing production plan, because—

Moving is Ninety Per Cent of Making

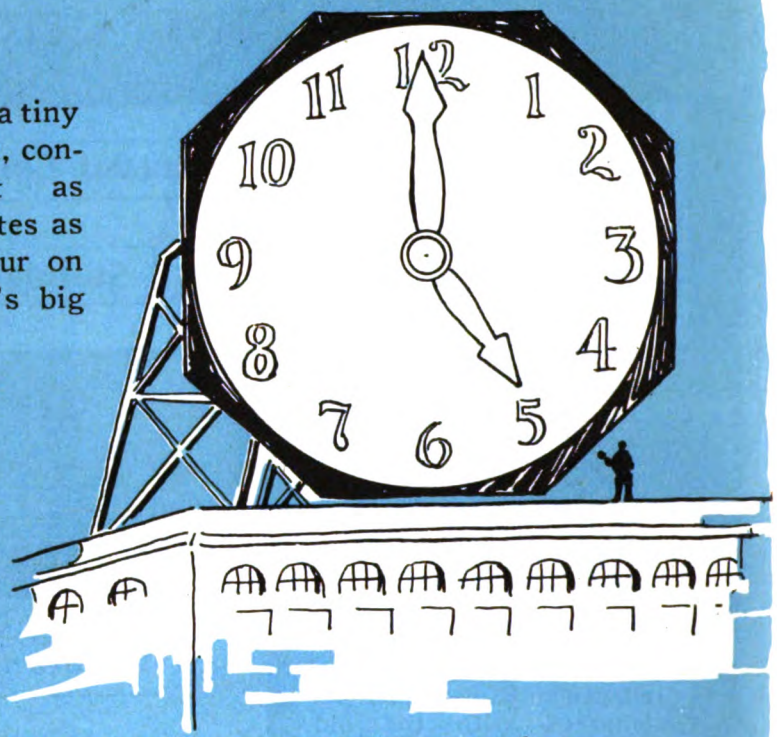


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How Big Are Your Man Hours?



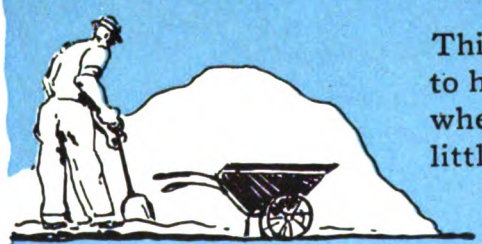
An hour, on a tiny wrist watch, contains just as many minutes as does an hour on Colgate's big clock



but

Hours in industry vary in their work contents fully as much as the variation in size of these two timepieces.

for example



This man, who is limited to his muscles, shovel and wheelbarrow, can put very little work into an hour.

whereas

This same man, operating modern materials handling equipment, can make an hour contain as much work as you want it to.



Moving is Ninety Per Cent of Making

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Handling Coal and Ashes in Large and Small Power Plants

By Edward J. Tournier

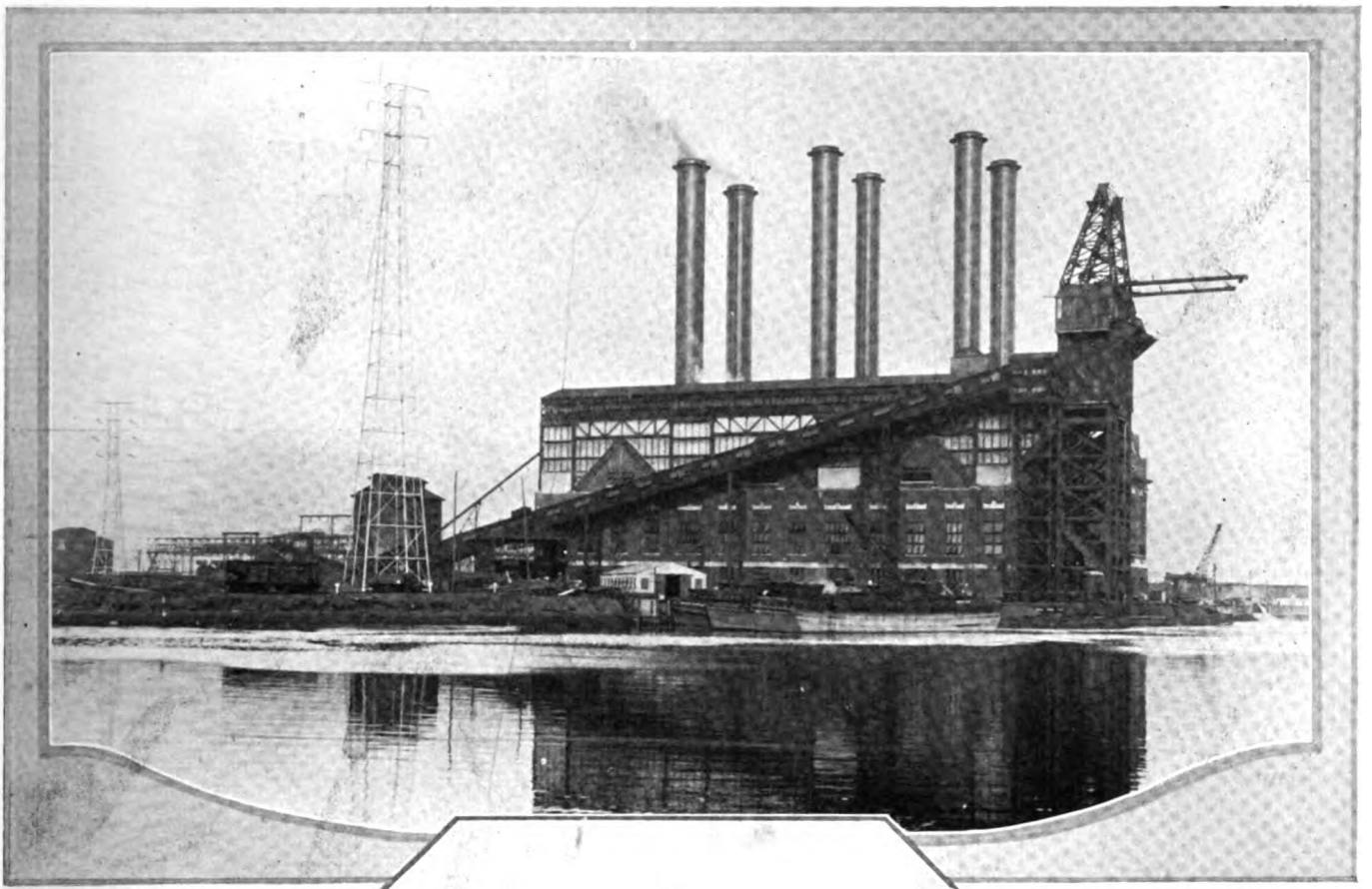


Fig. 1. This is a 36 inch belt conveyor 250 ft. long handling coal at the plant of Public Service Electric Co., Newark, N. J. It has a capacity of 300 tons per hour, running 300 ft. per minute.

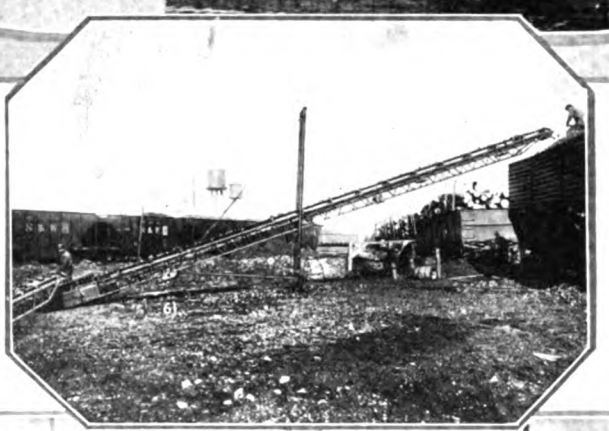


Fig. 2. The type of conveyor shown at the left, is useful for unloading cars and for transferring coal to storage, or from storage to boiler room. It is readily portable and requires but little power.

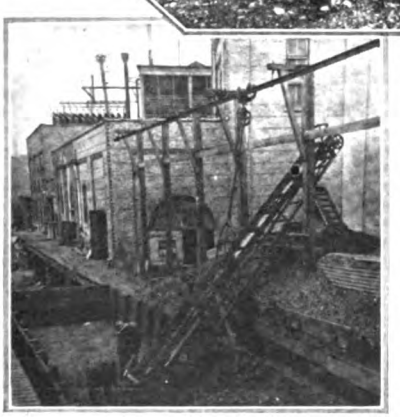


Fig. 3. At the right is shown an installation of a car unloader suspended from a simple overhead rig, for transferring coal from cars to storage.



Fig. 4. A single-strand malleable iron chain carrying cast iron scrapers, traveling in a steel trough. This simple arrangement carries coal at the rate of 25 tons an hour, from railroad to storage.

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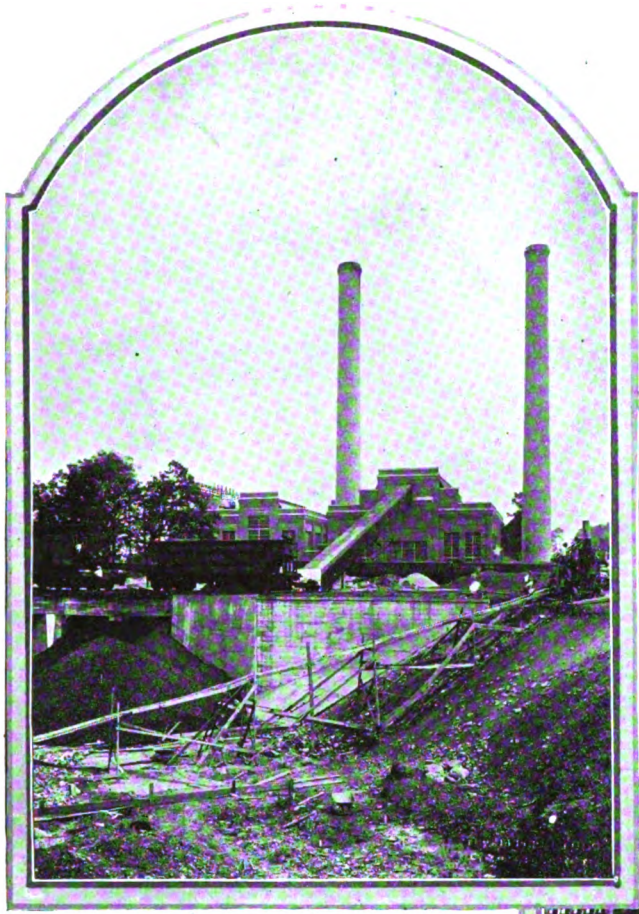


Fig. 5. This conveyor is 16 inches wide, carries 40 tons per hour, and requires 5 hp. for operation. Where there is a considerable distance between the track and boiler house it is often economical to use a belt conveyor for conveying and elevating.



Fig. 6. This skip hoist elevates coal to the bunkers, and a by-pass chute is used to form the initial pile. A bucket elevator might be used for elevating, in place of the skip hoist, if desired.



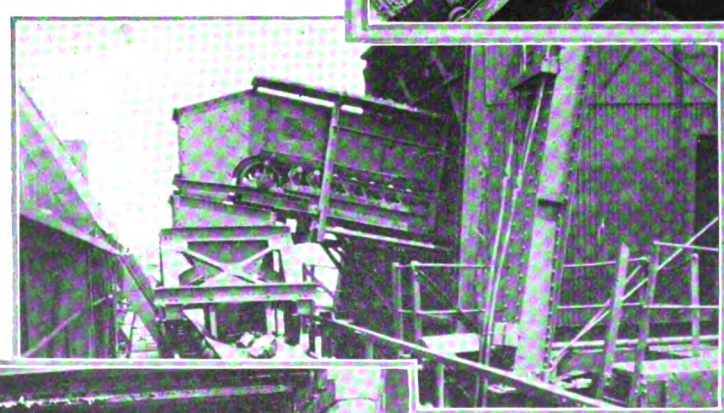


Fig. 7. A steel apron conveyor is shown above, delivering coal from a track hopper to a bucket elevator, which carries it on upward to bunkers.

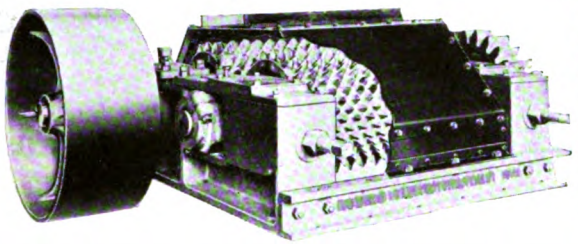


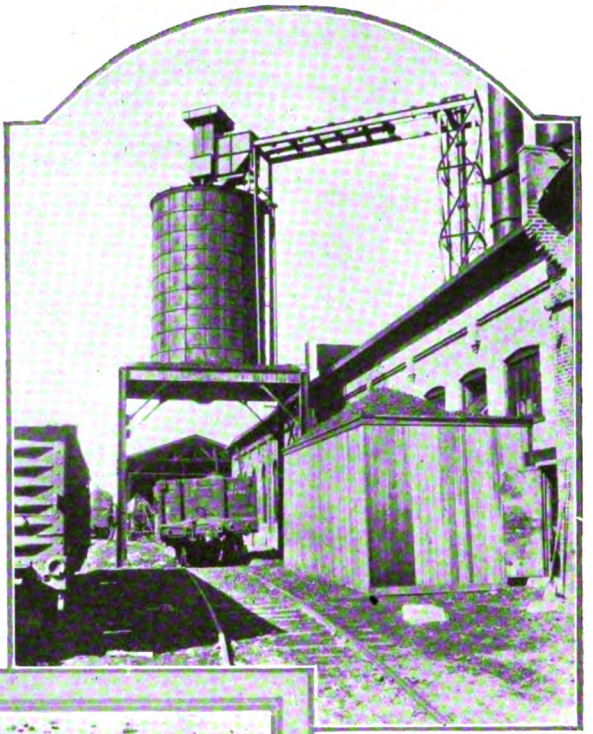
Fig. 8. At the left is a feeder of the conveyor type, with a rubber belt instead of a steel apron. While it performs the same function as that in Fig. 7, it cannot operate on angles over 15 degrees. On the other hand, it is less affected by abrasion.

Fig. 9. This installation of track hopper reciprocating feeder and double roll crusher is capable of handling 100 tons of coal per hour.

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Fig. 10. The double roll crusher shown below is constructed of cast iron, has removable roll segments and is arranged to allow movement of one shaft for the passage of tramp iron. It has a capacity of 50 tons per hour.





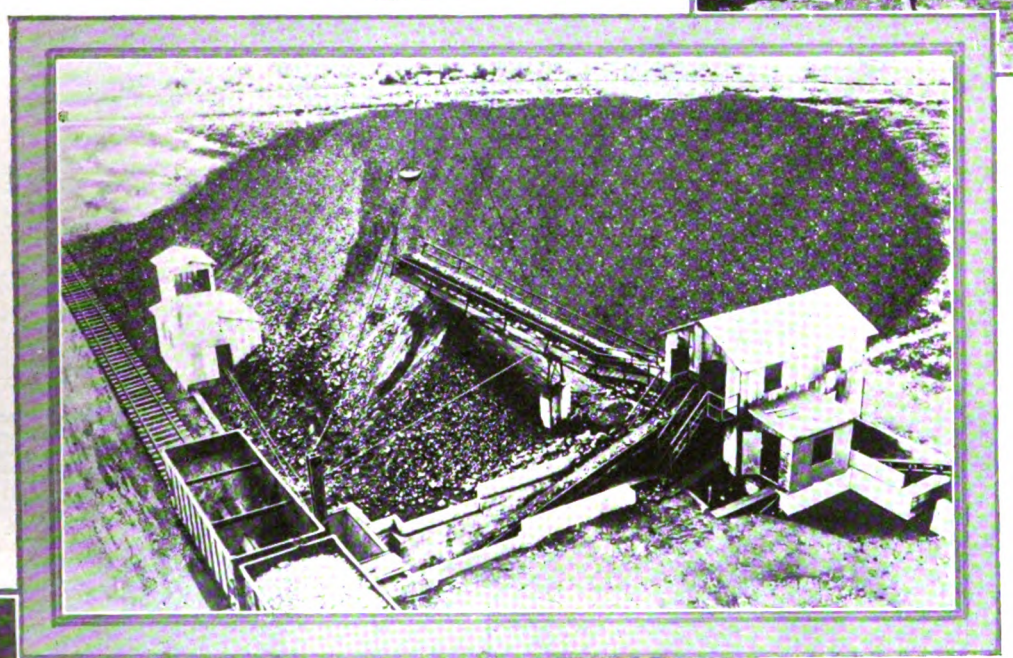


Fig. 11. Above—The Illinois Central Railroad's power plant at Mattoon, Ill., makes use of a steam jet ash conveyor. This illustration shows the 8 inch conveyor pipe leading to a 35 ton storage tank over the railroad siding.

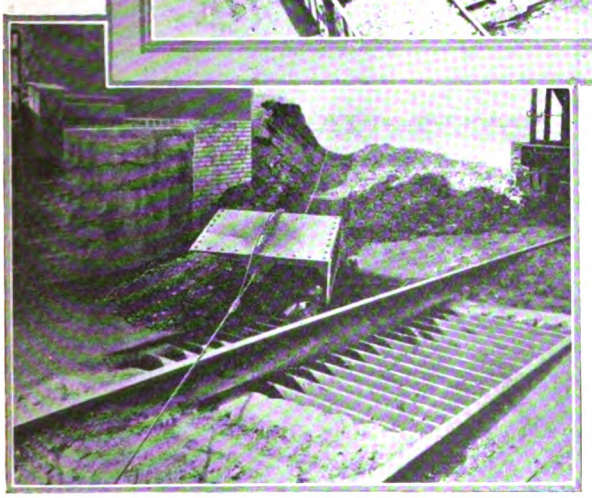
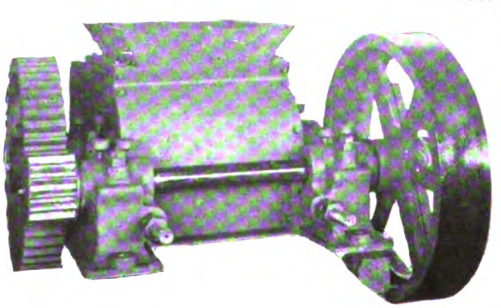


Fig. 12. Above—For forming the initial pile a conveyor coming from under the track may be used. This elevates the coal to a suitable height for the proper working of the drag scraper. From this initial pile, continuously fed by the conveyor, the coal is scraped to all parts of the storage space, at the rate of 100 tons per hour.

Fig. 13. The track hopper shown, has a bar grating to prevent large lumps from passing to the conveyor in cases where no crusher is installed. By the arrangement shown the same hopper is used for unloading cars and reclaiming. This installation has a capacity of 150 tons per hour and is operated by an electric drive of 100 hp.

Fig. 14. Below—The single roll crusher has a greater range of adjustability than the double roll construction which enables foreign matter to pass with less danger of damage. This machine with a capacity of 50 tons per hour is driven by a 20 hp. motor.



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Fig. 15. The belt conveyor, above, is 150 feet long and 20 inches wide. It handles 100 tons of coal per hour, at a speed of 300 feet per minute. Note the movable automatic tripper in the background.



Fig. 16. Above is shown the upper run of a combined coal and ash handling conveyor (see Fig. 17). In the background is the discharger which turns the buckets over to discharge coal to bunkers.

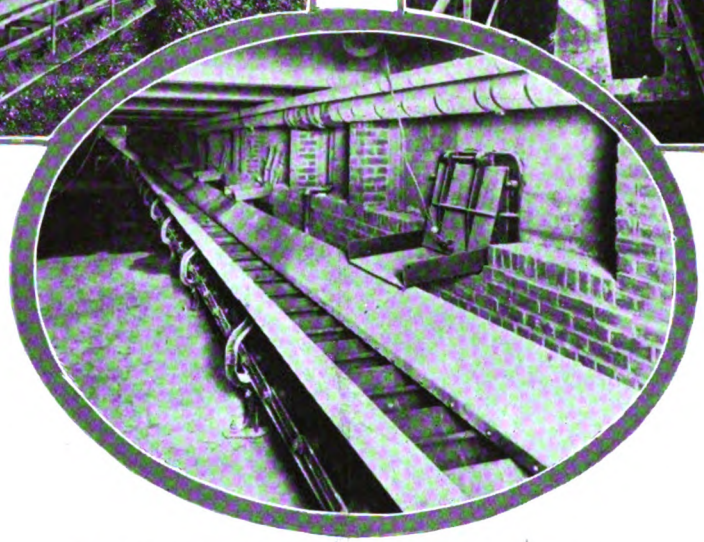


Fig. 17. This is the lower (ash-handling) run of the conveyor shown in Fig. 16. Ashes are raked out through the ash doors to the shallow pan, and so into the buckets.

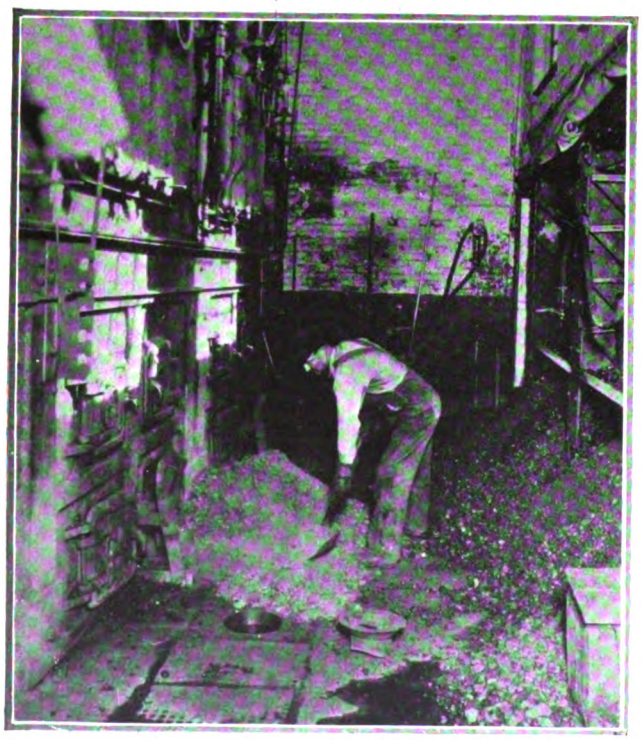


Fig. 18. This shows the intake to the steam jet ash conveyor at Mattoon, Ill., the storage and discharge point of which is shown in Fig. 11. For the fireman, this is simplicity itself.



Fig. 19. A single strand chain elevator delivers ashes to this overhead storage bin at the rate of 15 tons per hour. This elevator consists of malleable iron chain with malleable iron buckets spaced 24 inches apart.

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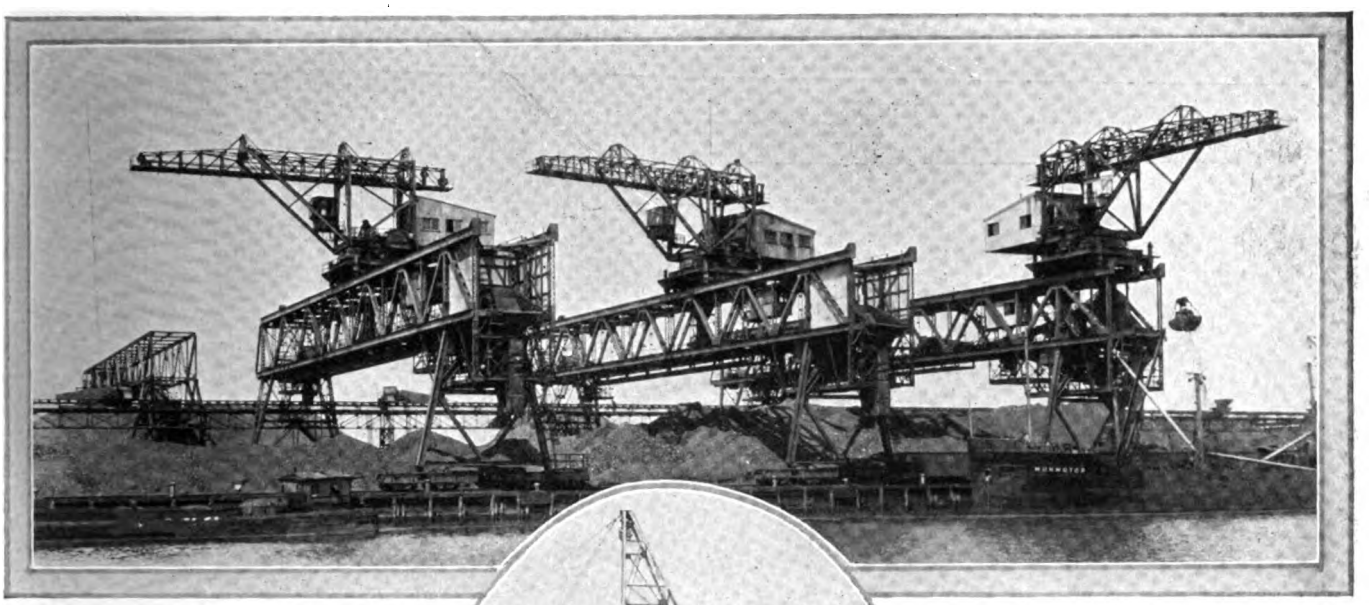


Fig. 20. For large quantities of coal and a large storage area, the traveling crane bridge is in common use. Note, above, the ease of handling from and to storage and from ships or railroad cars.

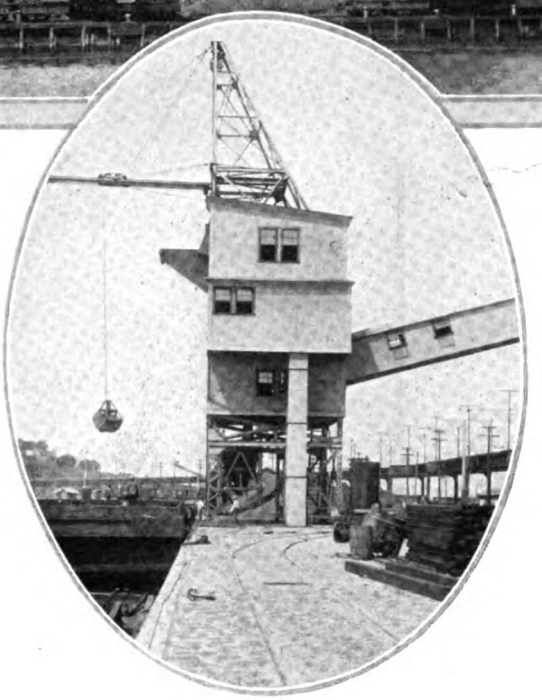


Fig. 21. At the left—Where coal is received by water, it may be unloaded by grab bucket hoist. Here, the hoist is mounted on a tower and feeds a conveyor (shown at the right, housed in).

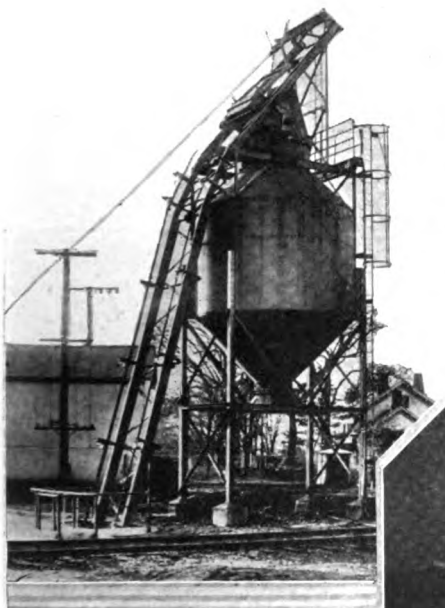
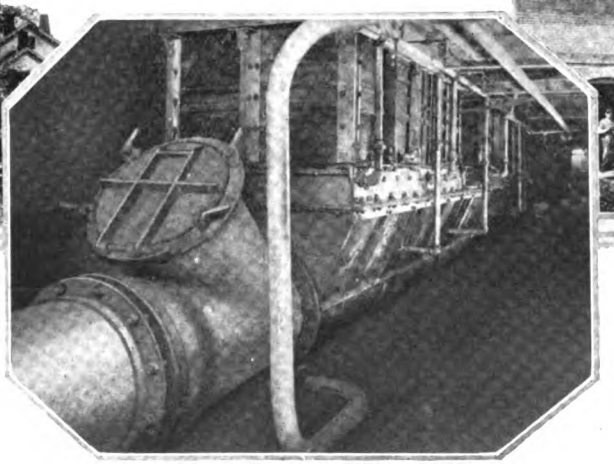


Fig. 22. In this ash disposal system, a skip hoist delivers ashes to the tank, to be carted away. The hoist is shown here at the top of the run, delivering its load.

Fig. 23. Below—A successful form of ash conveying system without moving parts, is by the use of high velocity streams of water, running in sluice-ways. Ashes are fed into the sluice-way by means of feed plates; high pressure feed nozzles being located at one or both ends of the feed plates.



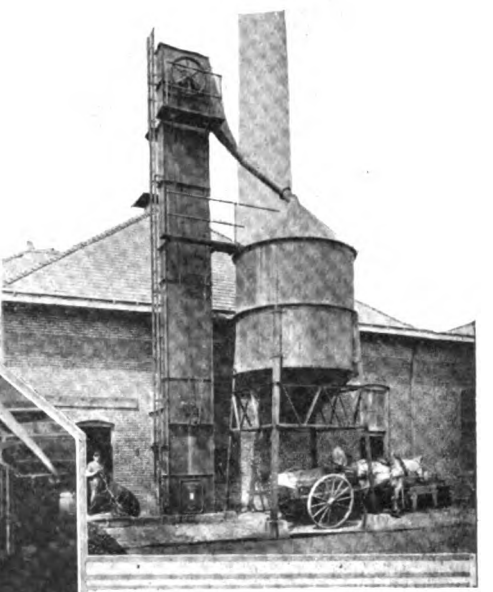


Fig. 24. Here is a skip hoist with a cylindrical steel tank. This method of ash handling has the least disadvantages as to upkeep. In proportion to tonnage handled, however, it requires more power than some of the other forms of equipment.

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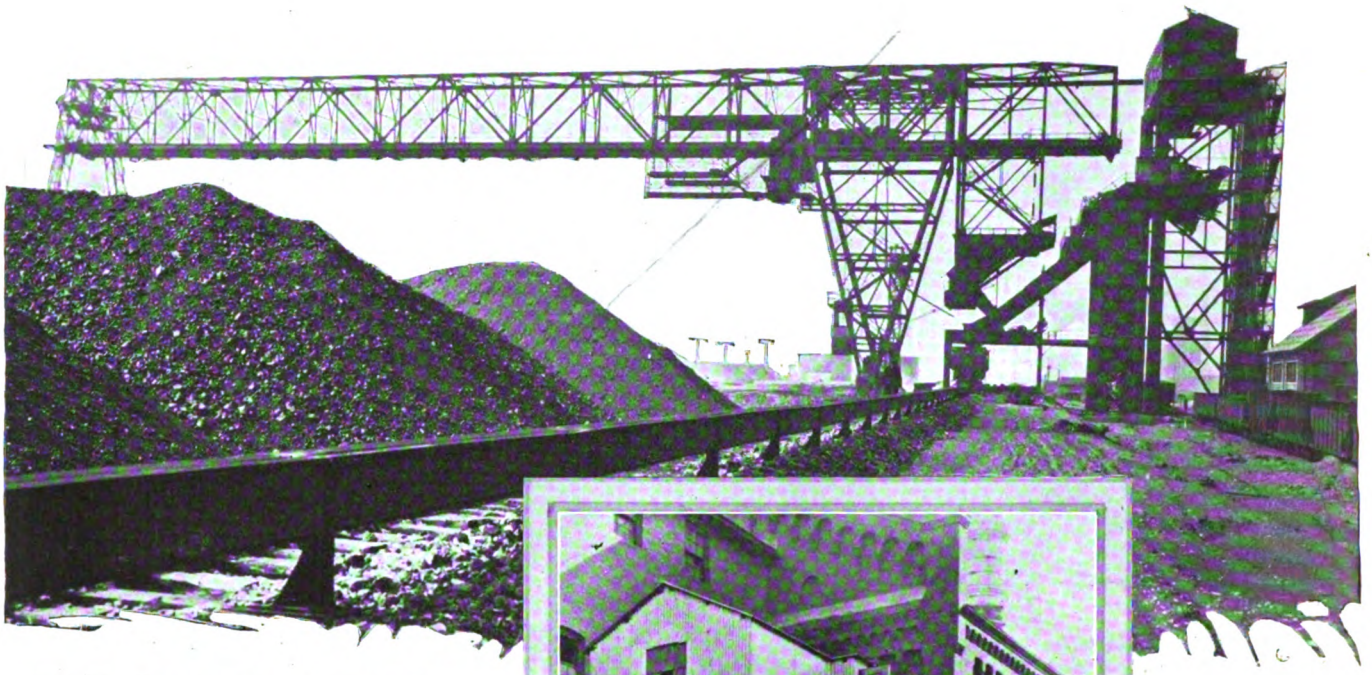


Fig. 25. Each variety of unloading bridge has its proper use. A type in common use is shown above—the man-trolley bridge, so called because the grab bucket operator travels in a cab from which operations are controlled.

Fig. 27. Below is an actual photograph of the sort of stuff that comes along with run of mine coal. The breaker (Fig. 26) sorts this out and protects the coal pulverizer from breakage.

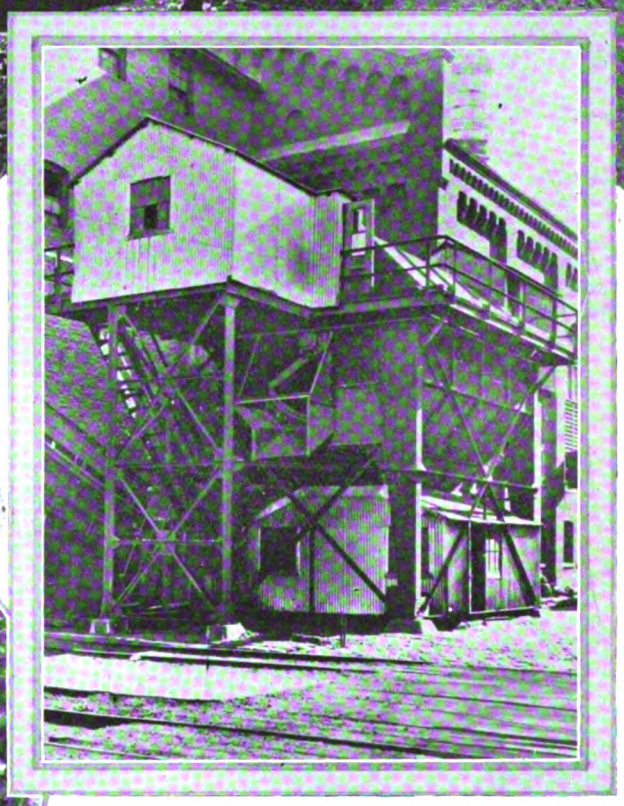


Fig. 26. At the left is shown a coal breaker and cleaner, used for preparing and cleaning run of mine coal, especially preparatory to pulverizing.

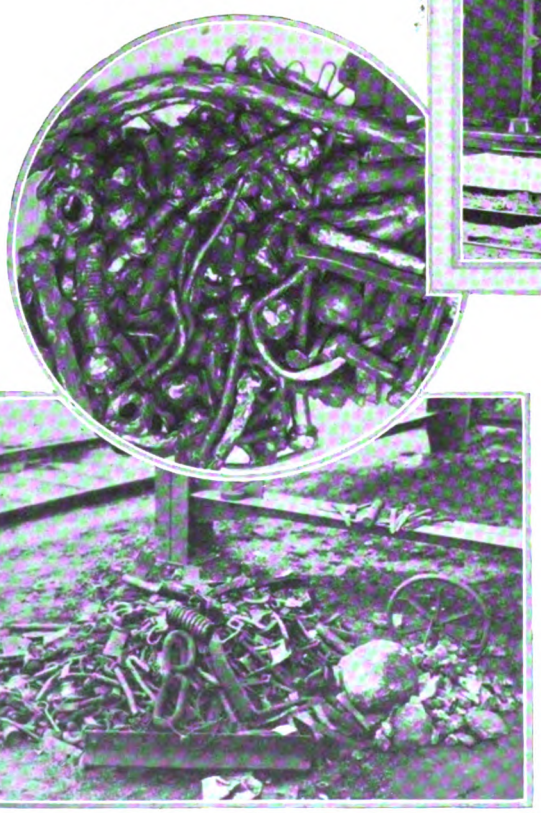


Fig. 28. Here is another group of odds and ends rejected by a coal breaker. It includes a railroad brake wheel, a cobble stone, and various other odds and ends that mixed in with the coal.

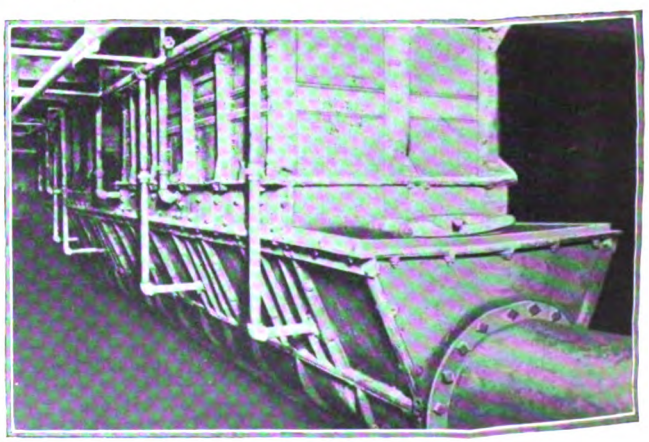
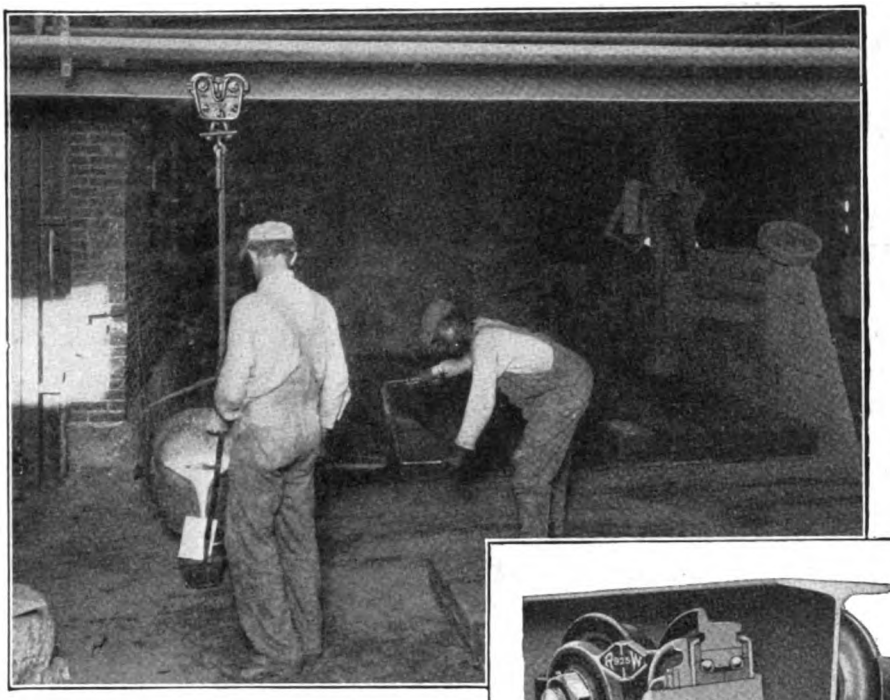
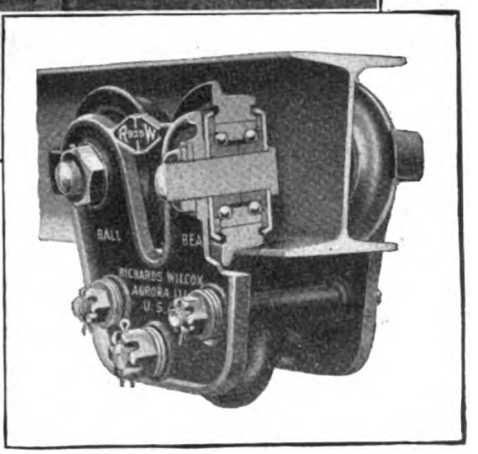


Fig. 29. This shows the water jet system handling ashes from 14 boilers of 600 hp. each, at the Lardner's Point Pumping Station, Philadelphia, Pa. The service of one man is required for 2 hours per shift. The ashes are removed in each of two shifts every day.

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Easy Operating Trolleys Speed up Production—

M. B. Dewey, Asst. Superintendent, Liberty Foundry Co., St. Louis, says:

"Richards-Wilcox trolleys have made an easy job out of a hard one in our foundry. Over 2 years ago we put the first ½-ton No. 925 OveR-Way Ball Bearing Trolley in our Plant No. 1, and now use 9 R-W trolleys there and 7 in Plant No. 2.

"The trolleys run on a 6 in. I-beam track, carrying molten iron from the cupolas to the moulding floors. Our Plant No. 1 is divided into 5 sections, with an interconnecting track to each section and switches to the track down its center.

"For several years we have been using a track and trolley system for conveying the ladles of molten metal to the moulding floors; but our former trolleys would stick. It was especially hard to push the ladles around the corner, making it a back-breaking job for one man. With the R-W OveR-Way trolleys, one man handles the 600 lb. ladles easily, saving both time and effort. The R-W trolleys also require practically no maintenance, but our former trolleys were frequently out of order.

"Our Plant No. 1 pours 30 to 35 tons of iron a day, and Plant No. 2, 15 to 20 tons—all being handled by R-W trolleys. Their easy operation allows greater speed in handling with less effort."

R-W No. 925 Ball-Bearing I-Beam Trolley sent for

FREE TRIAL

So confident are we of the ability of the R-W No. 925 Trolley to render superlative service that we will gladly send it to any reputable manufacturer for free trial. Such a trial involves no cost or obligation, for if the trolley fails to demonstrate its superiorities under actual working conditions you have only to send it back at our expense. This offer, we believe, is far stronger than any claims we can make. R-W No. 925 is made in seven capacities —¼ to 4 tons. Ask for this FREE trial.

Richards-Wilcox Mfg. Co.

"A Hanger for any Door that Slides."

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Why Stick to the "Man's Size" Load?

How Mechanical Handling Multiplies the Production Unit

By E. T. Bennington and K. R. Weise

MECHANICAL equipment for handling materials has proved itself beyond any shadow of doubt. On the score of time saving and on the score of releasing non-productive labor for more remunerative work—for these two accomplishments alone, materials handling equipment pays.

There are, however, other benefits. No longer is there need, for example, to hold within man power limits the size of the production units. What this means in increased production is obvious from the illustrations on these pages.

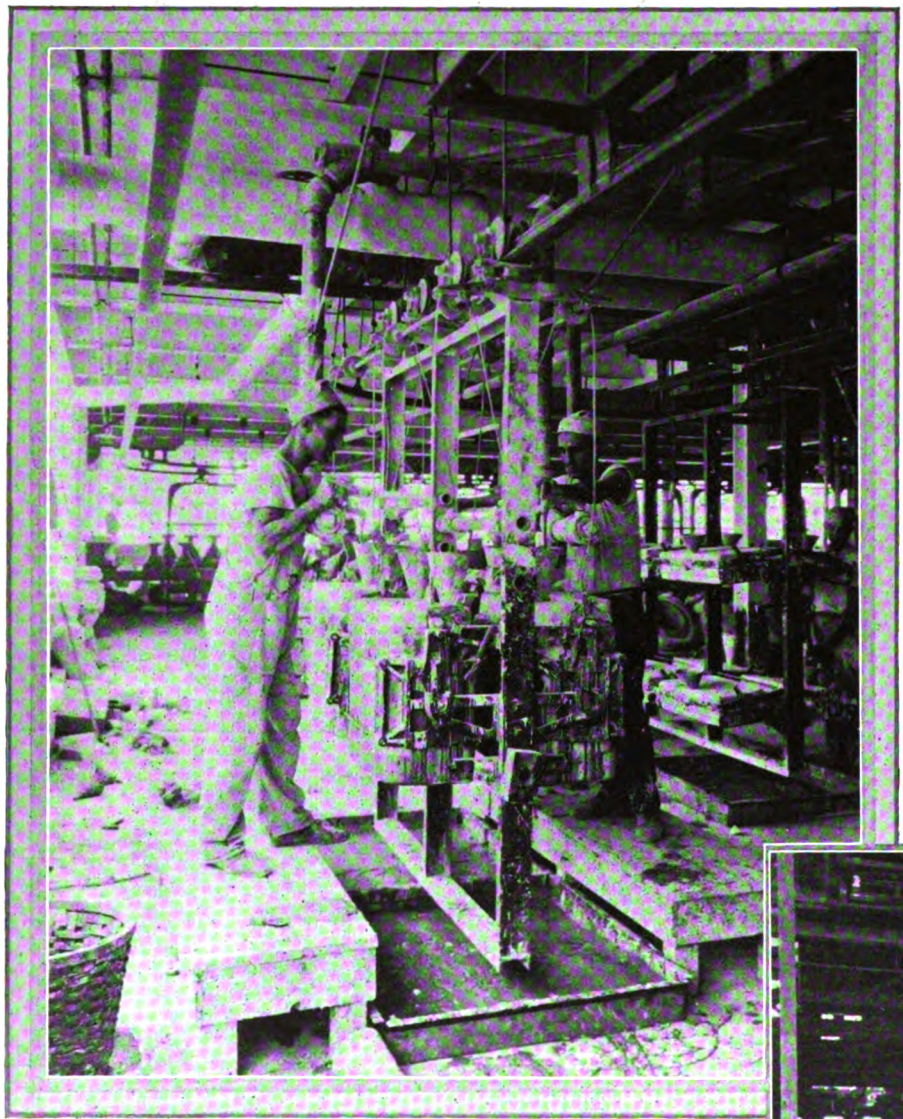


Fig. 1. At the left—In the manufacture of pottery, note how this conveyor rack simplifies casting and eliminates endless re-handling. A single piece used to be the unit of production.



Fig. 2. Two men, without having to do any heavy lifting, are pouring a ladle which is many times larger than any that could be handled by old methods. An example of multiplying the production unit, with less labor and less lost time.

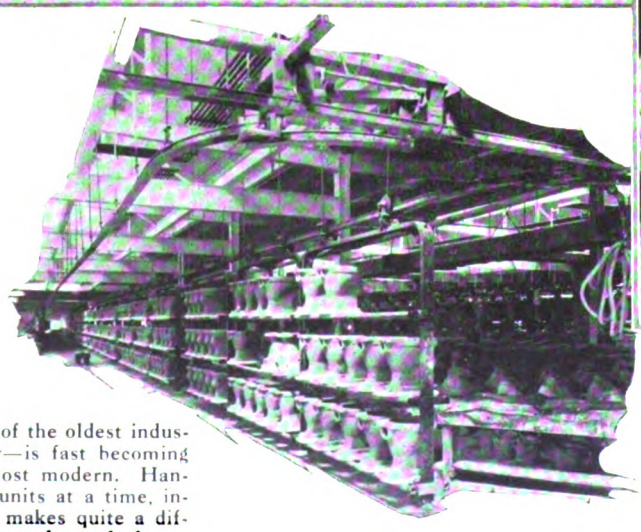


Fig. 3. One of the oldest industries—pottery—is fast becoming one of the most modern. Handling fifteen units at a time, instead of one, makes quite a difference in cost and speed of production.

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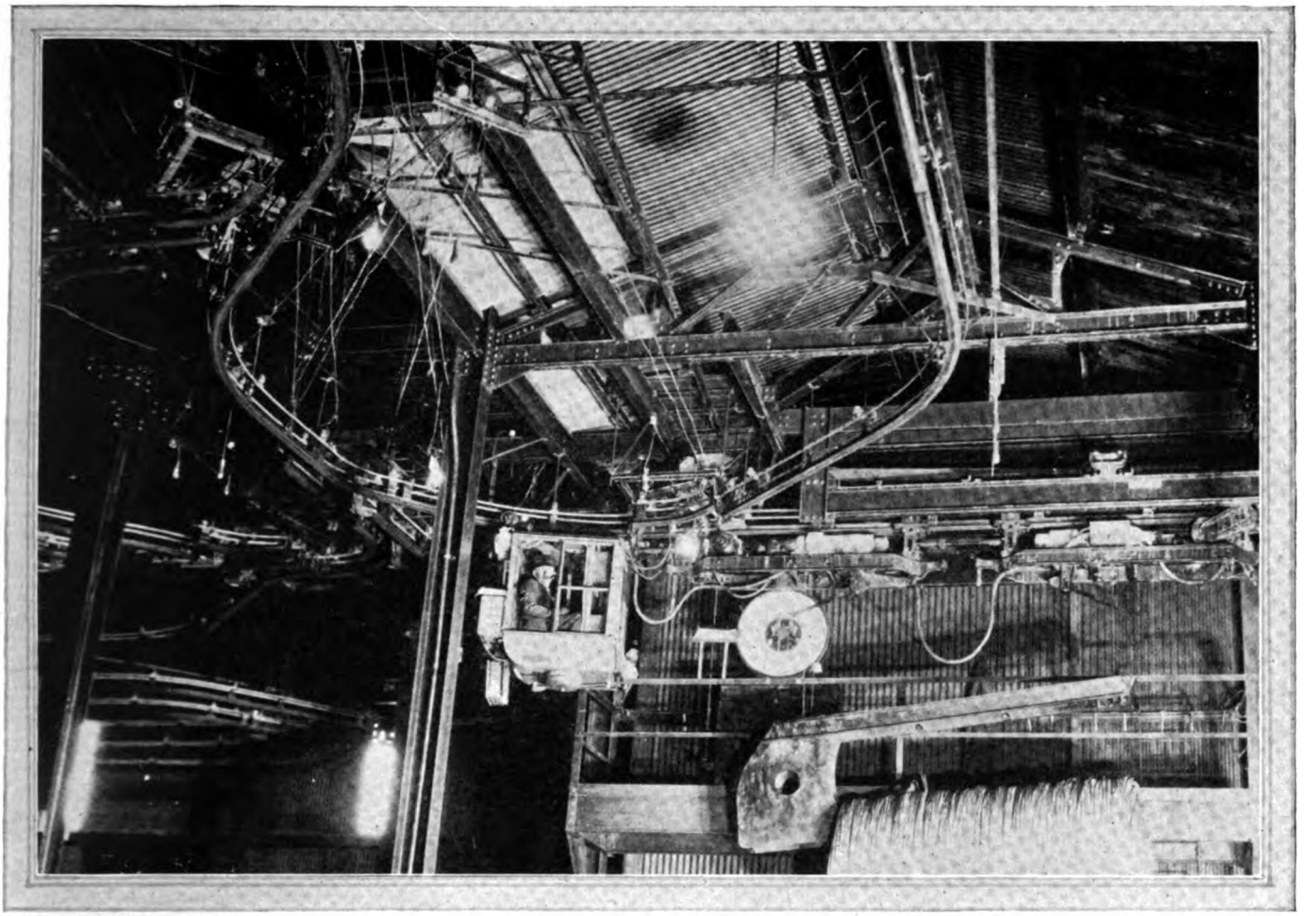


Fig. 4. Above—Rod and wire mills have found that production costs can be cut and production itself multiplied, by increasing the size of the production unit. Note, in the lower right-hand corner, the size of the production unit—steel rod, on its way to cleaning.

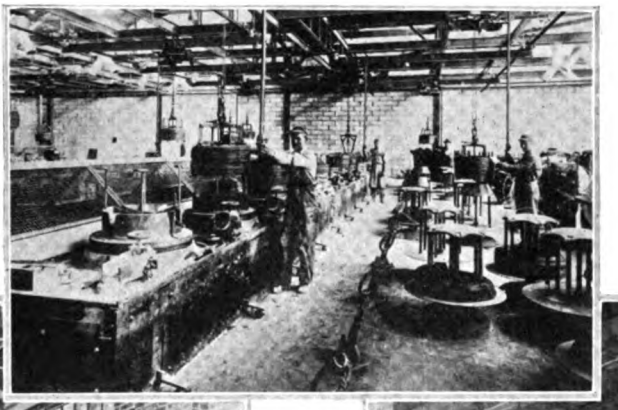


Fig. 5. In wire drawing, the size of the coil that can be handled to a large extent governs the production. Wire mills have found it profitable (and modern handling equipment makes it possible) to handle 300 pound coils instead of the former limit of 100 to 150 pounds.

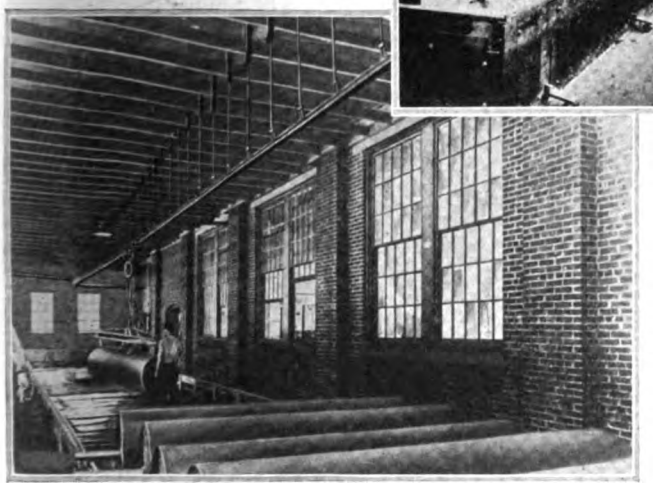


Fig. 6. Until equipment became available for handling bigger units, carpet and linoleum manufacturers had to keep the dimensions of their rolls within traditional limits. Nowadays, the width and weight of the roll are limited only by shipping and market considerations.

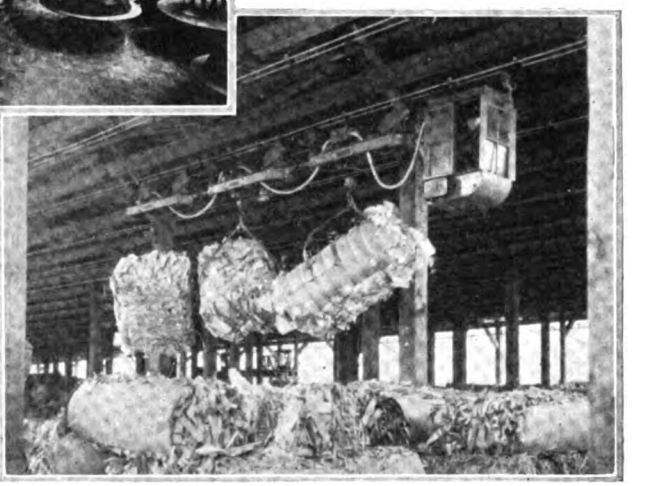


Fig. 7. Paper mills no longer favor the small bales of rags or waste paper that were common a few years ago. Modern equipment has shown them the economies of handling only the big fellows, and handling even these, two or three at a time.

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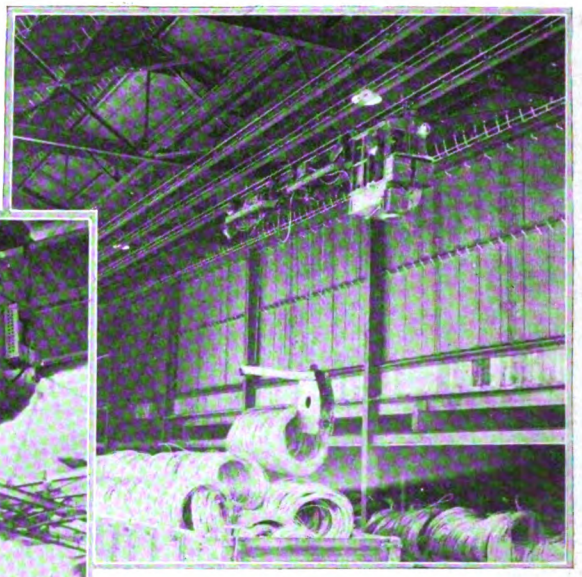


Fig. 8. Below—Handling rolls of paper in a large paper mill. Equipment of this kind enables one man to handle many more tons per day, with profit to both his employers and himself.

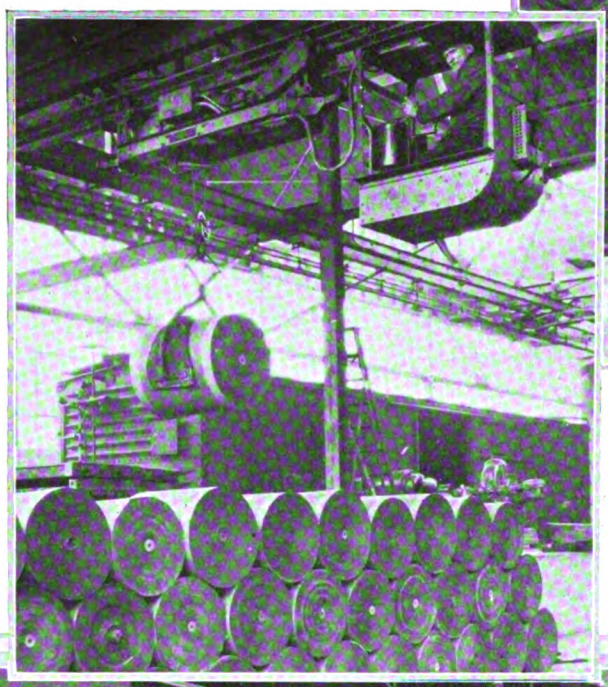


Fig. 9. With this installation, the man in the cab can (and does) remove 450 tons of wire rod from this mill to storage or to cars in one day. How long would such a job take, if each load had to be limited to 150 pounds?

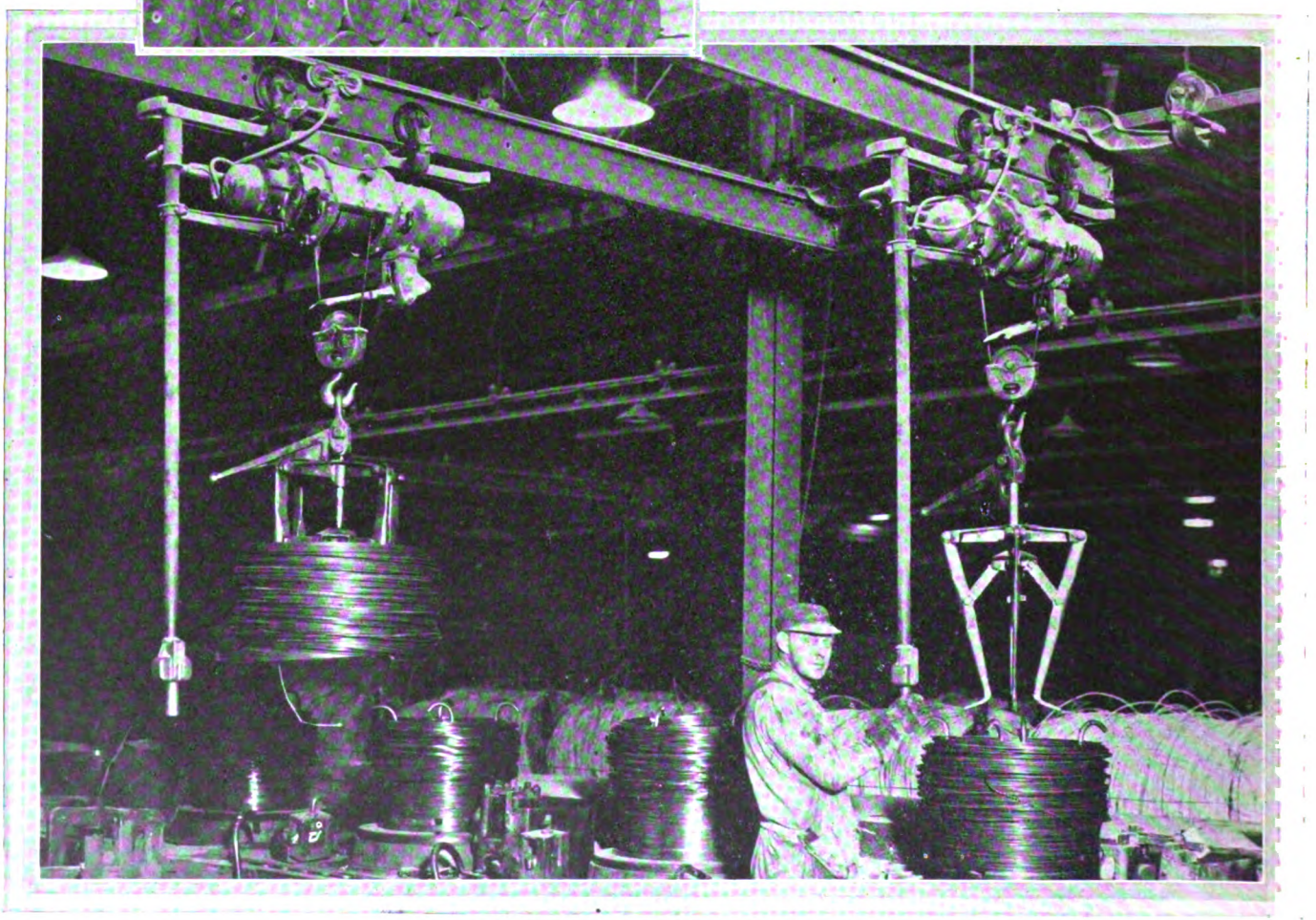


Fig. 10. By push-button control, this operator directs without effort the handling of 350 lb. bundles of wire. This increase results in a very decided increase in tonnage of wire produced per man.

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Fig. 11. Above—Here is a case where the picture itself tells a story more eloquent than words. It is only necessary to say that this view was taken in what is probably the most modern pottery in the country.

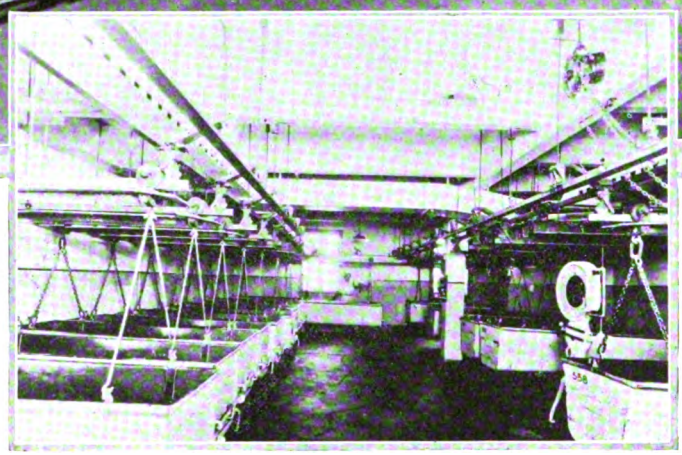


Fig. 12. The modern bakery would be hard put to it, in a city like New York or Chicago, for example, if it were limited to batches of dough that could be handled by manpower alone.



Fig. 13. The textile industry, only a few years ago, considered fifty pound warp beams a regular thing, because men had to do the handling. Today, the 600 lb. beam is common.

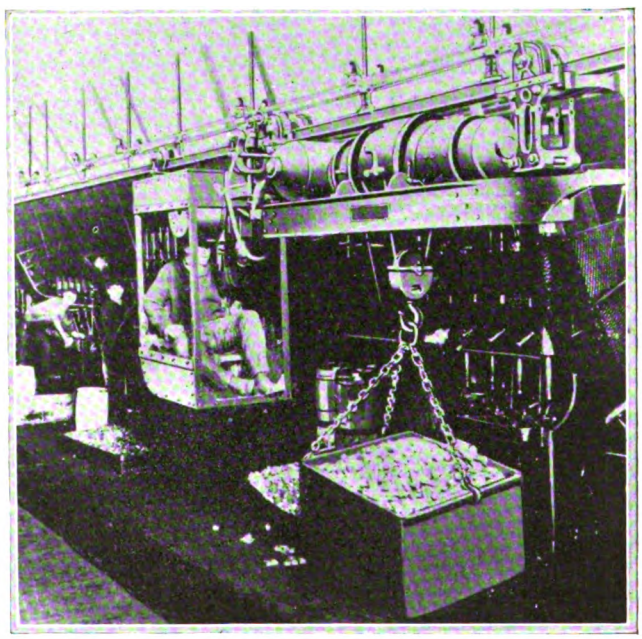
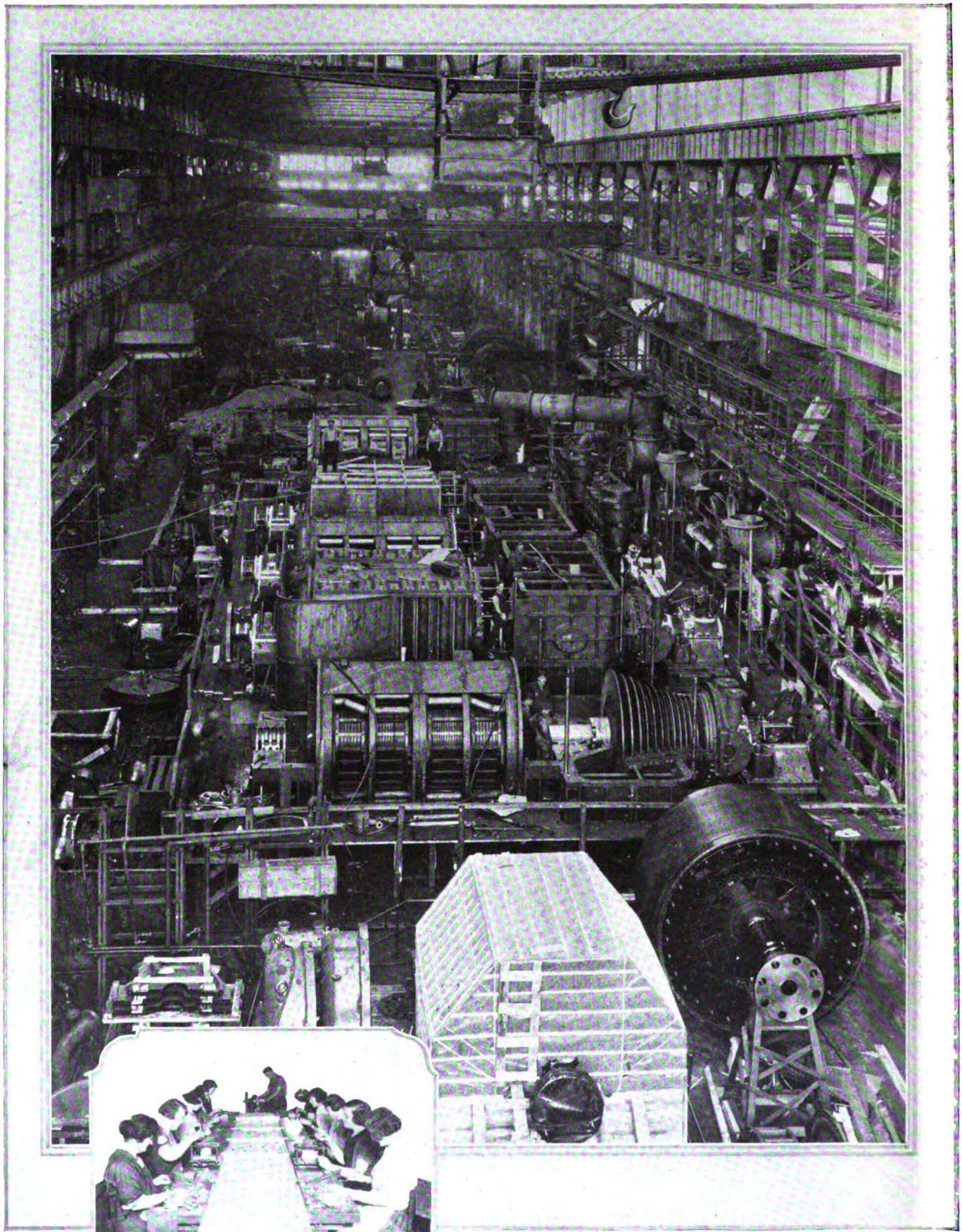


Fig. 14. Fifty pounds of bolts in tote boxes used to be the rule in bolt manufacture. Here is a 2,000 lb. container which has revolutionized the ideas of production units in this plant.

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Above is shown one of the two main bays of the General Electric Company's turbine building, Schenectady, each of which is served by six cranes arranged on two levels. Aprons projecting from the side galleries facilitate transfer of materials. The small view, at the left, shows a belt conveyor in progressive assembly on miscellaneous cable at the Lynn Works.

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A Study in Contrasts

Materials Handling Problems of the General Electric Company

By R. H. Rogers

Industrial Engineering Department, General Electric Company

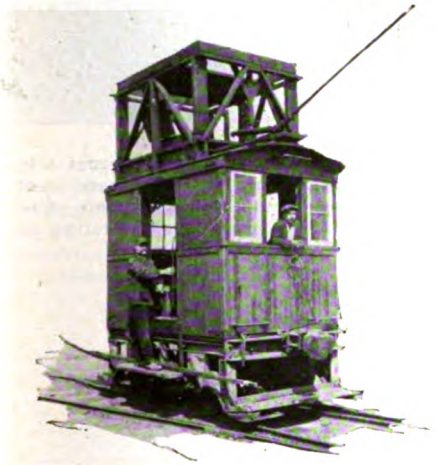


Fig. 1. This shifter car is still "on deck," with its original motors, after over 30 years' service.

THE General Electric Company presents an especially interesting study in materials handling methods, because of the extreme variety in size and kind of the units which go to make up its production. The same organization that manufactures electric meters, X-ray tubes and fractional horsepower motors—all involving the handling in production and assembly of a multitude of small parts—also produces huge turbo-generators involving the handling of units weighing as much as 155 tons. Furthermore, in assembling a large turbine generator, for example, not only must a 100-ton mass be handled; but (as in the illustration immediately below, on this page) this mass must be moved accurately.

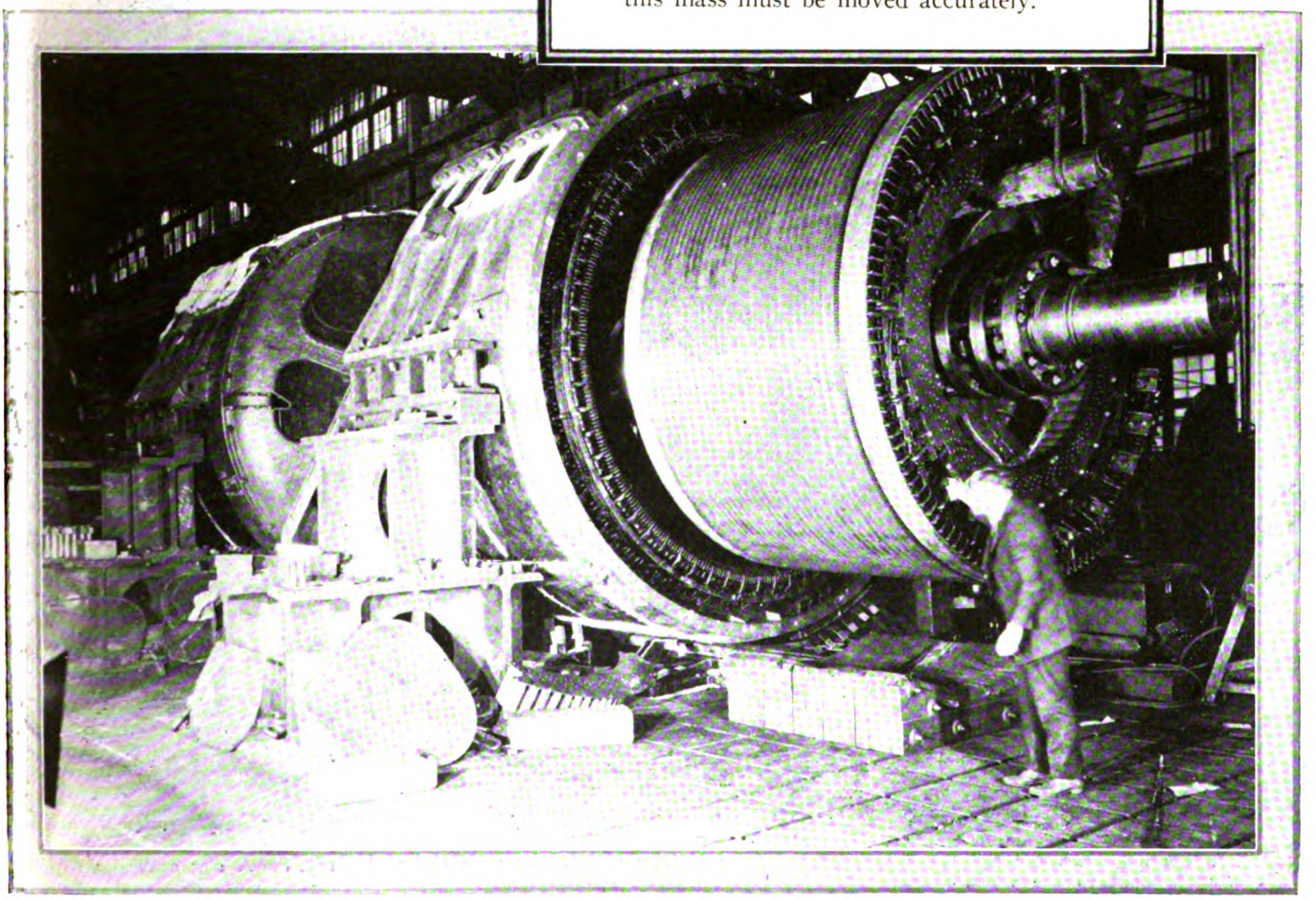


Fig. 2. Putting the rotor into the stator of a 22,500-horsepower motor. The clearances are very small so that the shaft must be kept level and all tendency to pendulum action must be damped out.

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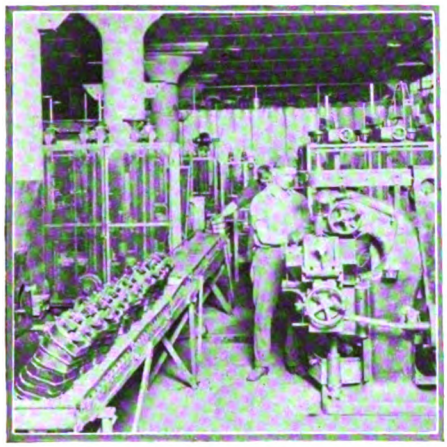


Fig. 3. A gravity conveyor, used in carrying meter parts to and from milling operations during production.



Fig. 4. Machining operations on meter bases, showing how the double line of machines is served by gravity conveyors running the full length of the room.



Fig. 5. Gravity conveyors also serve here, in the assembly of small motors, which are thus carried from one operation to the next.

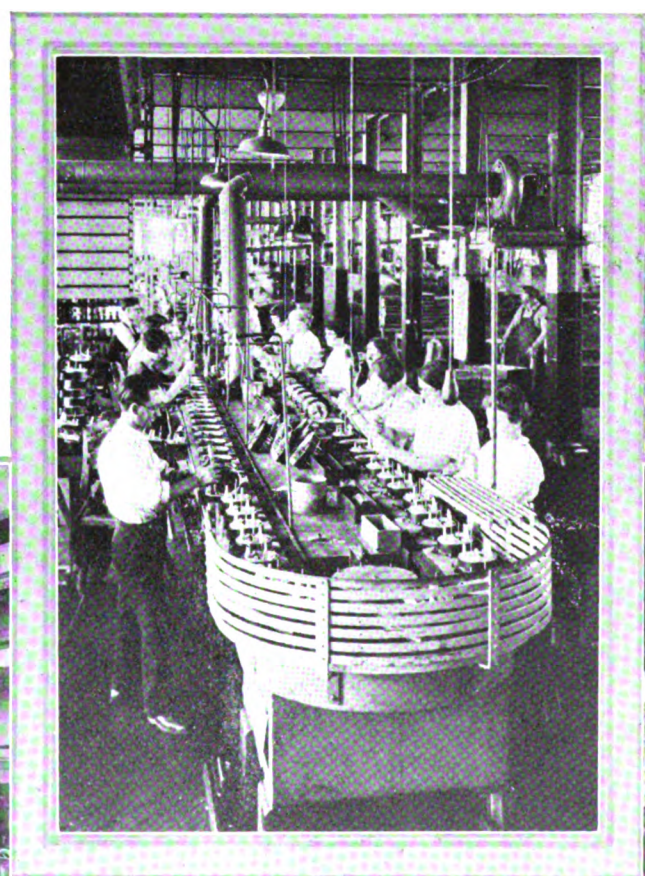


Fig. 6. Above is shown the progressive assembly of watt-hour meters, carried on on a power driven conveyor, with the operations synchronized to the conveyor speed.

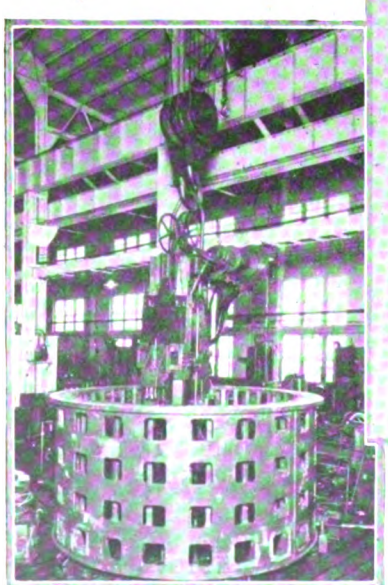


Fig. 7. On big units, the tool is often brought to the work, instead of vice versa. Here, a crane is lowering a machine tool inside the stator frame of a water wheel driven generator.



Fig. 8. A slat conveyor which carries reels of tested wire to the braiding departments. Note the steep upward run in the background.

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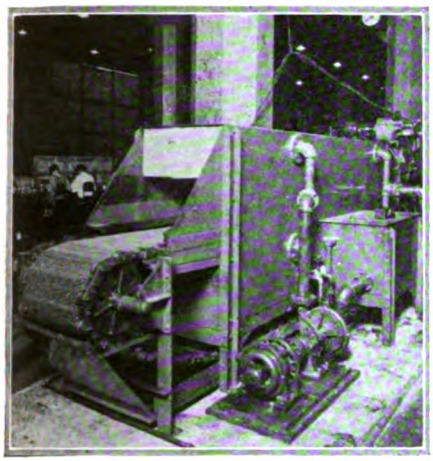


Fig. 9. A parts washing machine for cleaning motor flanges. Mechanical handling of parts through washing operations eliminates a great deal of lost time in production.



Fig. 10. This shows the start of the conveyor run for the progressive assembly of armature cores, at the Windsor Works.

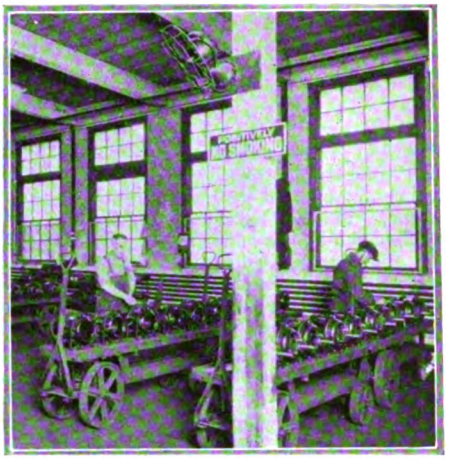


Fig. 11. In the manufacture of these A.C. motors at the Taunton Works, assembly at this stage is carried out on the hand trucks shown, rather than on conveyor lines.

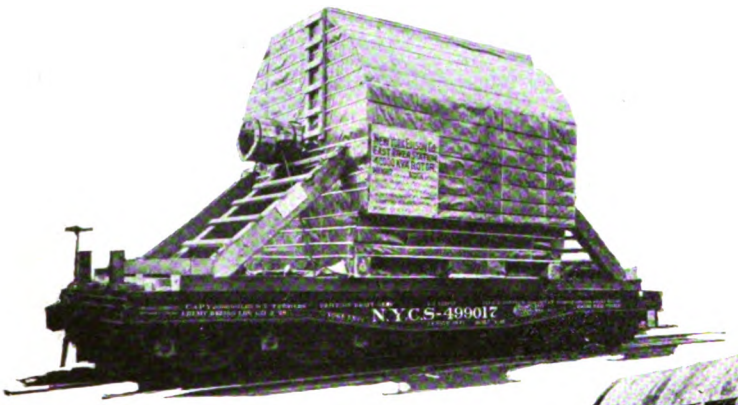


Fig. 12. Above is a 113-ton armature leaving the Schenectady Works, packed for rail transport to Albany; and from there by lighter to New York.

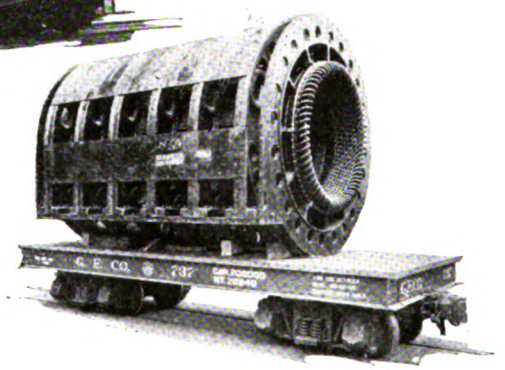


Fig. 13. The highest capacity narrow gauge car yet built, is shown on the right. Of 100-ton capacity, it serves the turbine department buildings at Schenectady.



Fig. 14. This shows the method of loading and unloading freight cars by the lift truck and skid system, as used at the Ft. Wayne Works.

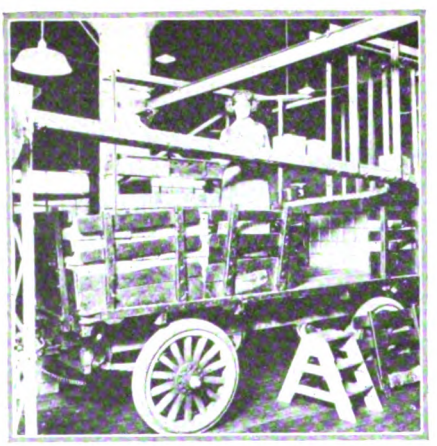


Fig. 15. At the Ft. Wayne Works, these conveyors are used for loading boxed meters on trailer trucks.

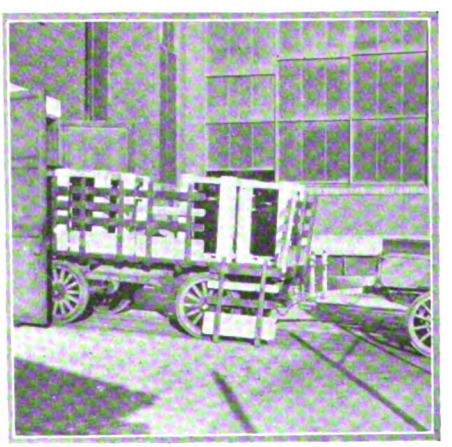


Fig. 16. These crated transformers, at the Ft. Wayne Works, are transported on trailers, down the elevator, and are hauled to the warehouse building.

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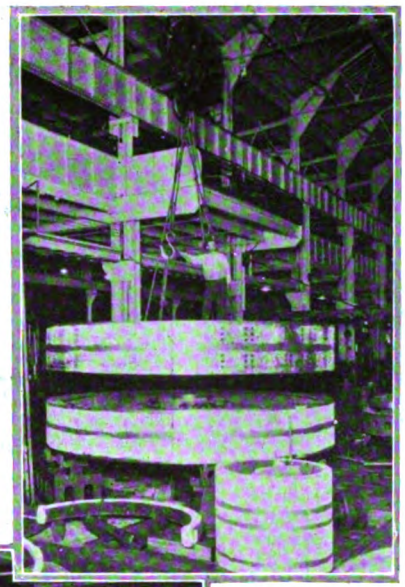


Fig. 17. Two parts of a 19-foot rotor spider being assembled by crane. In the background can be seen one of the aprons which permit cranes in the main bay to serve the side galleries.

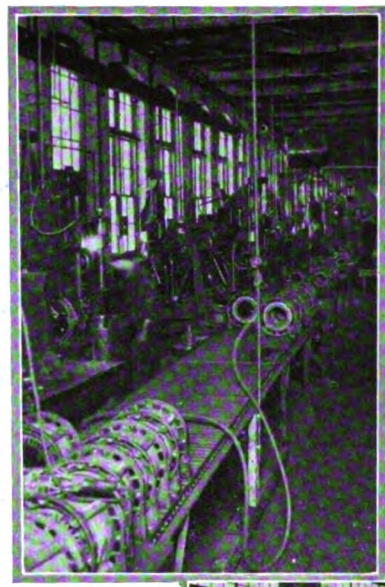


Fig. 18. In a previous view (Fig. 11) of motor assembly at the Taunton Works, assembly trucks were shown. Here, at the same works, are conveyors which serve in the progressive manufacture of motors.



Fig. 19. Above is an imposing array of conveyors at the Ft. Wayne Works, as used in meter manufacture. In addition to the gravity runs, note the elevating conveyor, in the extreme right background, for boxed meters.

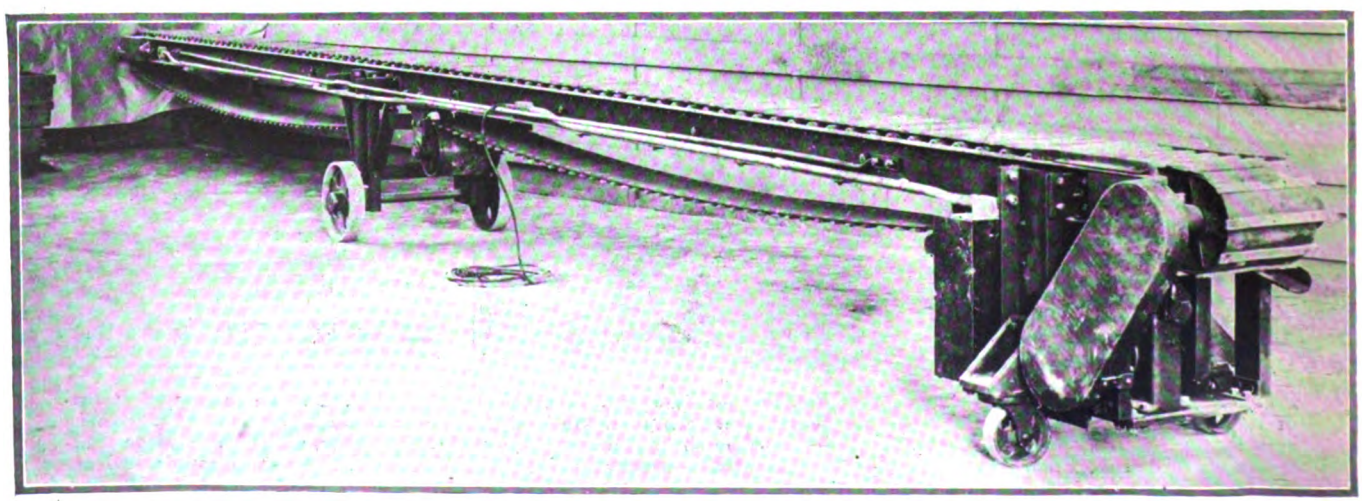
Fig. 20. Below is shown a tripod rack for crane slings, illustrating the convenient method of segregating. These slings are made from undamaged sections of used crane-cables.



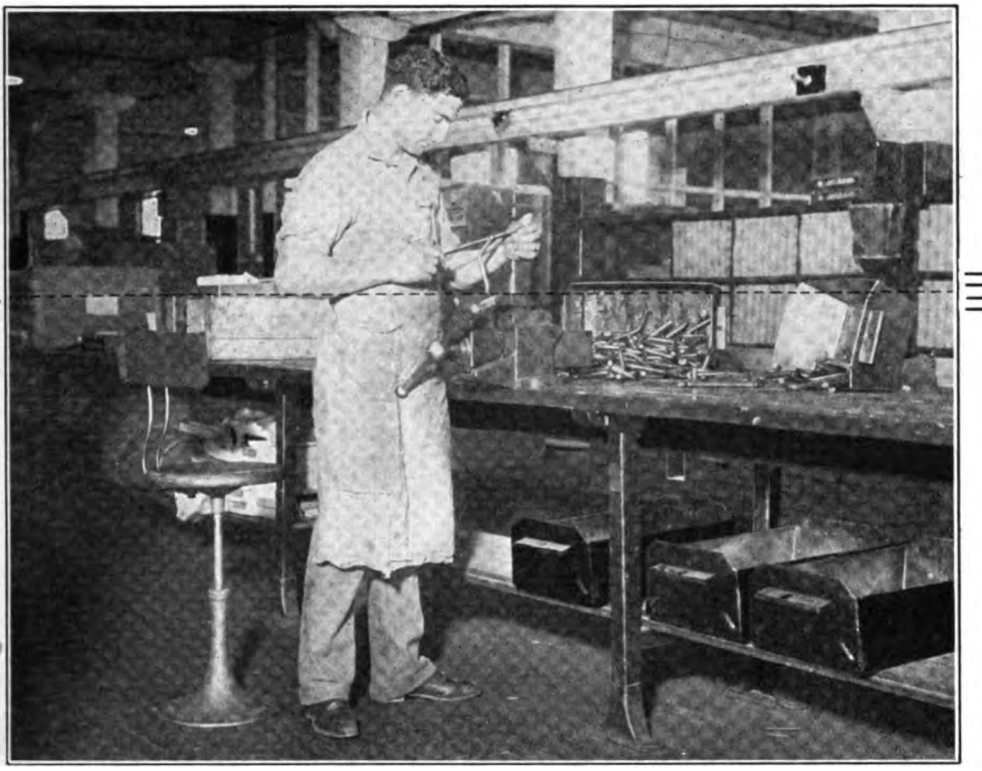


Fig. 21. Above is a view of the flash enameling furnaces at the Ft. Wayne Works. These conveyors make the enameling and baking a continuous operation.

Fig. 22. Below—a portable belt conveyor for porcelain ware. This unit, made at the Pittsfield Works, is 33 feet long, with a 12-inch belt which travels 30 feet per minute



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Does Your Shop Furniture Give Maximum Working Convenience?

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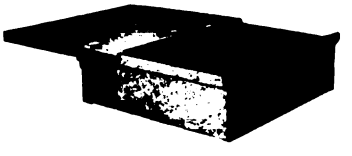
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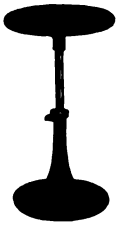
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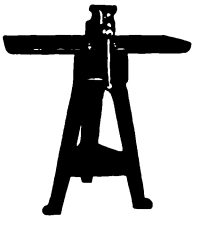
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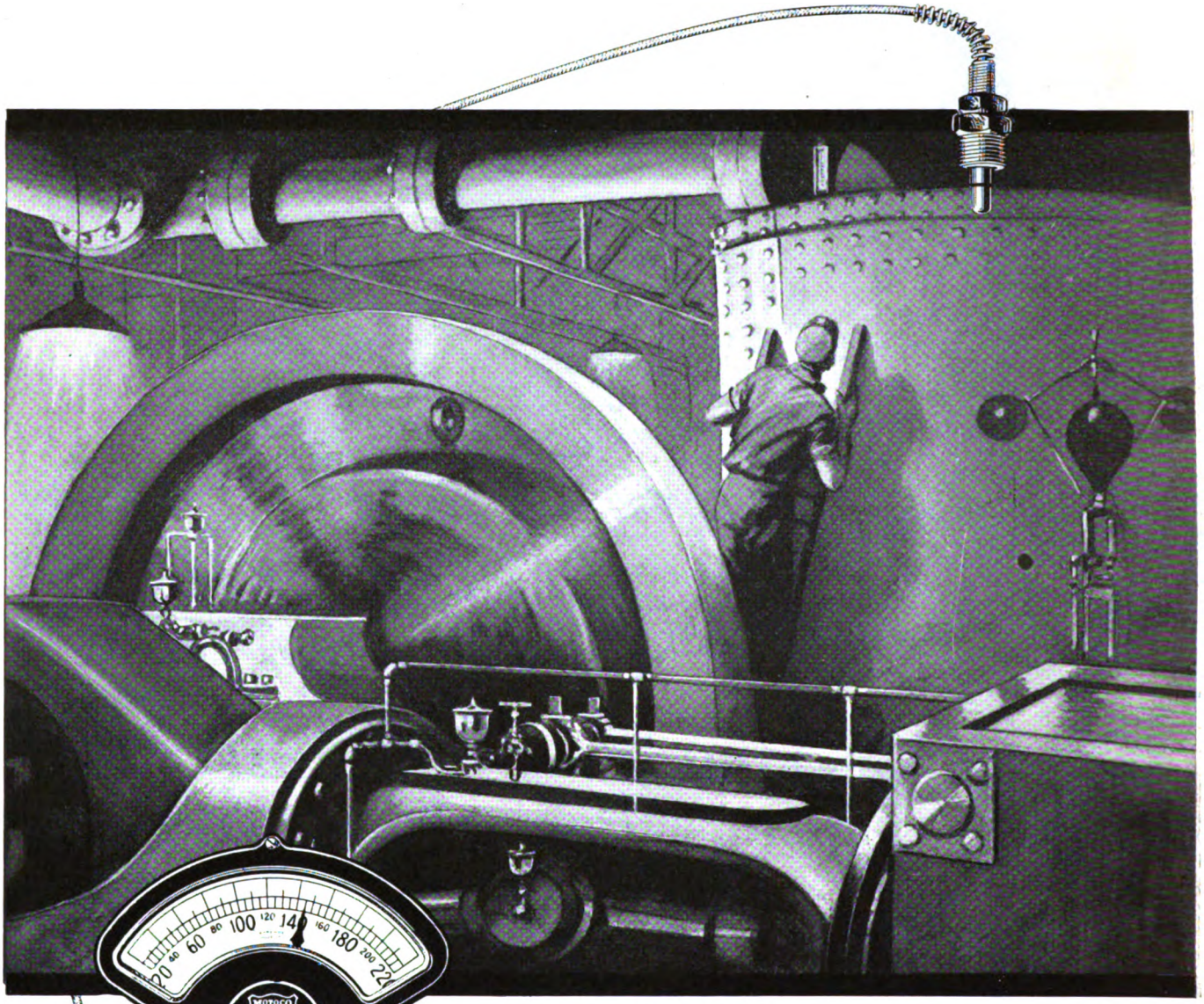








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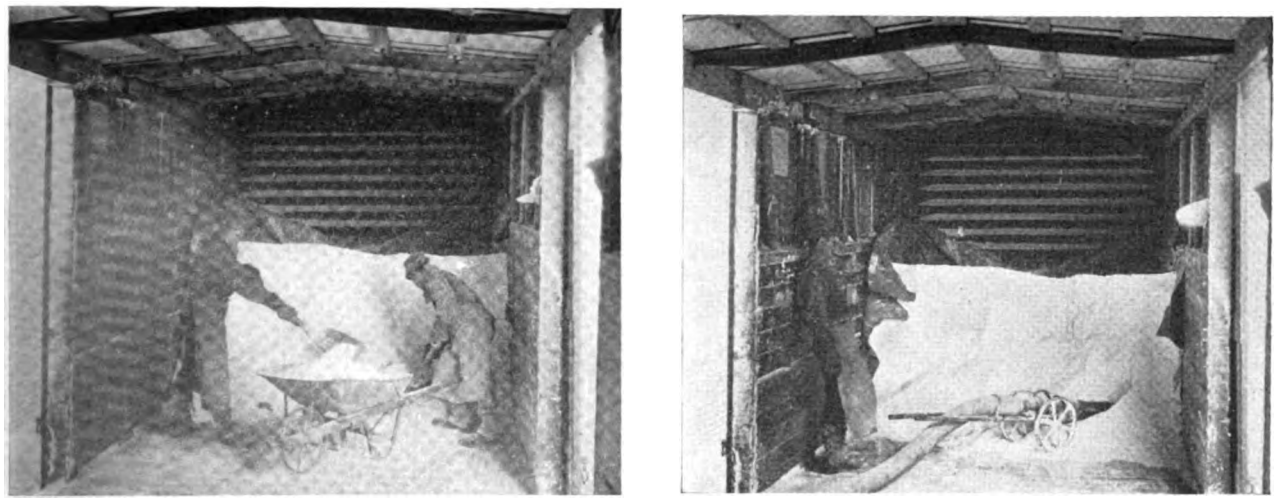


Fig. 1. Here is an interesting comparison of methods for unloading soda ash. The old method, on the left, beside being dusty (note the cloth over the man's face) requires a third man to handle the wheelbarrow. The pneumatic system has now been in use at this plant for five years.

Making Air Do the Conveying

The Pneumatic Handling of Dry Materials

By Edward J. Tournier

THE indirect power of vacuum is a form of energy infrequently found in Nature, and wherever it does useful work, it must be artificially created. By extending the principle of the household vacuum cleaner to larger units, materials may be, and are, conveyed horizontally, vertically and around obstructions.

The pneumatic conveyors will handle poisonous, fine and dusty materials or rubber heels with equal facility. Indeed for such materials as soda ash and pulverized lime the vacuum system is the only practical method. For the best results, however, the materials to be handled must be dry.

Handling materials such as run-of-mine coal is not a possibility at present, by pneumatic conveyors. Not on account of physical reasons but that the cost of power and maintenance would be prohibitive. In fact no builder of such apparatus has ever advocated its use for material containing a high percentage of large lumps. Materials containing a moderate proportion of small lumps mixed with fines, such as phosphate rock, however, may be handled pneumatically. Within a fairly well defined field, however, the pneumatic system of conveying is doing its bit to reduce waste in industry.



Fig. 2. The material shown here indicates the maximum size lumps handled by means of a high pressure system, the view being one-quarter natural size.

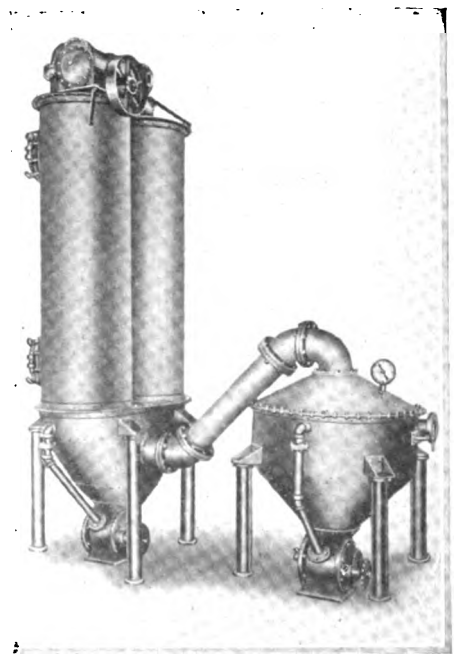


Fig. 3. Two of the essential parts of a high pressure system are shown here. The unit at the right is the receiver, where the fines are separated from the coarse material. The unit at the right is the filter apparatus for removing dust.

The essentials of the simplest form of vacuum conveyor are an air duct, a vacuum pump and an air receiver. In this type, whatever dust exists in the materials conveyed pass through the pump. Where this is objectionable, either because of abrasives which damage the machinery or because of danger to health, a filter may be added. This will eliminate the most objectionable portion of the dust A higher efficiency

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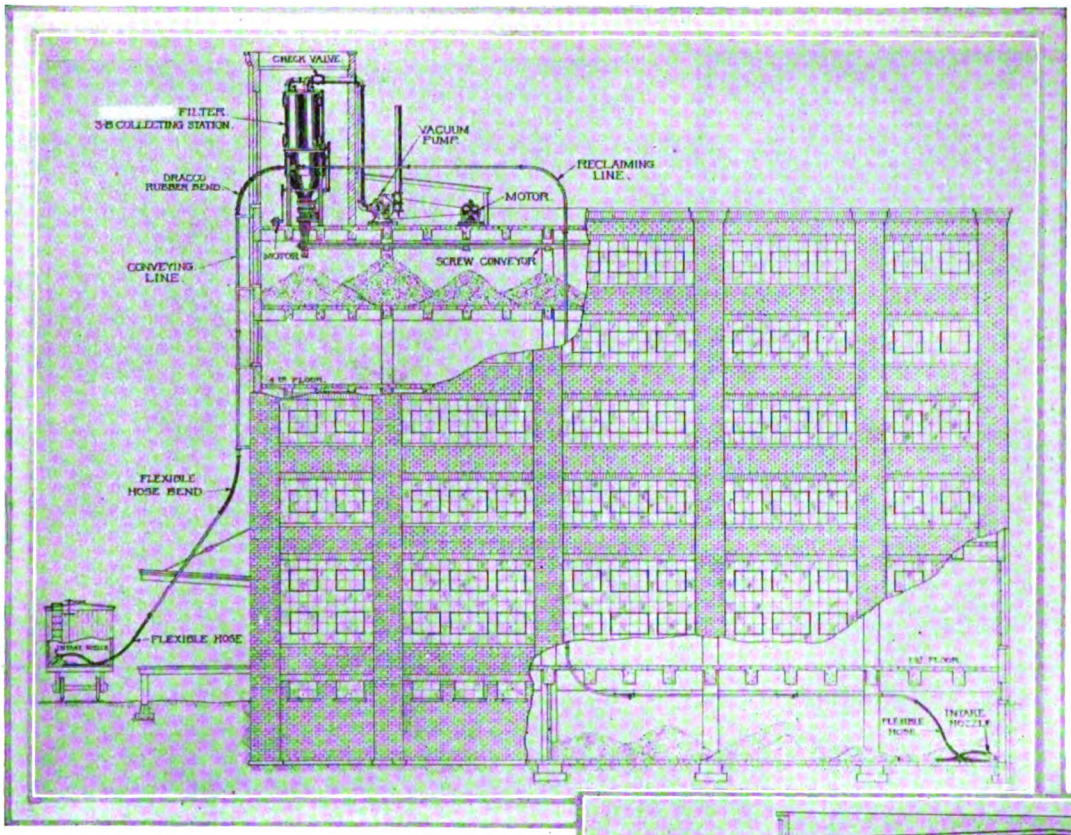


Fig. 4. Here is shown a typical plant for unloading box cars, storing materials and reclaiming from storage. The significant features of such a layout are its flexibility and the small amount of space occupied.

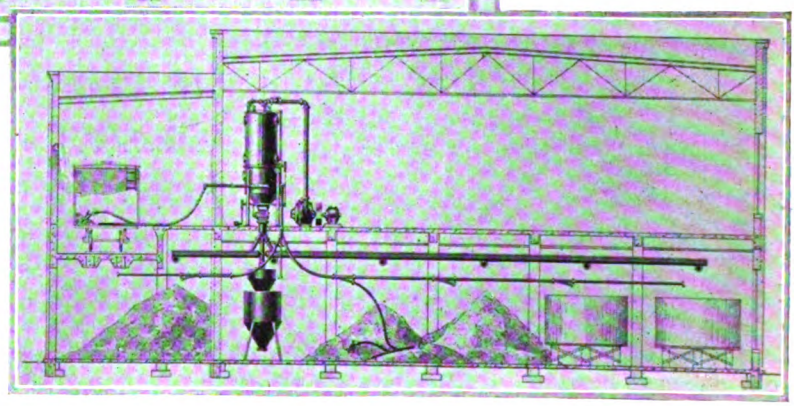


Fig. 5. This system, consisting of conveyor lines, receiver, filter, high vacuum pump and screw conveyors, enabled the New York & Pennsylvania Paper Co. to substitute dry powdery domestic clay for an imported pasty product. The latter was difficult and expensive to handle in addition to being costly on account of import duties.

apparatus may also be built for separating the fines from the coarse materials. The most modern and efficient system is one in which all the material must be retained and discharged at a single point. This is the type of apparatus used in handling bulk cement, which must meet severe tests for fineness. In this case no dust must be permitted to pass through the pump, because dust losses affect the fineness of the cement, and, in passage,

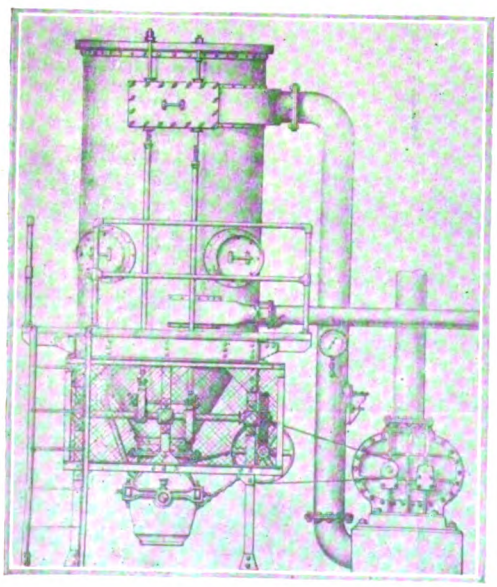


Fig. 6. The principal difference between this unit and the apparatus in Fig. 3 indicates the variation between the high vacuum and low vacuum pneumatic systems. In the view shown, the receiver and filter are self contained in a single machine.

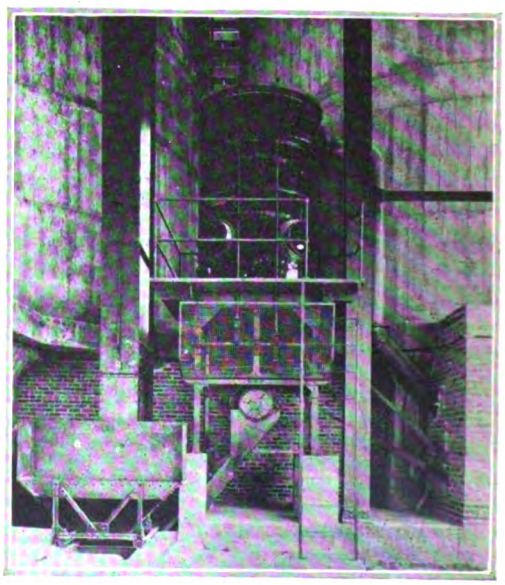


Fig. 7. This view shows the receiver and filter combination handling soda ash at the Ottawa, Ill., division of the National Plate Glass Co. The material is being unloaded from box cars and delivered through a feeding device to a bucket elevator at the left.

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the material injures the mechanism of the pump.

There are sometimes local conditions in buildings which make it impossible to install mechanical conveyors. At other times a small tonnage must be handled over great distances in congested factory yards, across roofs and other obstructions. The flexibility of the pneumatic conveyor meets these requirements economically and efficiently.

The use of a pneumatic system by a paper manufacturer permitted the substitution of domestic white clay for an imported product. The latter usually contains 20% to 25% moisture which makes it very difficult to handle with any kind of conveying equipment. The discovery of a very excellent grade of white, powdery clay within conveying distance of the plant led to experiments which proved the material equal to the imported clay. A pneumatic conveyor used in this plant eliminates dust losses and permits the use of a domestic product.

The unloading of phosphate rock from vessels is usually accomplished by means of grab buckets, with frequent damage to the boats, and losses through spills. A

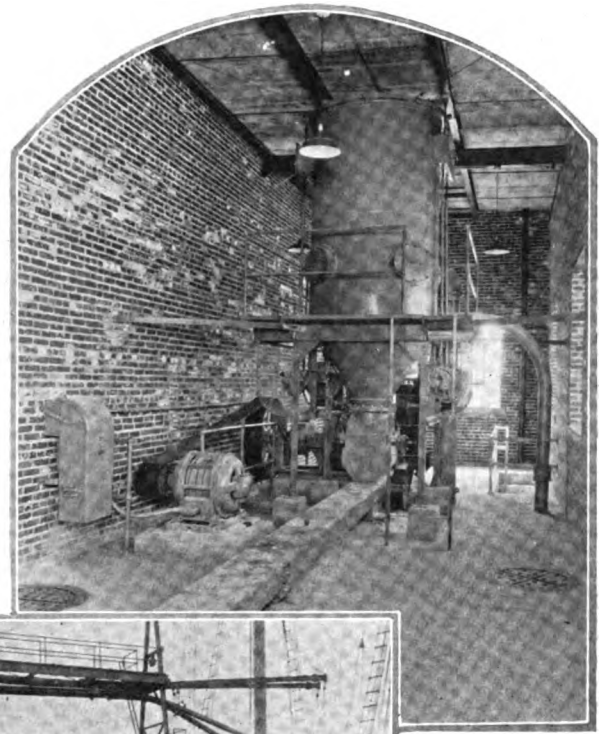


Fig. 8. A new filtration plant in a large Eastern city has installed a low vacuum system for handling lime from box cars. The combination receiver and filter is seen discharging into a screw conveyor for distribution into storage bins.

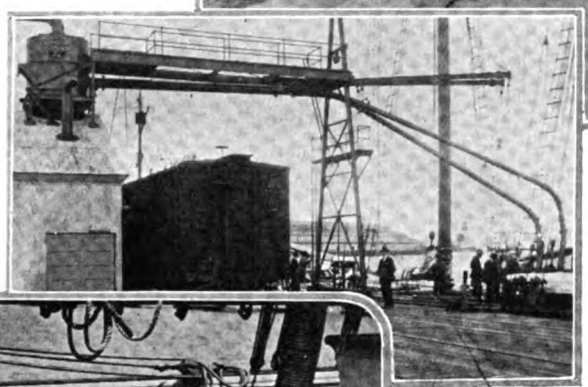


Fig. 9. This installation (above at the left) of a low vacuum system is handling dried copra from vessels to storage, at a California port.

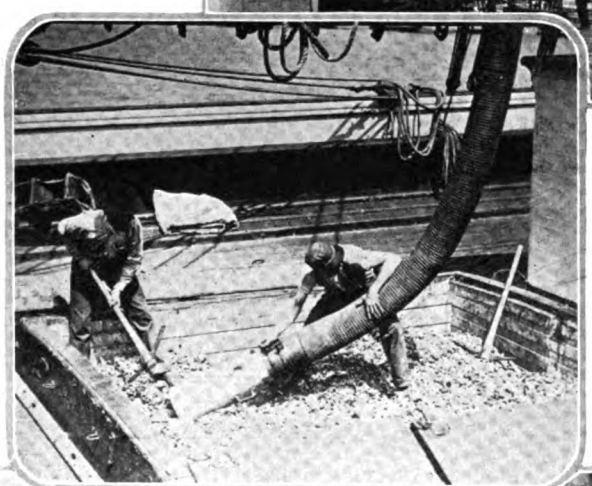


Fig. 10. In this view (at the right) the intake nozzle may be seen receiving copra in the open hatch of the boat. There are two 8-inch suction pipes used in this installation.

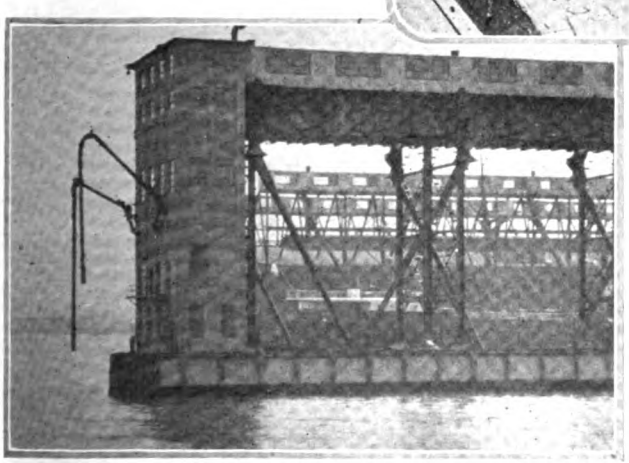


Fig. 11. This view shows a pneumatic grain handling installation at the Baltimore & Ohio R.R. pier at Baltimore, Md.



Fig. 12. Part of the wreckage created by a grain dust explosion is illustrated in this view. The pipe line in the foreground is the suction line of a pneumatic conveyor installed to salvage the grain still remaining.

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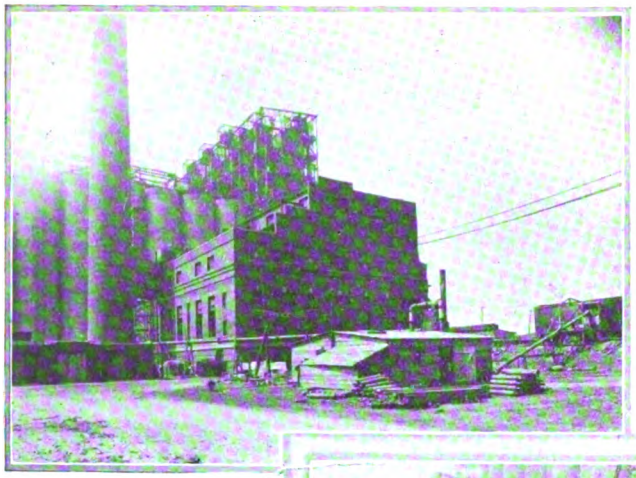


Fig. 13. This view of a long pipe line was taken at the grain elevator of the Chicago & Northwestern Elevator Co. at South Chicago. This line extends from one of the wrecked bins and delivers grain at the rate of 3,000 bushels per hour into cars.



Fig. 14. The combination receiver and filter of the low vacuum system are seen at the left, with the conveyor line delivering grain to cars at the right. This system is part of the salvaging operation at the Chicago & Northwestern Elevator Co.'s plant.

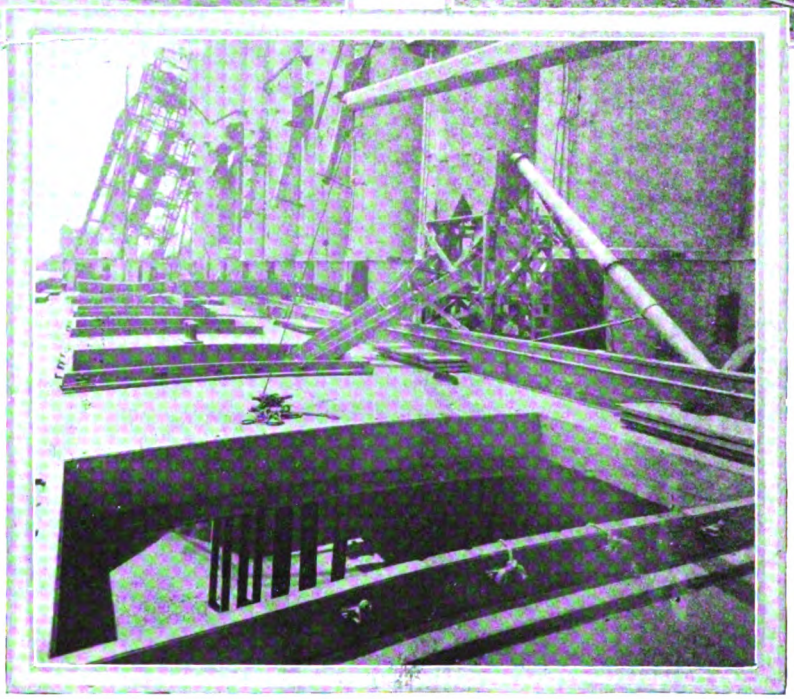


Fig. 15. It was necessary in this plant to deliver to vessels as well as to cars. The view shown indicates a temporary marine leg receiving grain from the second suction line of the system described elsewhere.

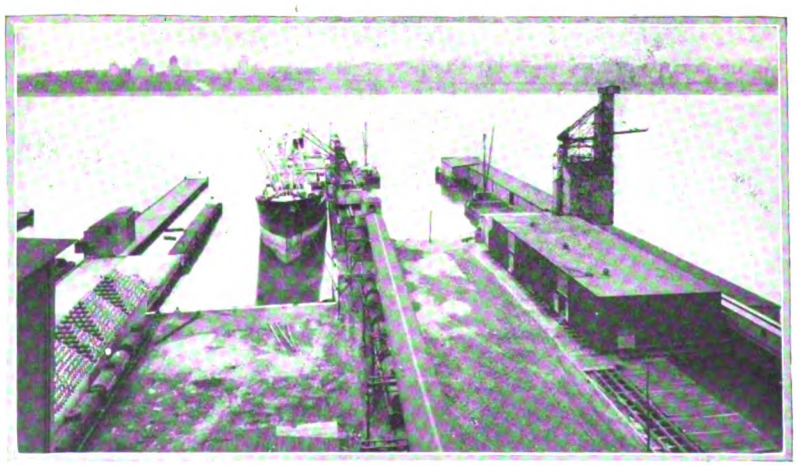


Fig. 16. In this view is shown the unusual condition of two radically different systems in use for the same purpose. Here flaxseed is being unloaded from vessels. At the right is a marine leg type mechanical elevator, and at the left are three pneumatic boom towers. Eventually there will be two more pneumatic towers of the low vacuum type, where the mechanical elevator now stands.

pneumatic conveyor was installed to do this work, which permitted more thorough unloading. The suction nozzle may be moved into corners, under cabins, etc., by hand. Unloading takes place at the rate of 30 tons per hour, and requires 60 horsepower. It will be seen from this performance that there is a considerable range, from fine clay powder to lumps of phosphate rock, which are all handled satisfactorily.

Although there is but one active principle in any pneumatic conveyor, there are two different theories among engineers, concerning its application. On one hand high vacuum is advocated and on the other hand low vacuum is thought to be more desirable. It should be noted in considering this question that only a partial vacuum may actually be obtained and that the difference in engineering opinion has to do with the degree of this partial vacuum. Aside from using so-called "high pressure" or "low pressure" there are also some differences in details.

Where extreme flexibility of the conveying system is required, or where space is restricted, pneumatic conveying is a most satisfactory solution of many problems. Where dust losses are objectionable and injurious to health or where fine dust contains recoverable values, the vacuum system of handling materials is receiving the most careful consideration from executives. It is performing a useful part in reducing industrial waste, and has therefore a legitimate place in the list of tried and approved equipment.

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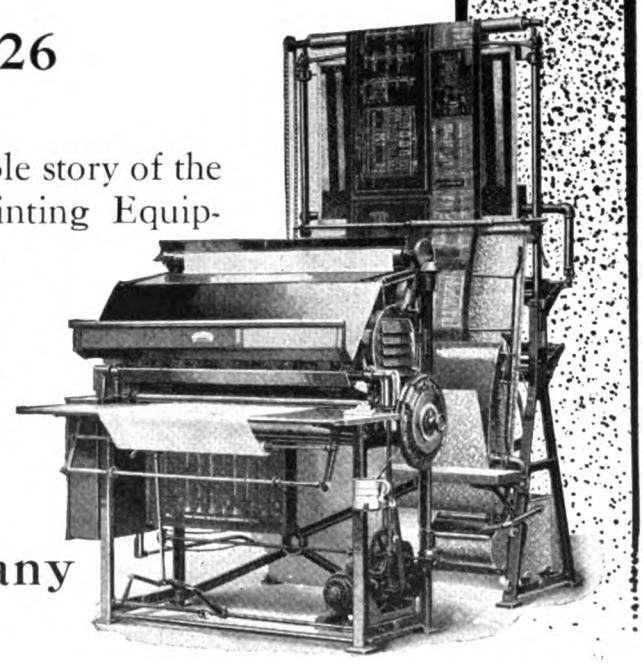
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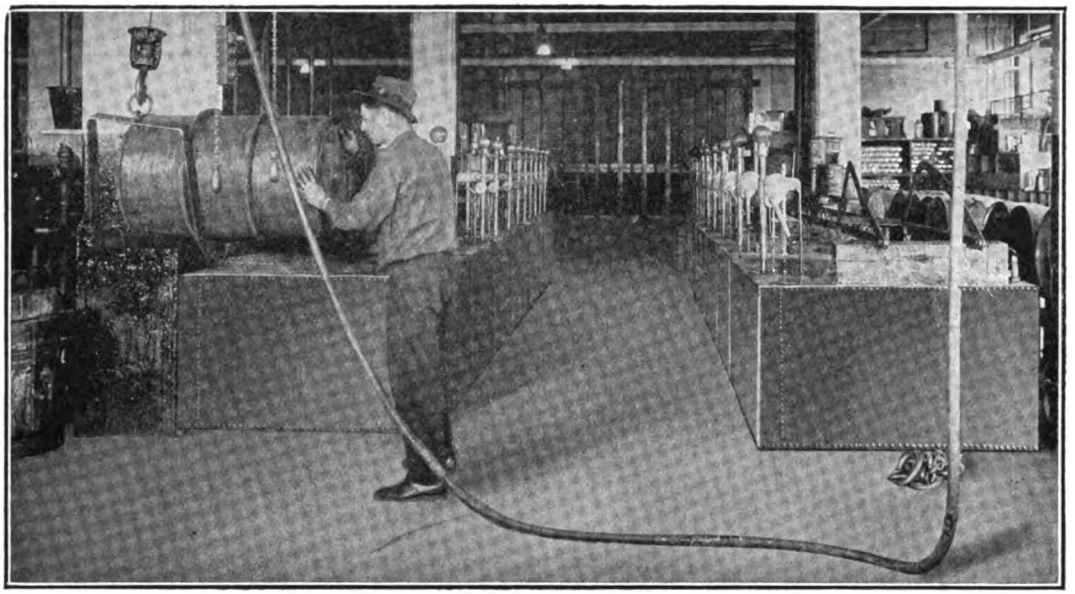
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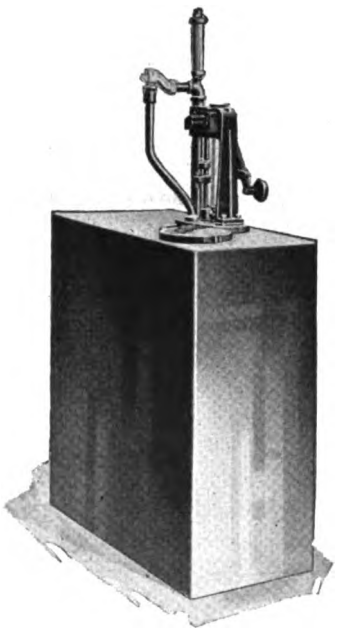


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Low Cost, High Speed Handling

How the Chain Block Earns Big Dividends

By F. C. Eibell



Fig. 1. This Pennsylvania saw mill uses a spur-geared block and I-beam trolley to handle the logs.

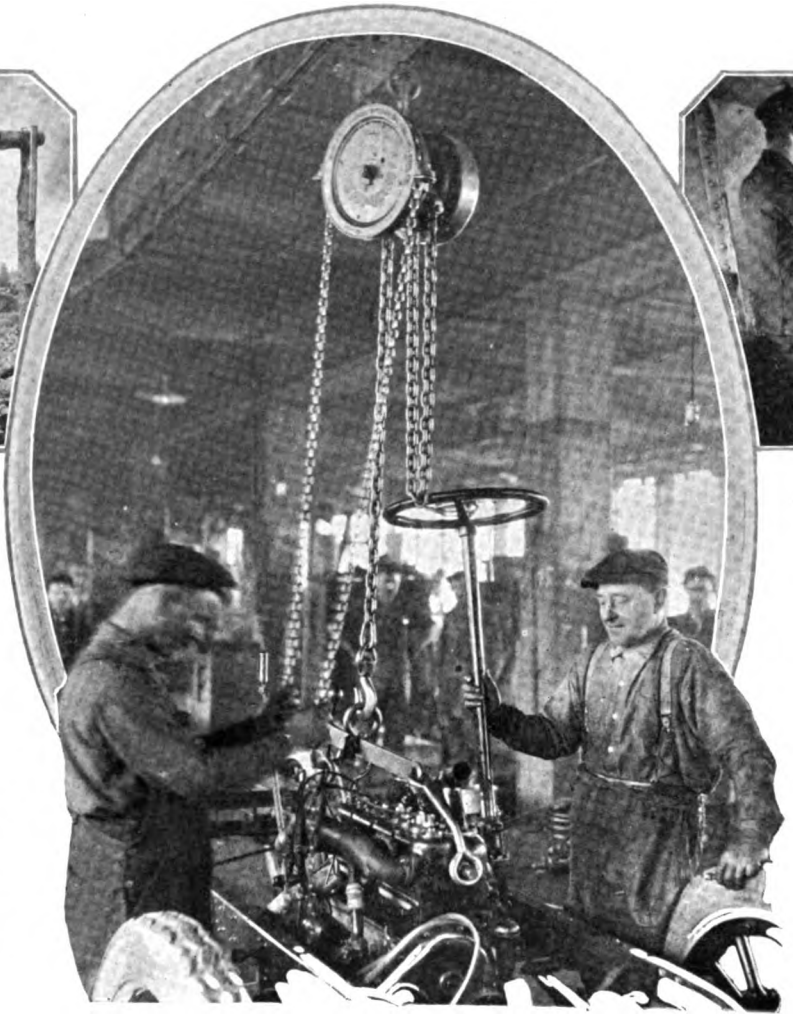


Fig. 3. Assembly work in an automobile factory. Speed with accuracy is the by-word in these plants and the hand hoist, the spur-geared block is the one piece of equipment that gives ease, freedom, and speed in placing the motors.



Fig. 2. On board ship as well as in the plant and factory, the chain block has many opportunities to demonstrate its usefulness. The method of suspension shown here has many industrial possibilities.

THERE are three general types of chain blocks in use today: Differential, screw-geared, and spur-geared blocks. They differ widely in characteristics, appearance, efficiencies, and prices. The selection of the block that will pay the best return on the investment depends entirely on the conditions of the intended use. Since the efficiencies of the various types range anywhere from 20% to more than 80%, and the costs of the blocks vary in proportion to their efficiencies, the use to which the block is to be put should be the determining factor in its selection.

A chain block intended for only occasional use, say for repairs in an engine room, serves its purpose well if it will lift its maximum load regardless of the number of men required or the time consumed in raising the load to the desired height, and, therefore, the cheapest type of block, the differential block, may properly be chosen. But, if a chain block is intended for use over an expensive lathe in placing and removing the work, the number of men and the length of time needed to handle the load become factors of prime importance, especially since the lathe stands idle during the time required to move the work. In this case the chain block having the highest mechanical efficiency, although it is the highest in price, becomes the cheapest to use. The Spur-Geared block would be chosen.

The Screw-Geared chain block ranks between the Differential and the Spur-Geared blocks in both efficiency and price. It has but few parts, and is adapted to give unusually good service under severe operating conditions.

Comparing the relative efficiencies of the three types of chain blocks to do a given job, say lifting a ton three feet, it will take:

3 men about one minute and three seconds with a differential block.

2 men about one minute and seven seconds with a screw-geared block, and

1 man only 45 seconds with a spur-geared block.

To insure greater safety, easier operation, and lower handling costs always select a chain block with ample capacity for the heaviest load it will be called upon to handle. This makes for economy, in the long run.

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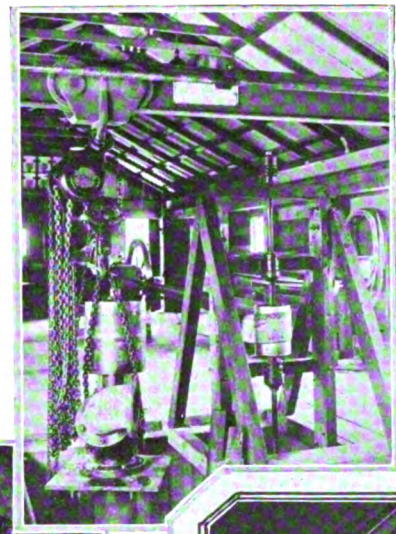


Fig. 4. The oil fields know the value of the chain block. Here is one on a repair job.

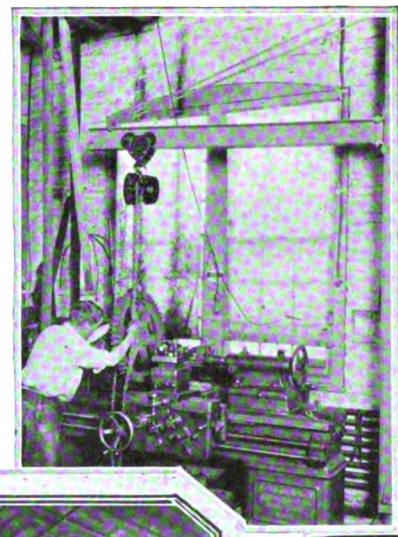


Fig. 5. This jib crane, trolley, spur-geared block combination is ideal in getting the most out of this machine tool. The work can be placed quickly and with precision, and taken from the machine even quicker. This is the kind of work on which a chain block pays tremendous dividends.

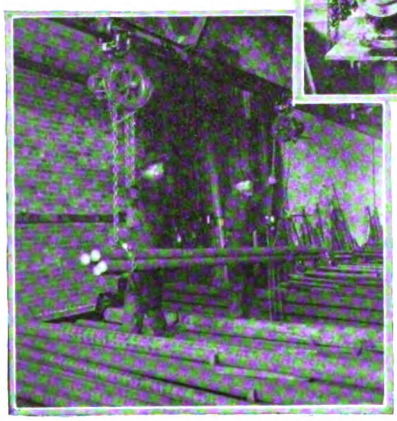


Fig. 6. This shows the use of twin chain blocks on an I-beam for handling long steel bars.

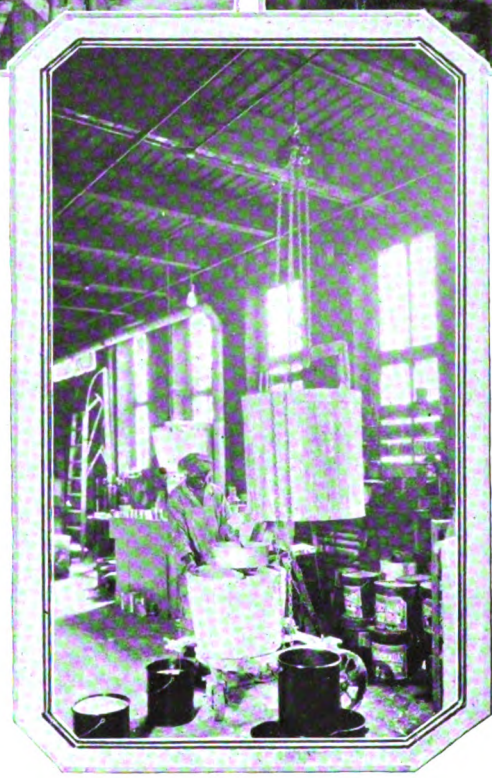


Fig. 7. Straining a paint blend—a simple and convenient way of handling blending tank and no necessity for setting them up on a permanent bench that takes up valuable room and is used only a small part of the time. When the straining is finished here the space is clear.



Fig. 8. An interesting movable rig in general warehouse work which should have many industrial applications.

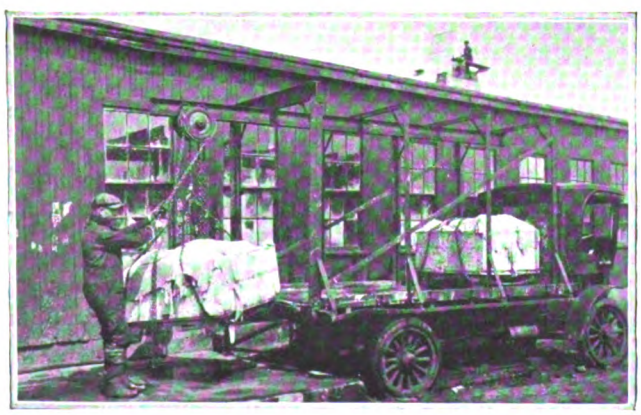


Fig. 9. The one man truck, the trolley hoist, or army block is so useful in applications of this kind that it is a wonder we do not see more of them.

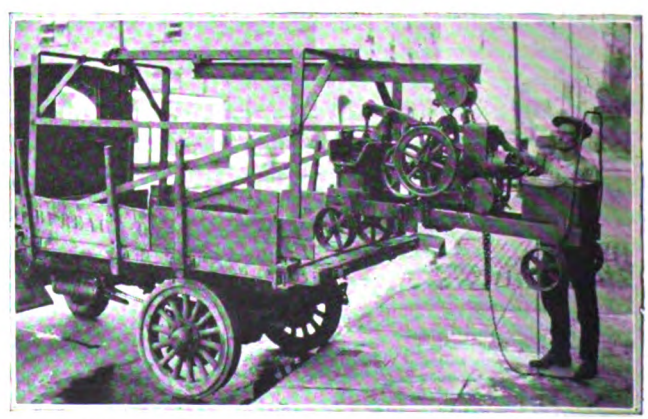


Fig. 10. Visualize the gang of men it would take to get this heavy, hard to handle pump up into the truck. One man and an army type block is a most satisfactory method.

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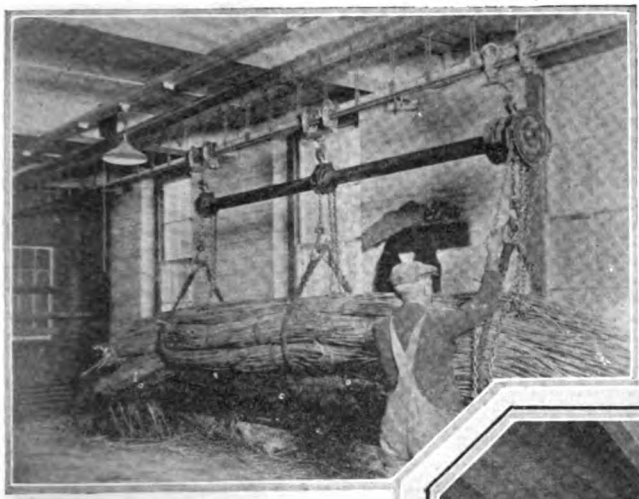


Fig. 11. A useful modification of the spur-geared block—the triple hook hoist—used to handle bundles of rattan in a factory which makes chair seats and baby carriages.

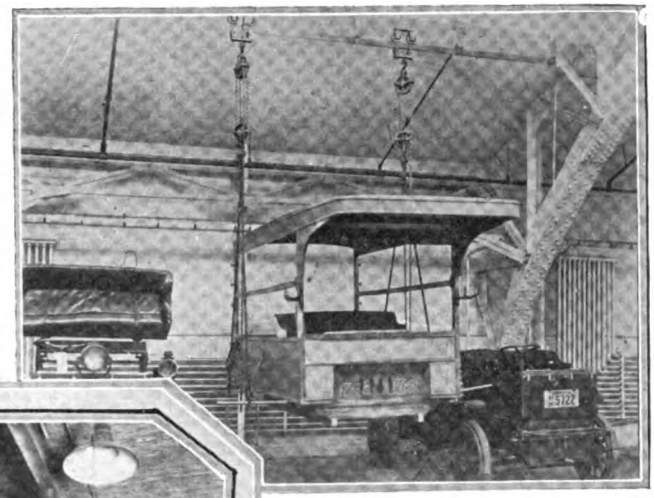


Fig. 12. Waiting for the chassis to back under. Differential blocks are used in this garage because they have to work such a small part of the time that more expensive types would not be justified. These are ideal for small public garages, and for the occasional job in the private one.

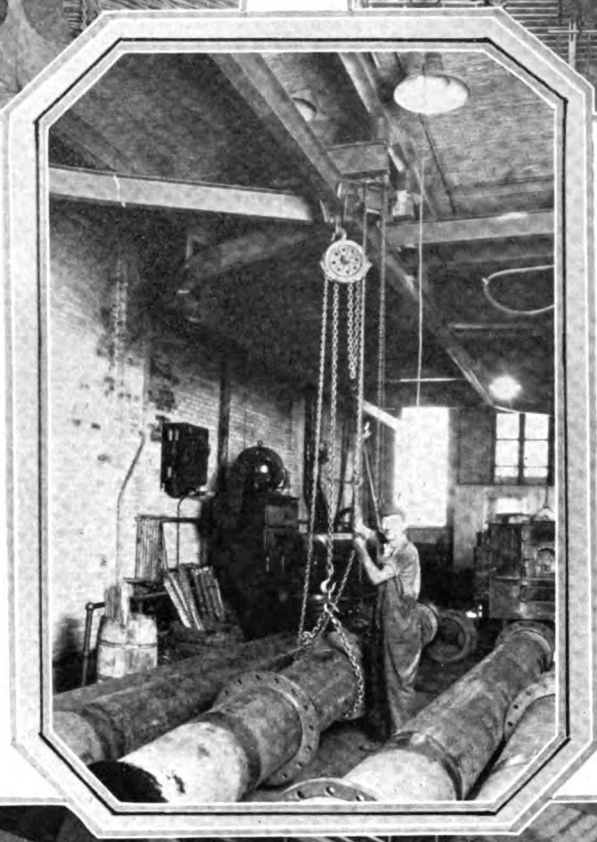
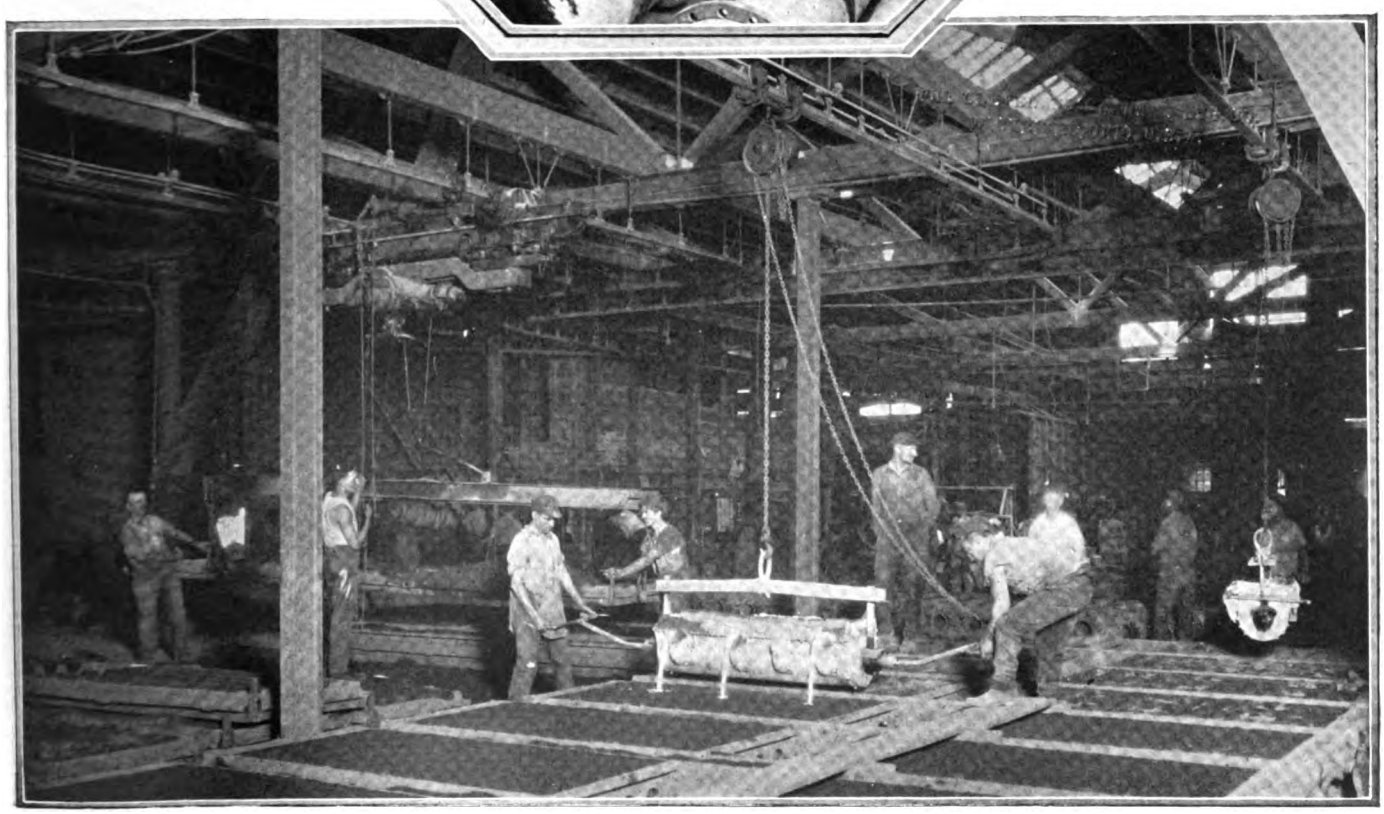


Fig. 13. In this well known iron works, the chain block and I-beam trolley combination does yeoman service. Note the switch arrangement in the I-beam which permits carrying the load to various parts of the shop.

Fig. 14. Pouring the molds. Imagine the job these two men would have handling the molten metal without the chain block-trolley combination to aid them.



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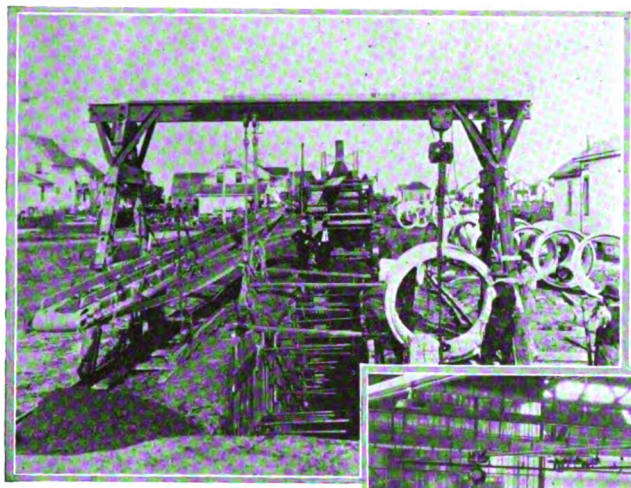


Fig. 15. Set on a movable I-beam rig, this Canadian contractor has demonstrated along several miles of sewer pipe laying the value of the spur-geared block and I-beam trolley combination.

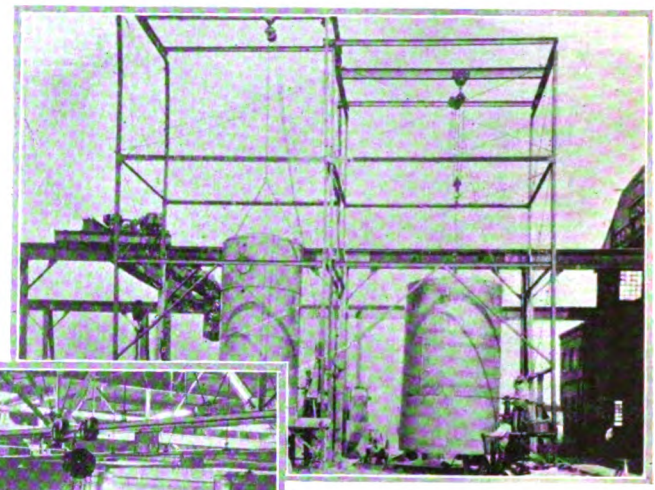


Fig. 16. You have seen the job riggers had setting up tanks and the gang of men required. Compare the old way with this simple chain block way, and the gang of men with these few. That's economy.

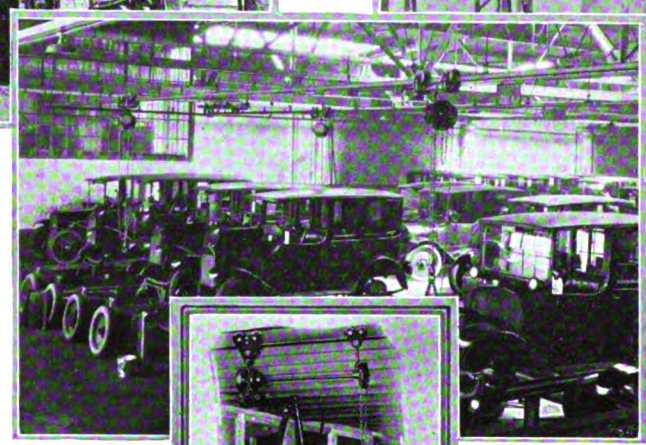


Fig. 17. A general view of tramrail installation in the Philadelphia garage of the Yellow Cab Company. Extensions have been made to this system since this photograph was taken.

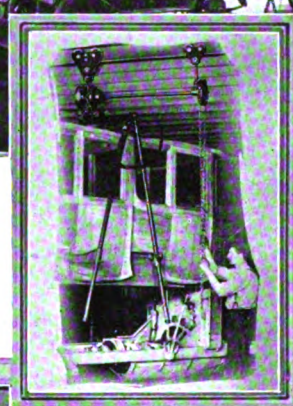


Fig. 18. The extended hand wheel type is used here in connection with an interesting sling arrangement to lift bus bodies. Quick, easy and safe beyond question. Should the load slip, the operator is far enough away to keep free of it.

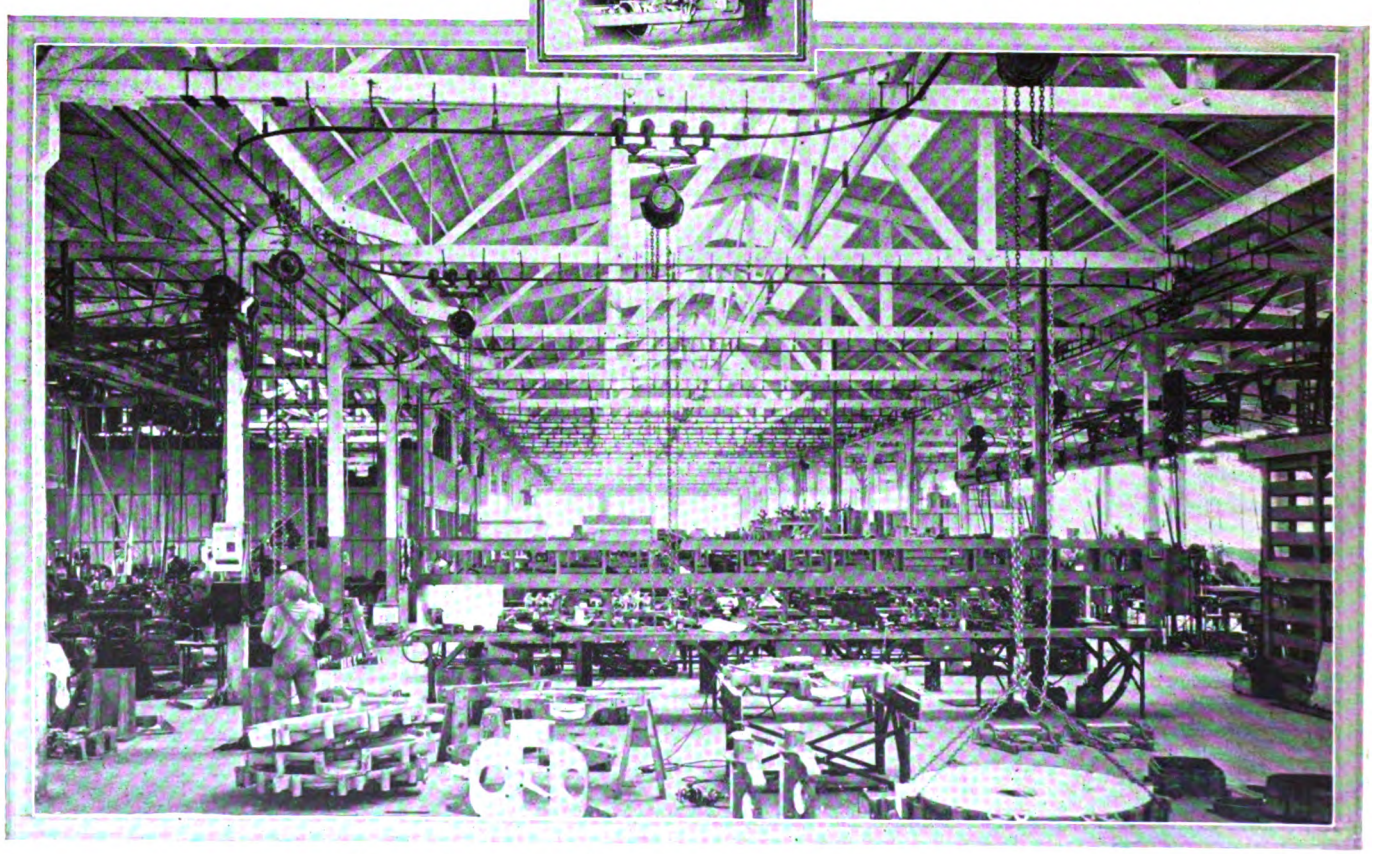
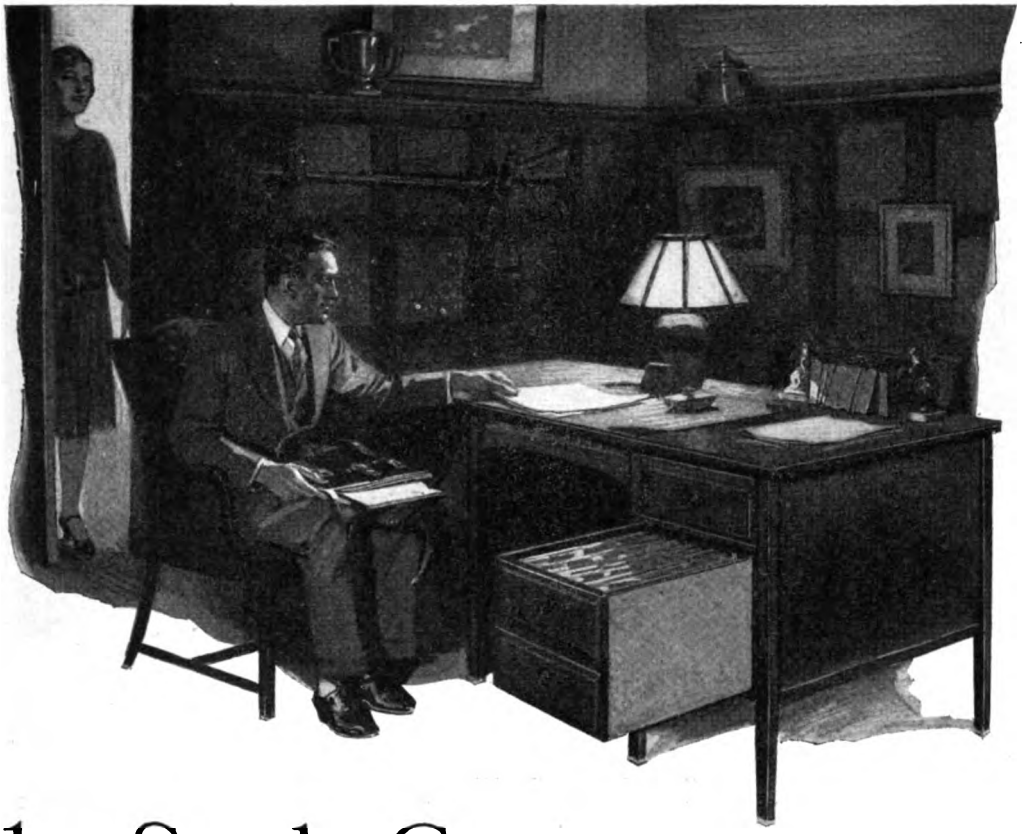


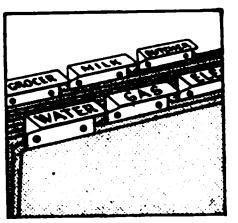
Fig. 19. A highly developed overhead trolley hoist system used in the machine shops assembly floor of a Pacific coast electric manufacturing plant on heavy assembling.

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For the Study Corner

a home desk that IS a desk



This large drawer is fitted with a G-W vertical file with Visible Rainbow index tabs. Use it for filing and finding quickly household and personal bills and receipts, and other business papers and documents of every kind.

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No wobbly, rickety writing table can compare with the firm-footed Globe-Wernicke Home Desk. Contrast its unobstructed table top of genuine mahogany or walnut. Examine its commodious, easy-sliding drawers.

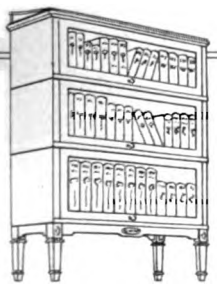
The lady of the house, herself, finds a score of uses for this home desk that combines beauty with real utility.

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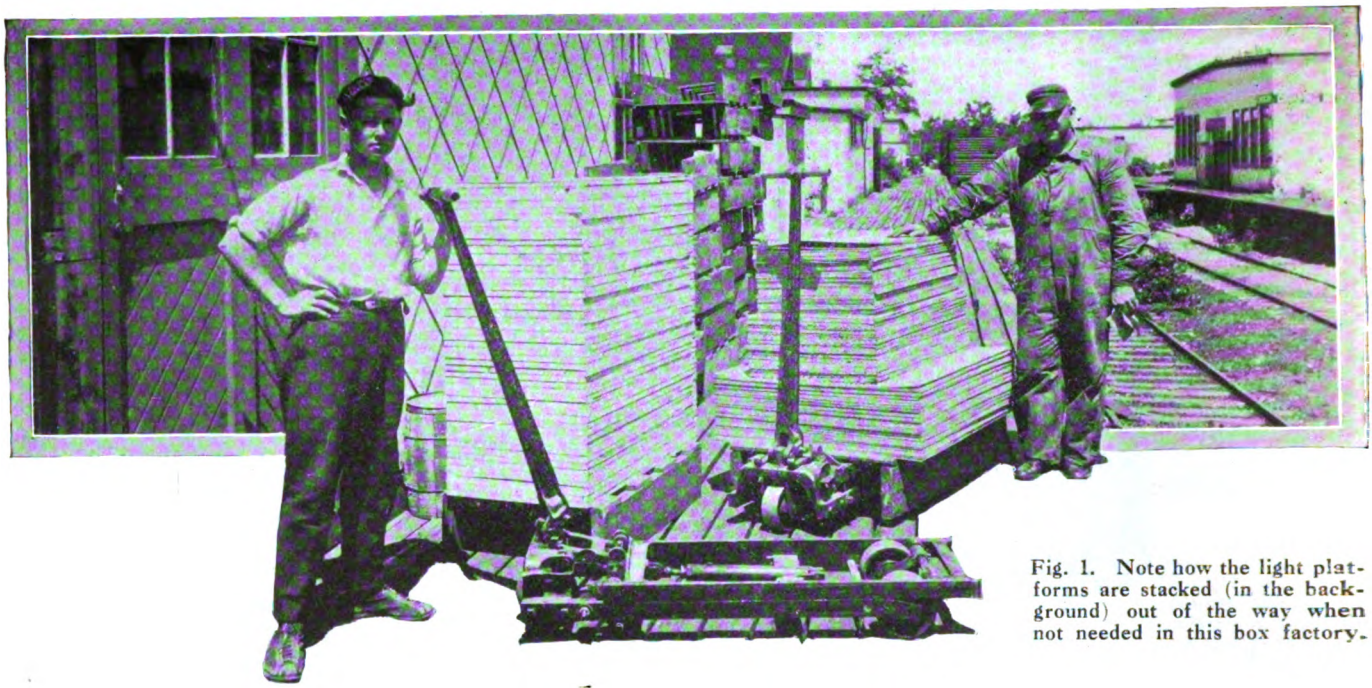


Fig. 1. Note how the light platforms are stacked (in the background) out of the way when not needed in this box factory.

Economies of the Hand Lift Truck and Portable Elevator

By Frank L. Eidmann

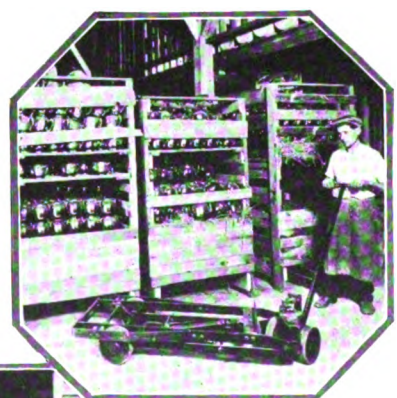


Fig. 2. The platform or skid may be of any design that best suits the product handled. Here are racks for handling porcelain parts at a pottery.

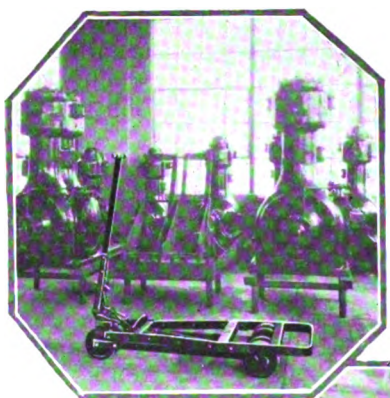


Fig. 3. Here is a case where refrigerating machinery is assembled on lift truck platforms, doing away with much rehandling.



Fig. 4. The lift truck as a trailer. This combines the low-cost advantages of the hand lift truck and platform for ordinary use, with the electric truck for occasional long hauls.

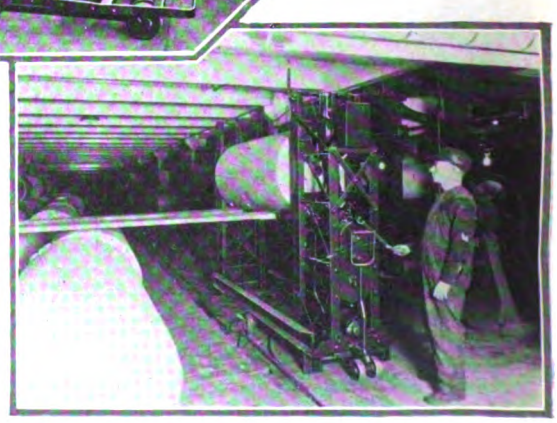


Fig. 5. The portable elevator has proved very successful in handling heavy rolls of paper and even pianos. It is usually electrically operated in such cases.

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Fig. 6. Above is a revolving base elevator which is used in storing steel drums in racks. The saving in manpower, on such work is obvious.

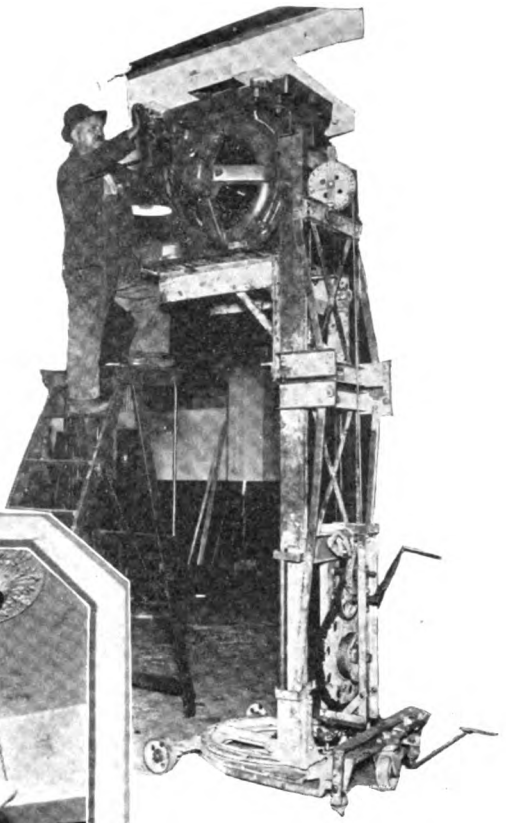


Fig. 7. Above—In the installation of overhead motors, the portability of this elevator made it more valuable than a gang of men.

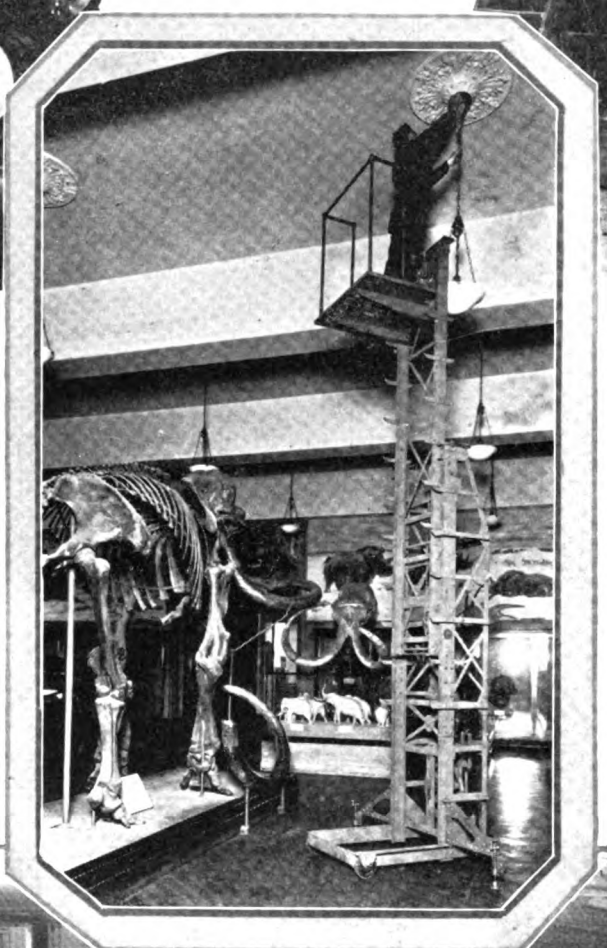


Fig. 8. Below—Ancient and modern; how the lights and ceilings of the American Museum of Natural History, New York, are cleaned.



Fig. 9. Trucking out of a box car into warehouse. Platforms (at the left) are taken in for loading. The loaded skid at the right carries damaged flour sacks, which are piled here for later removal as a unit.

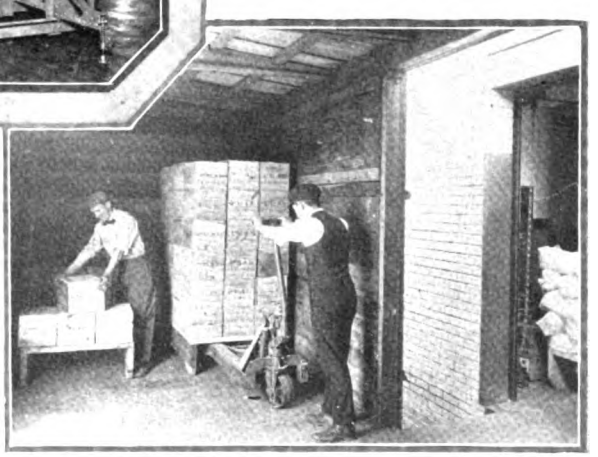


Fig. 10. This shows the interior of box car (see Fig. 9) with one platform being loaded and one ready to be removed. The load is 72 cases, of 40 lbs. each.

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Fig. 11. At the plant of the Detroit News, where portable elevators on tracks expedite the piling of news print rolls.



Fig. 12. Here is another case where the portable elevator is highly useful in installation work; erecting a line of heavy pipe.



Fig. 13. Above—This hand-operated revolving base portable elevator is used in storing sheet metal in racks in the storehouse. It permits of economical storage space and easy handling of these clumsy sheets.





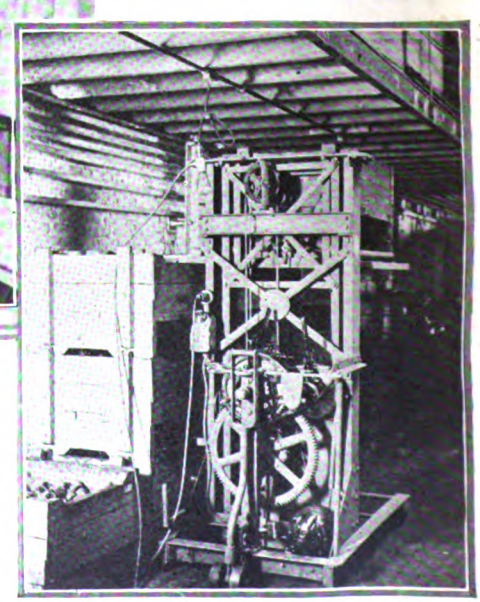
Fig. 15. Below—The storage of jigs, fixtures and dies is made an orderly, economical proceeding by means of the hand operated portable elevator.



Fig. 16. Below—A telescoping elevator, operating here under a balcony, stacking loaded lift-truck platforms.



Fig. 14. An electrically operated portable elevator used in piling crates. The man at the top of the picture is just under the warehouse roof. "The roof is the limit" in storage space, with this equipment.



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Fig. 17. Handling crated packages of chewing gum from packing to shipping room, at the Beechnut Packing Co., Canajoharie, N. Y.

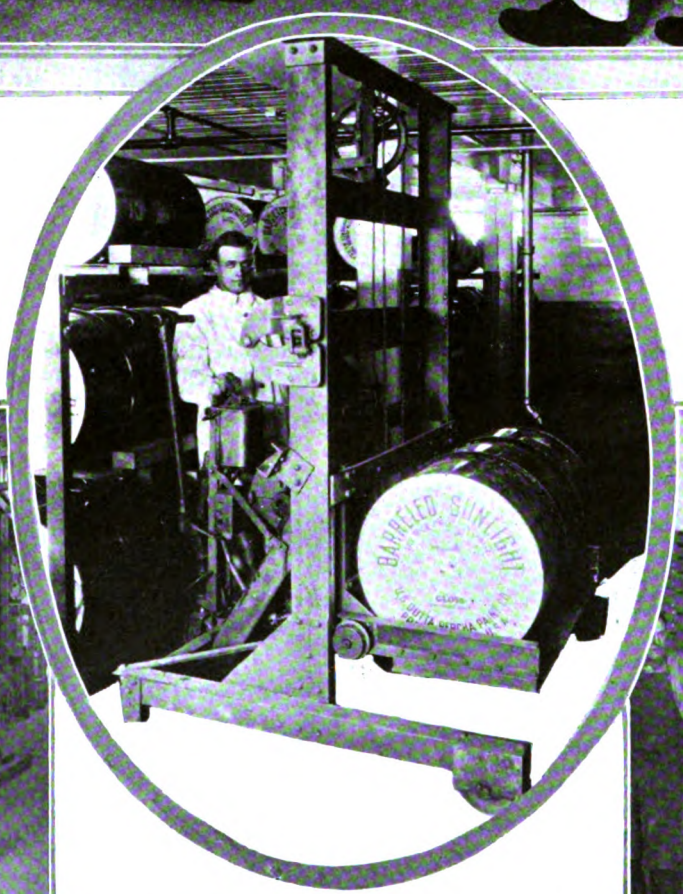


Fig. 18. This shows a special type of stacker, at the U. S. Gutta Percha Paint Co., Providence, R. I., lifting drums of paint into steel racks. The design allows drums to be rolled onto platform from the floor.



Fig. 19. These lift truck platforms are loaded with shingles. Note how they are stored in tiers, by means of the elevator in the background.

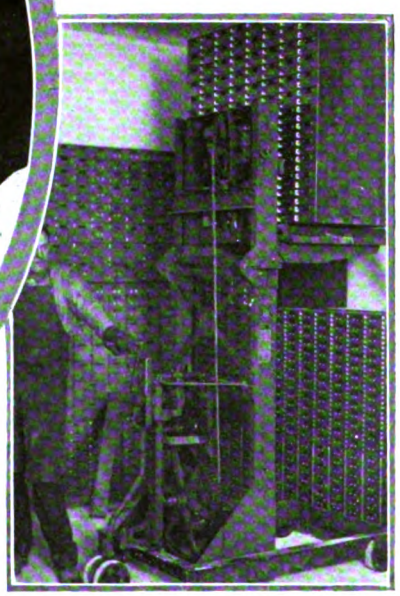


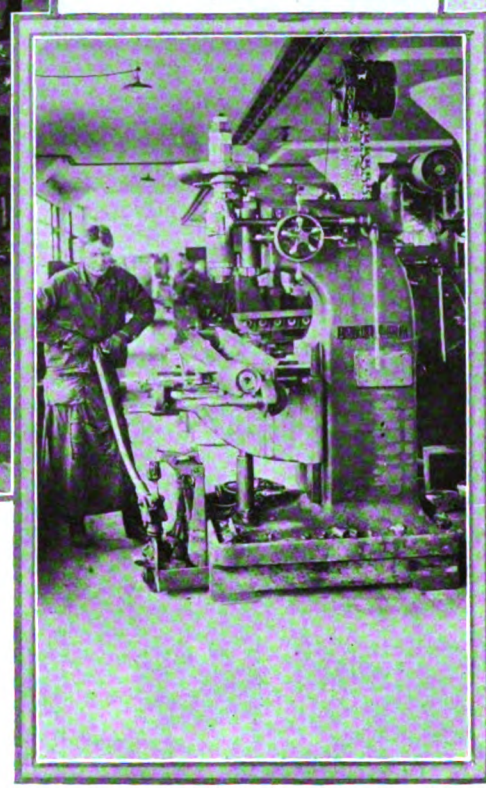
Fig. 20. These safety deposit box sections had to be moved from one vault to another. Vault space is costly, and the sections are heavy.

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Fig. 21. Here, loaded lift truck platforms are being stored in a balcony, by means of this electrically operated portable elevator.

Fig. 23. Below is another case where machinery assembly is carried out on lift truck platforms. The truck carries these from one department to the next, and through inspection and testing, to the shipping room. The platform finally serves as a base for the crate.



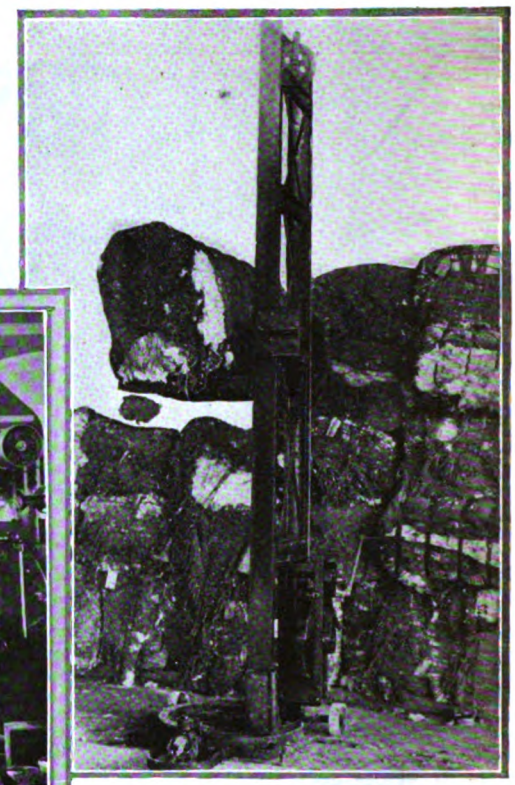


Fig. 22. The piling of large bales of cotton for outdoor storage is considerably simplified by the use of this revolving base portable elevator, with large labor savings.

Fig. 24. Below—Cotton bales are both heavy and bulky. By stevedore truck, a single bale is a good load, and much time is lost in successive handlings. Note here how four bales are piled on top of a simple but rugged platform in the first place; after which, it is a one-man job to move the loaded platform by means of a hand lift truck



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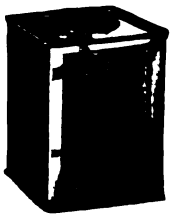
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Increase your plant's efficiency

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1 Make your concrete floors dustproof and wearproof. A treatment of Lapidolith, the original concrete floor hardener, will do the trick. Lapidolith is a liquid, chemical compound that may be applied to concrete floors as easily as water. It changes an easily worn out, dusty concrete floor to a fine, dense surface as hard as flint. A floor treated at night is ready for business in the morning. Lapidolith will give you permanently dust-proof, wear-proof concrete floors. It is effective on old floors as well as new.



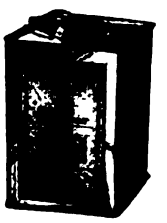


2 Protect your wood floors against splintering, rotting, or drying out. A dressing of Lignophol will add years of wear to any wood floor. Lignophol will work wonders with even an old, apparently worn out wood floor. It is a preservative dressing that penetrates the wood fibres and restores their natural gum and oil. It does away with all need for messy floor oils that do no more than lay the dust, and have to be applied again and again. One treatment of Lignophol will last for years. Lignophol preserves wood floors and eliminates future floor repair expense.



3 Cut down your painting bills. Cemcoat is a paint that will save you a great many repainting bills. It stays white long after other paints turn yellow, and may be washed again and again. It is especially suitable for brick, plaster, or concrete walls as it is not affected by the free lime usually found in these walls. It will not crack or peel. Cemcoat is made for both exteriors and interiors. It comes in white and colors.

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The Fisher Body Company's plant in Detroit. This concern has used Sonneborn products for years. Photo by MacGregor and Fallin.



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How Conveyors Help Ford Production at Highland Park

New Pictures of Latest Transportation Methods in World's Biggest Auto Plant

By Jervis B. Webb

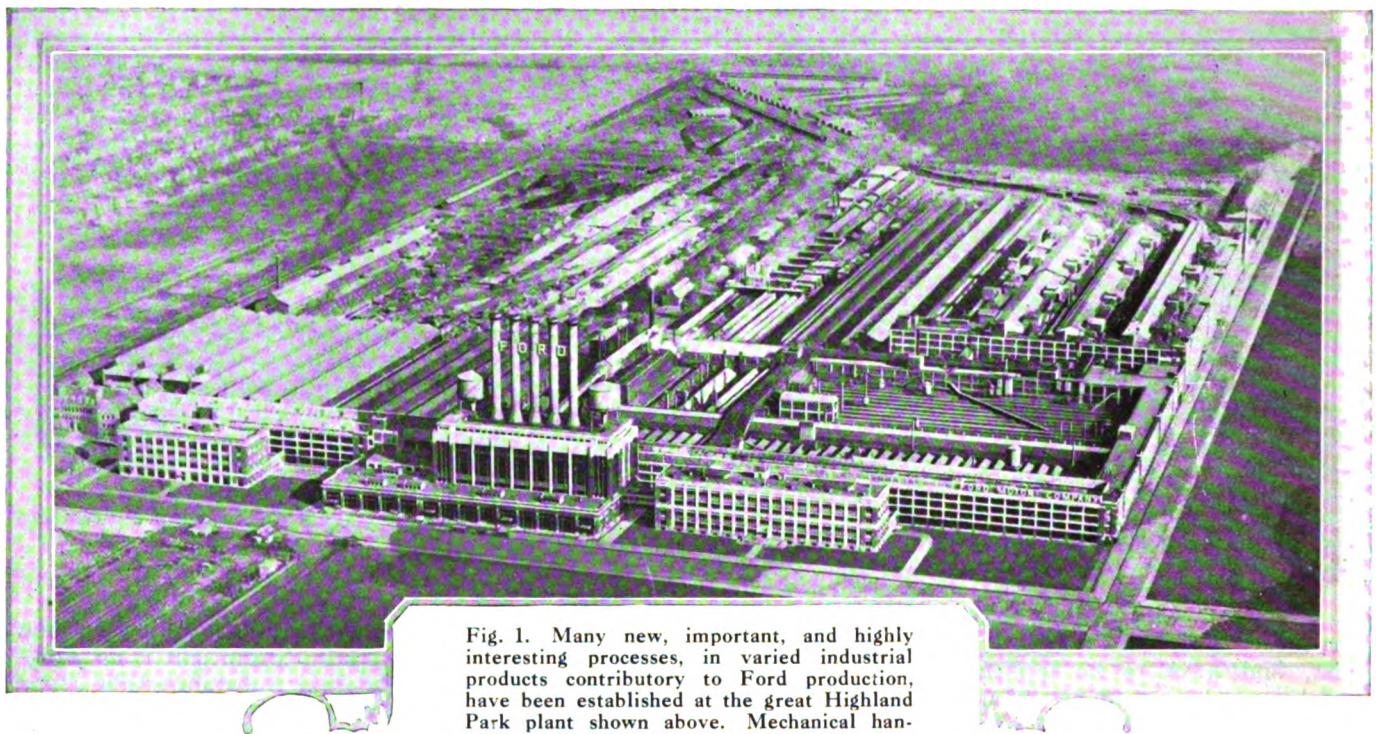


Fig. 1. Many new, important, and highly interesting processes, in varied industrial products contributory to Ford production, have been established at the great Highland Park plant shown above. Mechanical handling is the backbone of the process in each.

STUDY carefully the pictures on the following pages. They help to reveal the "secret" of Ford's supremacy as a manufacturer of motor cars.

This "secret" is nothing more nor less than doing things in the simplest and most direct way, with the least effort and confusion. To accomplish this end, Ford makes great use of mechanical transportation.

What he does in his industry, with mechanical transportation and handling can be done in nearly every industry under the sun. It is not confined to the making of motor cars.

In fact at the great Highland Park plant, nearly every conceivable industry is represented in the making of parts and apparatus that are essential to the car or tractor.

During the past three years the Ford Motor Company has taken over the making of a number of contributory products that were formerly purchased. In some cases this has been done in order to insure an adequate supply of accessories, parts or raw materials, and in others, to effect a saving in cost or to eliminate waste. In nearly all instances, however, the previous method of making has been altered to suit the Ford idea of moving production. How efficacious the new methods have been may be judged from the fact that in each case there has been a substantial reduction in net cost, in spite of the high Ford wage scale.



Fig. 2. A moving production line for electrical ignition cables. The wire ends are prepared and the terminal clips attached and soldered "on the move." Chain conveyors with lugs provide the transportation. This is considered a "light job" and enables the aged and crippled to earn a full day's pay.

Many of these new Ford industries—for each is really a little industry in itself—are located in the company's Highland Park plant. Room for them has been made available here by moving the motor machining and assembling to the River Rouge plant—now known as the Fordson plant. So that while the huge Highland Park plant is as busy a hive of human endeavor as it

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ever was, its activities have been changed to include many new products.

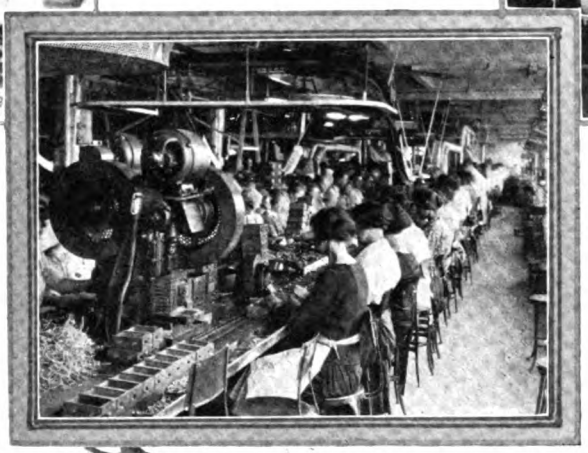
In examining the pictures which follow, which were especially taken for this article by the Ford Motor Company, the reader cannot fail to be impressed with the primary importance of transportation as exemplified in Ford practice. The work moves, but the workers stand, or sit still. Their energy is concentrated on necessary and not upon unnecessary movements. In every operation, mechanical transportation is predominant, and the means of effecting it are capably adapted to the purpose at hand. Thus, instead of the conveyor being a secondary aid to production, it becomes the primary requisite.

This same cost cutting power of mechanical transportation is applicable to many other industries as well as that of motor car making. This is amply proven by the following examples of practice which relate to products not necessarily classified as automotive.



Fig. 3. Above—Making ammeters on the move. Two assembly lines, such as this, with a total of 85 employees, including those on stamping presses, complete 10,000 instruments in eight hours.

Fig. 5. Below—The main assembly line of the vibrator coil department. Here the various units composing the complete vibrator assembly come together and are placed in the wooden coil boxes and sealed.



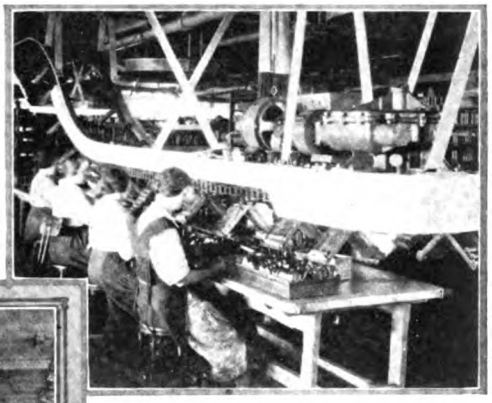


Fig. 4. Above—Vibrator coil operations are speeded up by means of the overhead car-carrier conveyor shown, which knits together through transportation, units and groups of operations otherwise necessarily separated.

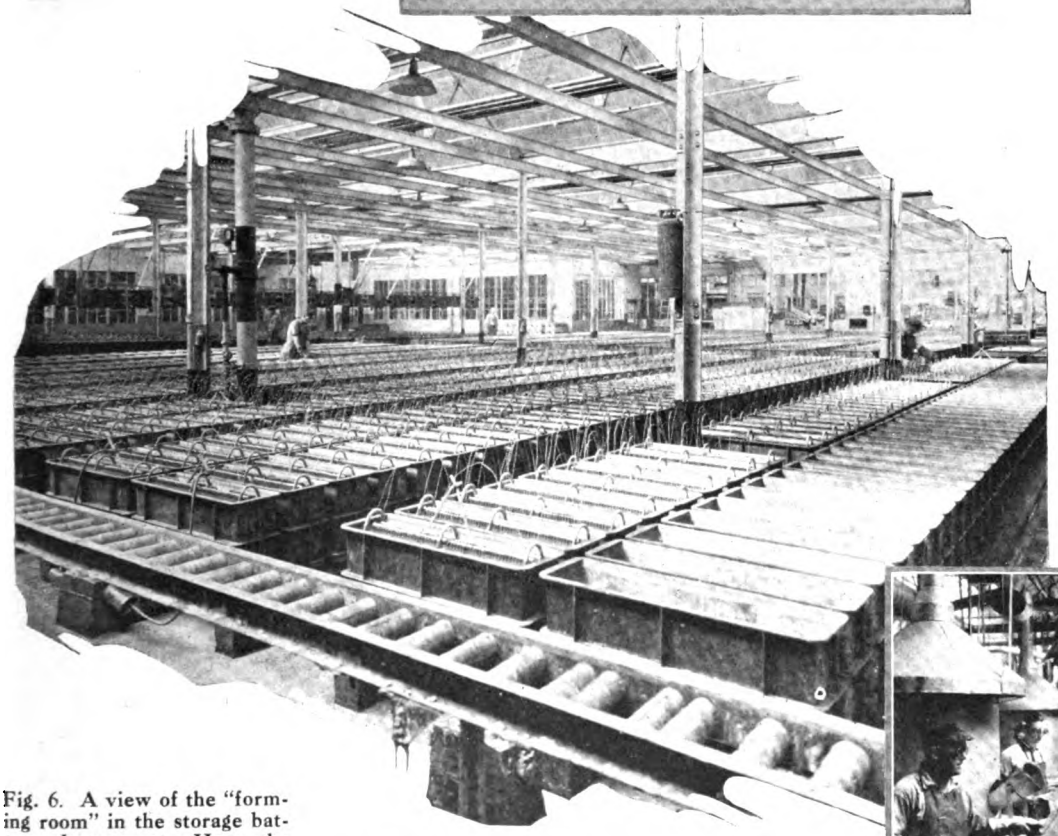
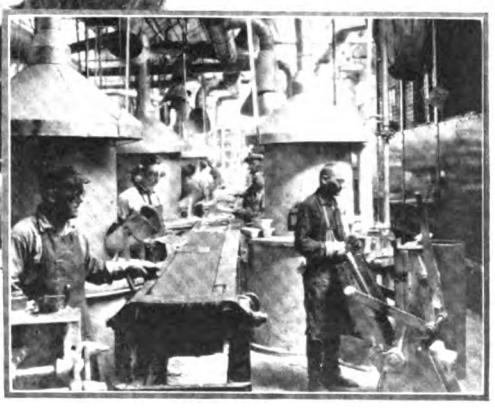


Fig. 6. A view of the "forming room" in the storage battery department. Here the plates, after being soldered to the connector bars, are subjected to a 48-hour charge. Note overhead tramrails for transportation.

Fig. 7. Belt conveyors provide the transportation at the lead melting pots and grid casting machines. Here the lead storage battery plates are cast in metal molds as shown below.



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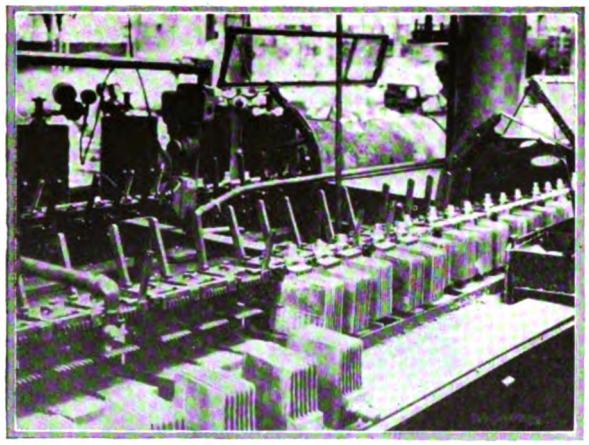


Fig. 8. A portion of the grid plate assembly conveyor where the battery plates are spaced and soldered to the connector bars. This conveyor acts as an assembling fixture as well as a means of transportation.

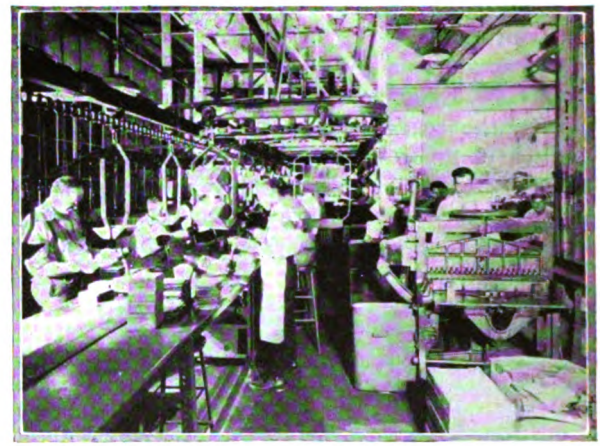


Fig. 9. A corner of the wood separator department in the storage battery department. The overhead conveyor takes the finished separator plates to the inspection department and thence to main assembly line.

Fig. 10. Below—Part of the main battery assembly line. Here the positive and negative grid units are put together with wooden separator plates between each pair. Note material feeding conveyor.





Fig. 11. Storage batteries nearing completion. At this point in the main assembly, the assembled plate units, with separators between the plates are placed in the battery boxes.



Fig. 12 As the batteries move along this table, on cables, hot asphalt is poured into them, sealing them in the boxes. There now remains but to add elctrolyte, and charge.

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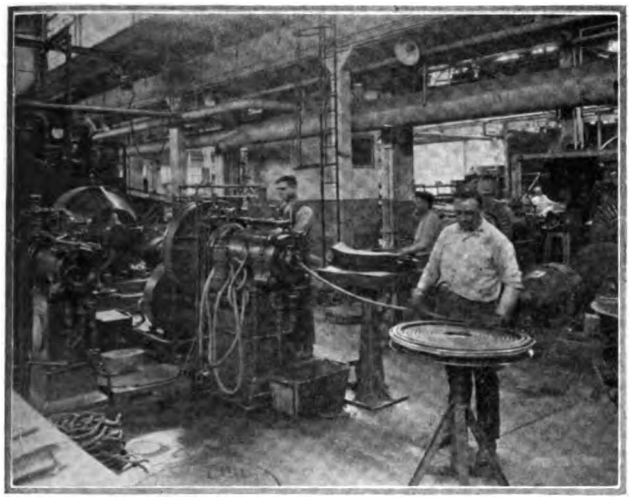


Fig. 13. The beginning of a Ford steering wheel rim. The rubber composition, known as "Fordite," is extruded from the machine shown above. At this stage it is plastic.

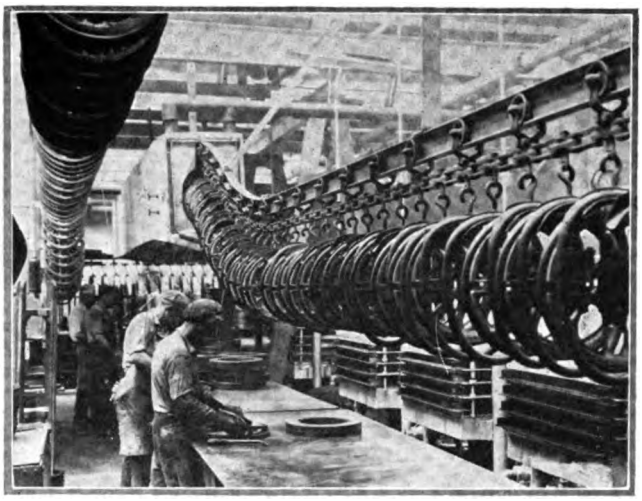


Fig. 14. Cut into proper lengths, the plastic rim stock is formed into rings which are placed on forms carried by the conveyor to vulcanizers and refrigerators.

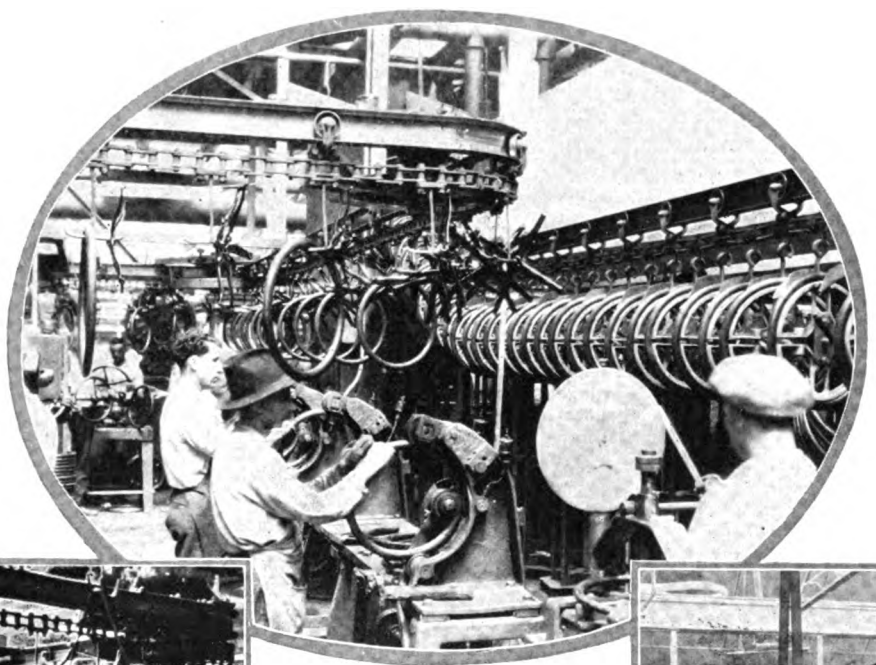


Fig. 15. The vulcanized rims are tested and trued-up in the devices shown above, before the spider is attached. Note the continuous overhead carrier.

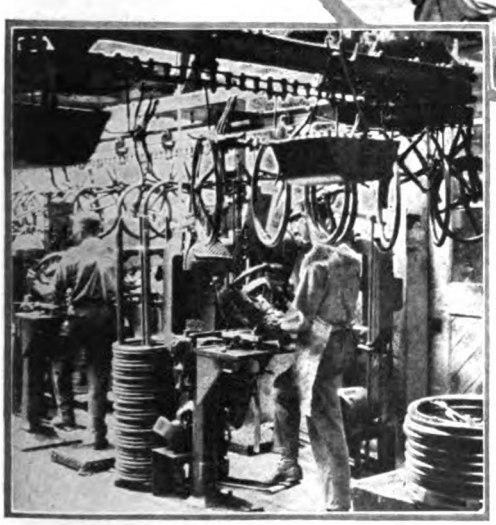


Fig. 16. Here the spiders are attached to the steering wheel rims. The work is delivered and taken away by the same overhead conveyor.



Fig. 17. More than 150 different composition parts are made for Ford cars and tractors. Here are some of the smaller Fordite parts being taken from the molds.

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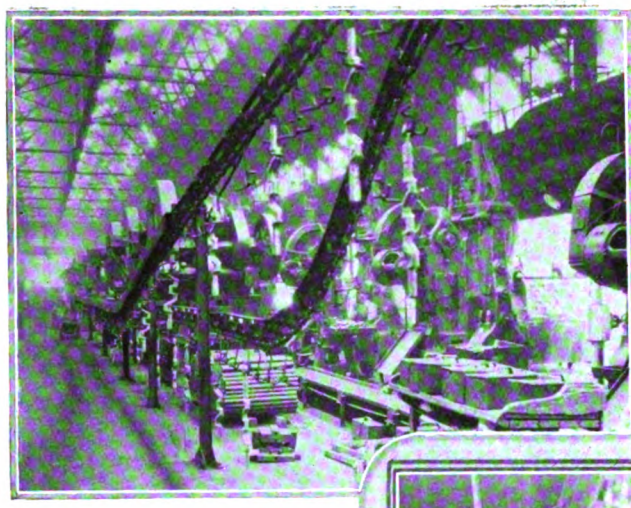


Fig. 18. Above—Crankshaft forgings, hot from the hammers, are cooled while being conveyed on this conveyor which also carries them to the trimming presses.

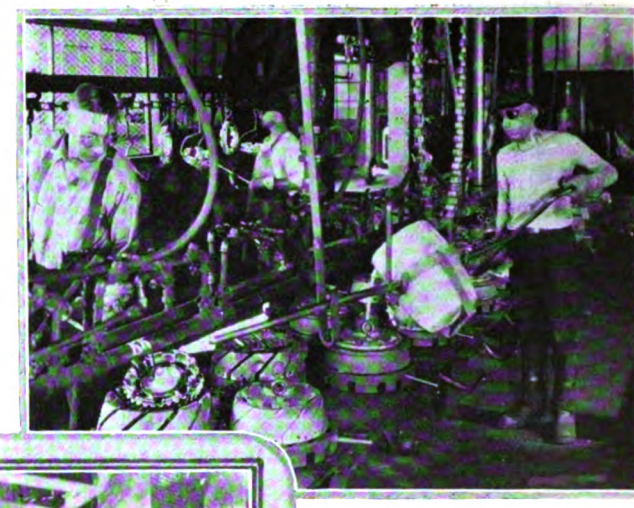


Fig. 19. Bronze worm gears are cast in permanent metal molds. As soon as the metal sets, the molds are opened and the gears placed on an overhead cooling conveyor.

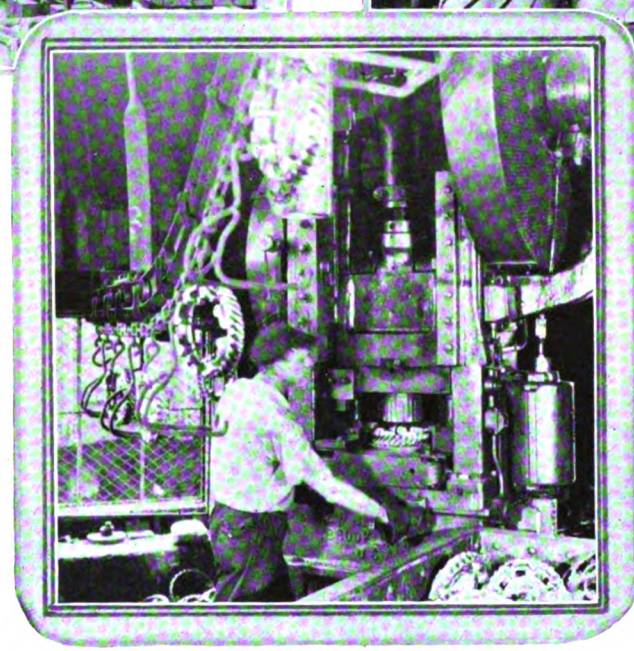


Fig. 20. Overhead conveyors carry the bronze gears to trimming presses where the gates are cut off. Then the trimmed gears are taken away on the same conveyor.



Fig. 21. Conveyor systems, such as used by Ford, are located with careful regard to convenience of the operators. Note the ease of machine loading exemplified above.



Fig. 22. Axle housings coming from the welders are cooled on the conveyor shown at the left in the above picture. Then they are transferred to the main assembly conveyor at the right.

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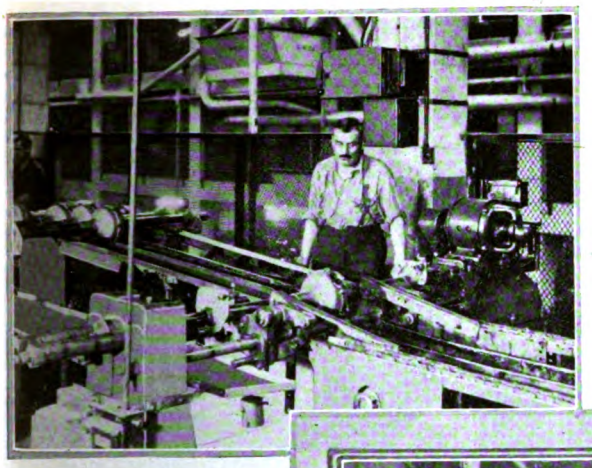


Fig. 23. Bearings are pressed into the axle housings as they pass this machine, all being done mechanically both as to conveying and pressing.

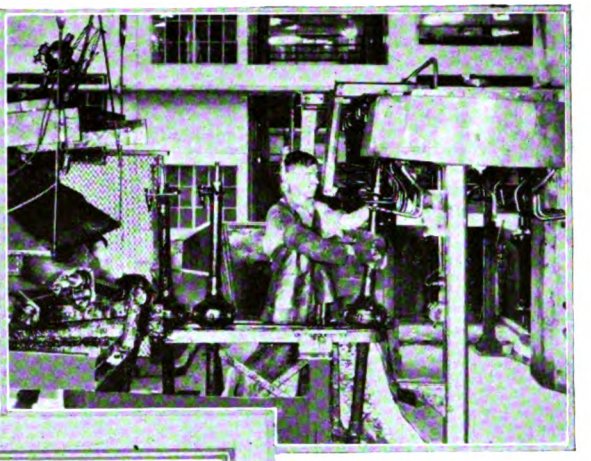


Fig. 24. Here the axles have emerged from the paint machine and are being attached to the final overhead conveyor system.

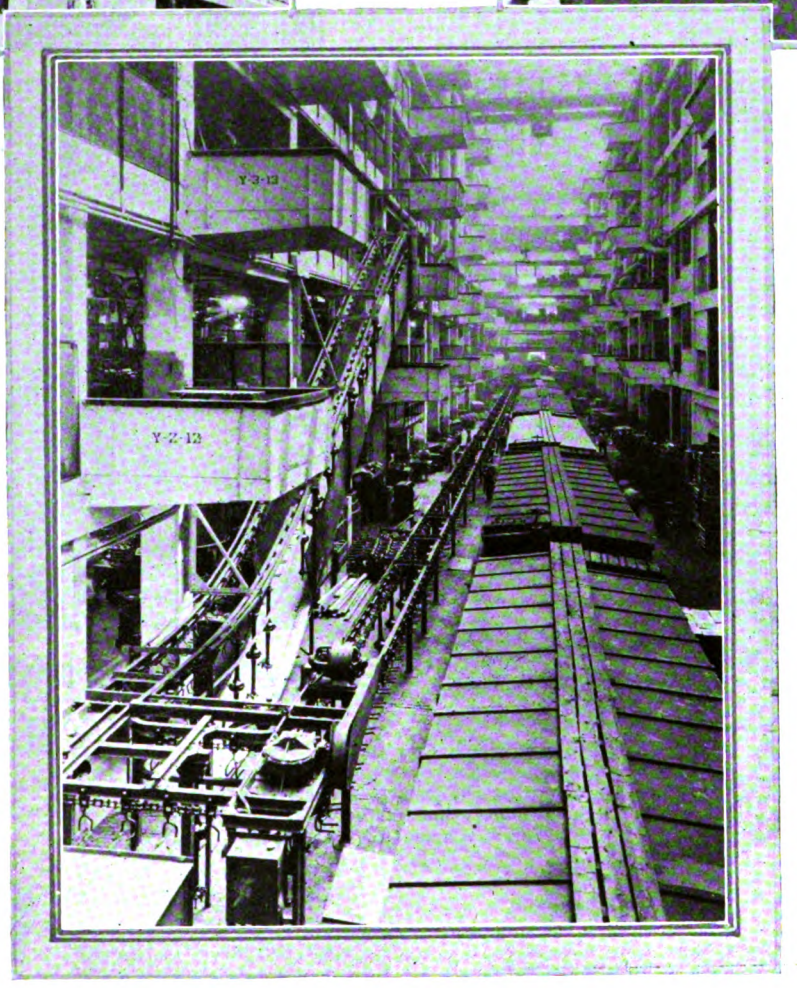


Fig. 25. The final conveyor in the axle assembly group carries the finished axles from the painting machine down to the car loading dock.



Fig. 26. Below—Cushions for Ford cars are made by the progressive plan, for which conveyors are indispensable. This shows the end of the cushion assembly line. Note belt overhead for supplying materials.



Fig. 27. Here is the start of the cushion assembly line. One would not think of cushion making as a mechanical job, but the use of conveyors, in the Ford plant, have made it highly mechanical.

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Fig. 28. At this point in the body assembly line, the body is elevated, by conveyor, so the operator can travel beneath it, on a lower conveyor, at the same speed, to work on the under part.

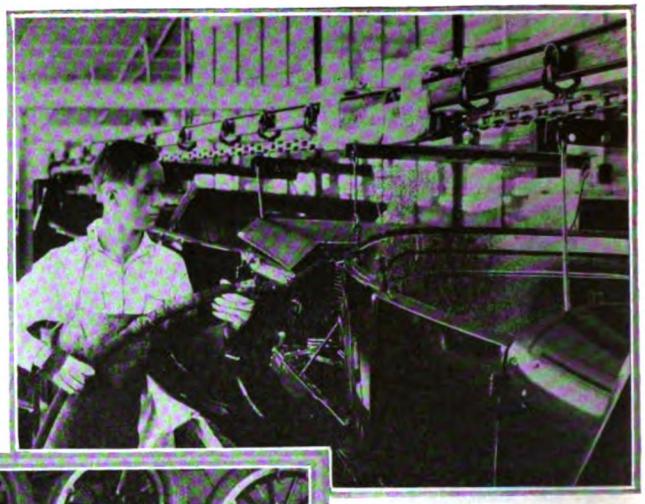


Fig. 29. The bodies receive their second coat of paint by means of a spray nozzle, while travelling along on the overhead conveyor system. Note yoke slings for carrying bodies.

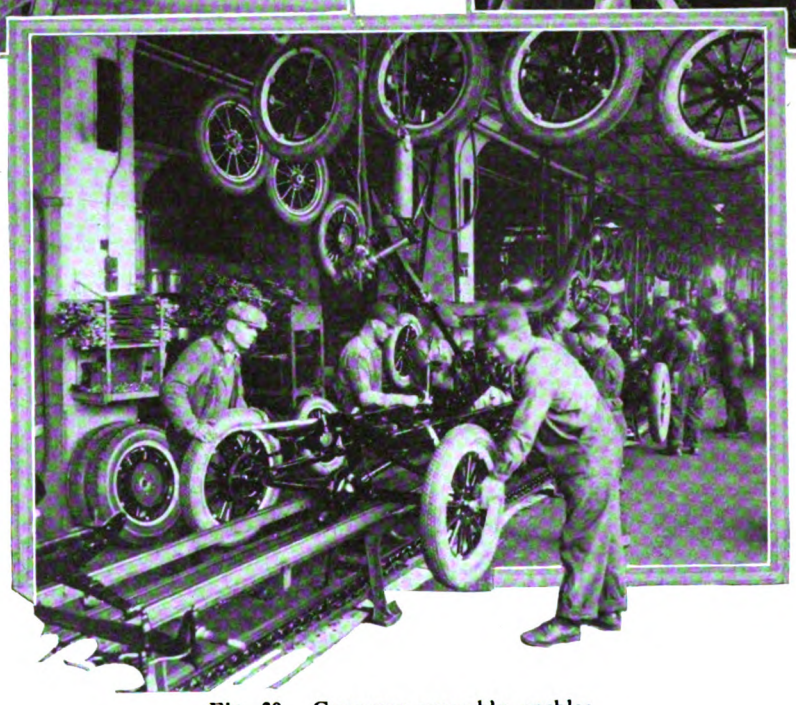


Fig. 30. Conveyor assembly enables all operations to be exactly timed. Note that the wheels are arriving at the assembly line at the proper place for attachment to the axles.

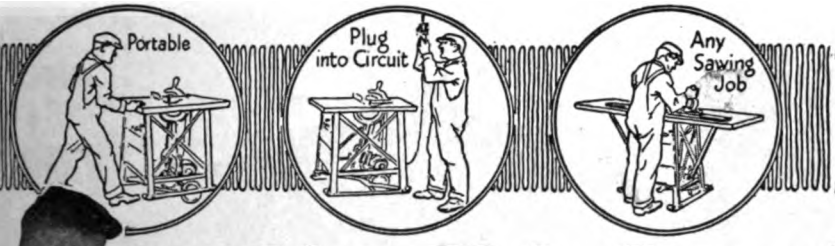


Fig. 31. One of the last assembly operations is the placing of the body upon the chassis. Bodies are delivered by one conveyor and the chassis on another. Here they come together.



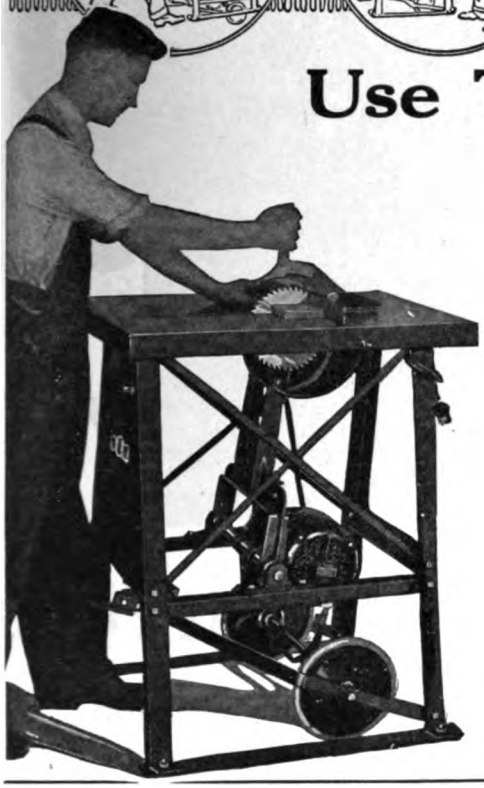
Fig. 32. The final delivery point for the Detroit district. Each car model is stored on a conveyor, a series of which are in this building. Cars are run off, as purchased, by merely pressing a button.

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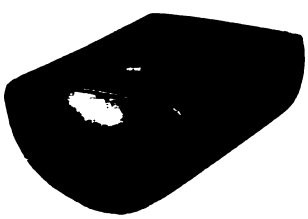
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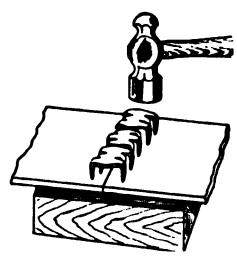
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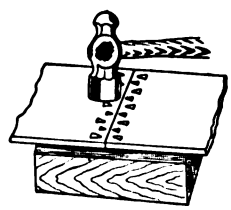
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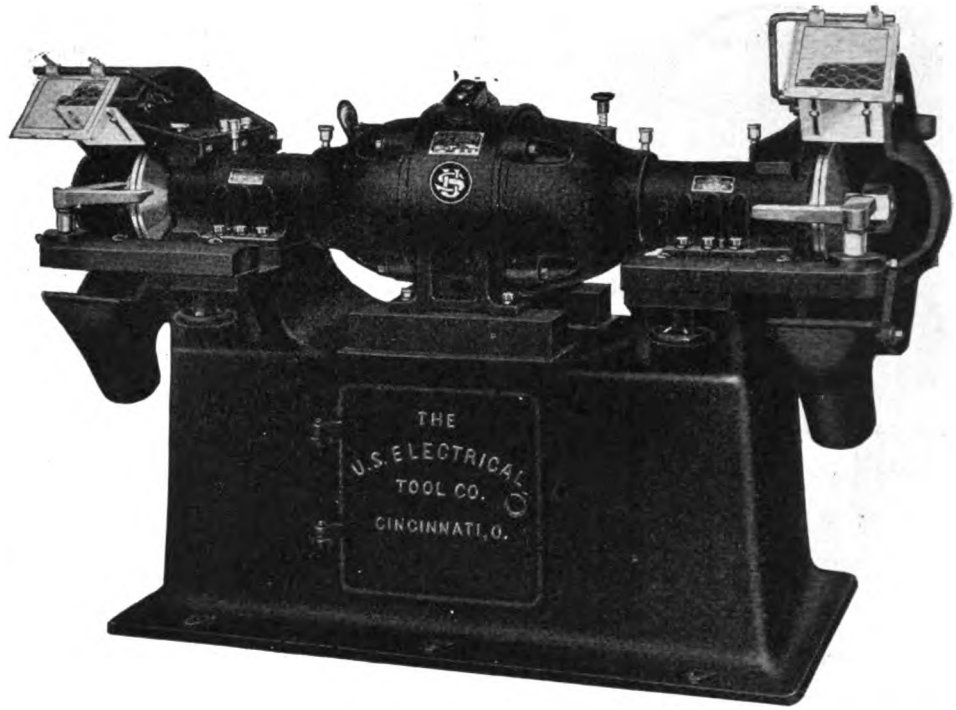
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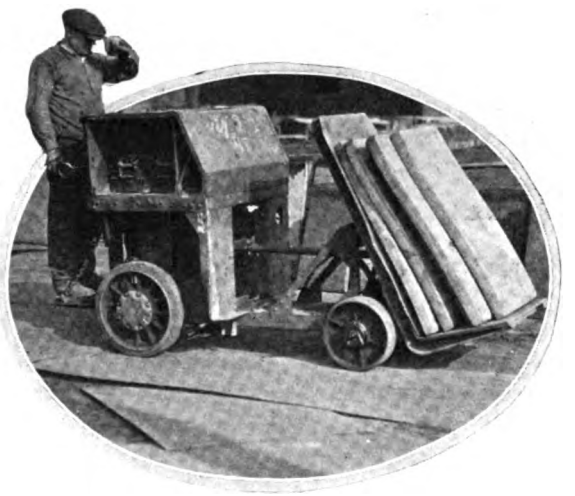


The Automotive Industries Make Wide Use of the Versatile Electric Truck

By Harold J. Payne

Of the Staff of The Society for Electrical Development

ORGANIZED industrial production hinges upon the proper synchronization of various activities among which the business of handling materials finds a place. Because the automotive industries lead in organization, it is logical that they should likewise lead in adopting effective methods and labor aiding equipment for this work of putting materials through process and assembly. It is estimated that close to 90 per cent. of the effort involved in turning out a motor car is required for doing so-called non-productive work—picking up and laying down parts for the innumerable operations required before fabrication can take place.



Figs. 1 and 2. Handling steel slabs manually is a slow and expensive job. The special chisel electric truck does the work of the crew shown above at higher speed and at minimum cost.

Since this group of industries leads, no field is more fertile of constructive suggestion to engineers and executives in other industries that are now being forced to devise new economies in manufacture. Keen competition and a changed labor situation can only be reckoned with effectively by continually multiplying the worker's output by placing at his disposal more power. At the moment it is the man pushing the wheel-barrow or the hand truck that needs to be helped more than any other if



Fig. 3. For moving flat strip in rods, coils of wire, fender stock, tire molds and other heavy doughnut shaped bundles, the ram truck similar to that shown above has proven especially well fitted. This particular unit is one of a fleet that earns 1,200 per cent. on the investment made.



Fig. 4. The high lift truck in capacities to six tons is winning great favor for handling heavy skid loads of material from car to storage and thence through process to assembly or shipping. Tiering of loads economizes floor space and does away with all avoidable rehandling.

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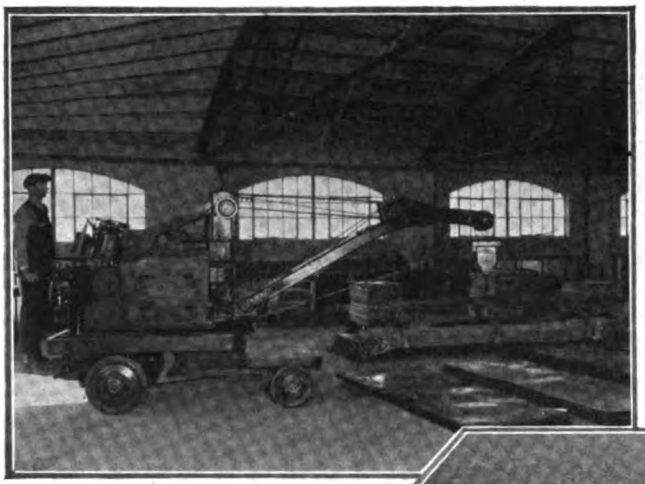


Fig. 5. For handling automobile sheet the crane truck with the special sling shown above is making a good record. This type unit is found useful in the service of the millwright gang—in one plant each truck is said to multiply the driver's capacity from 30 to 35 times. The hourly cost of operation of such a machine rarely exceeds 50 cents including interest, depreciation, maintenance and power.



Fig. 6. This is one of the recently developed low lift trucks, built in capacities to 4 tons. The automotive industries are in some cases going to trucks of 5 and 10 tons to multiply effective storage and manufacturing area and to boost the operator's capacity beyond the average figure.



Fig. 7. Hot heavy handling of forgings — in this case crankshafts—is a difficult job for any equipment. In the plant where this 3 ton low lift truck is used a saving of 18 men per unit is reported.

the unit cost of work done is to be held at its present level or reduced to a lower level.

For increasing the output of those who have done the heavy work of materials handling with manual tools in the past, many types of power operated equipment have been devised. Conveyors, cranes, tramrails. hoists, industrial railway systems, pneumatic systems, gas and electric trucks and tractors. Each in its place is best, but the place for each is not always easily determined.

Probably no single type of modern material handling

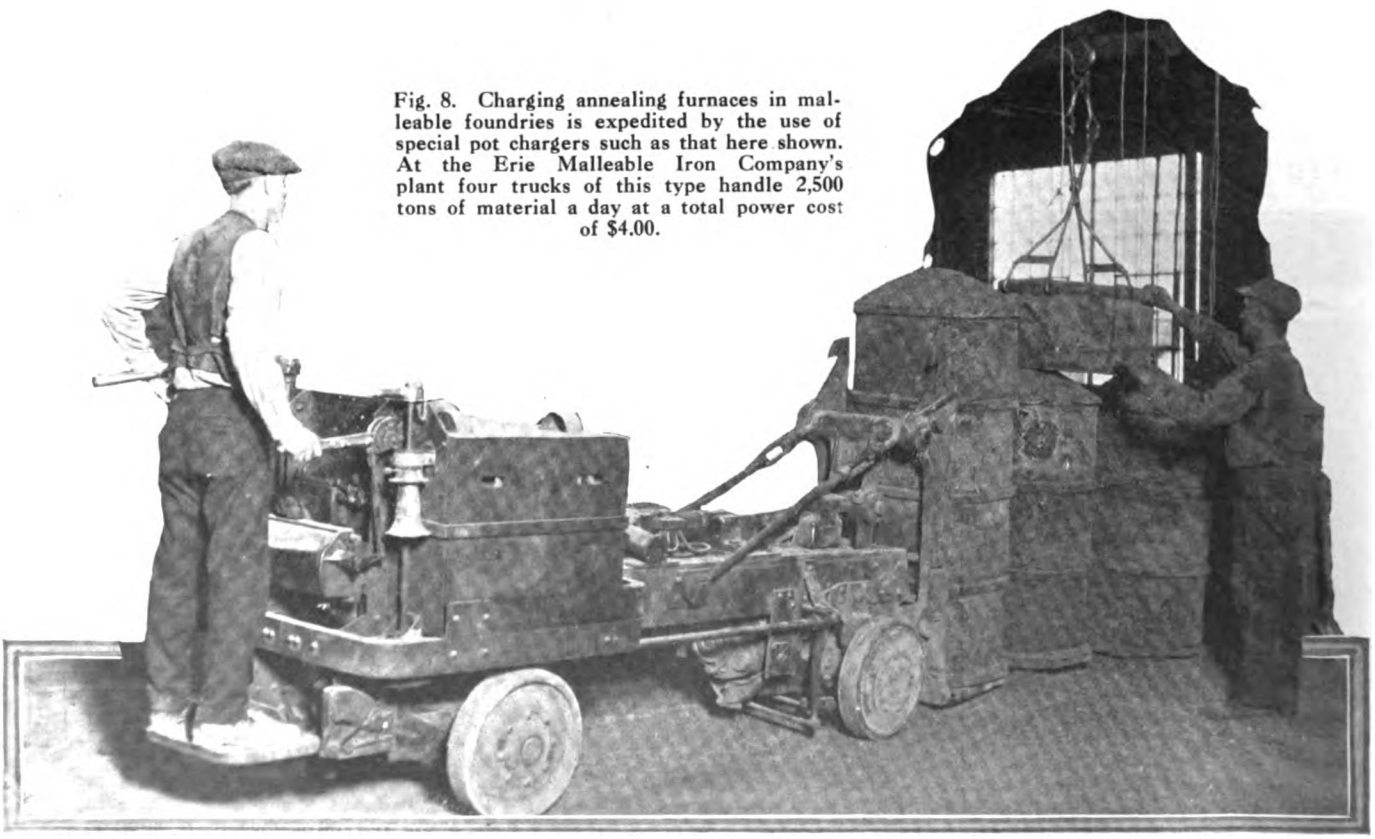


Fig. 8. Charging annealing furnaces in malleable foundries is expedited by the use of special pot chargers such as that here shown. At the Erie Malleable Iron Company's plant four trucks of this type handle 2,500 tons of material a day at a total power cost of $4.00.

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equipment is more versatile than the electric industrial truck. With its constant flexibility, its wide horizontal and vertical traveling range, its unquestioned dependability, this equipment is now to be found in progressive plants wherever material can be moved to advantage over the ground or floor. So in the automotive industries we find the ram truck at work in the strip and wire mills, the crane truck in foundries, building plants, wire mills and a host of others, the pot charger in the malleable foundry and the box charger in the heat treating plant. We find lift trucks carrying such varied materials as upholstery leather, plate glass, red hot



Fig. 9. Molds for steel castings are handled by this fork truck which with two jolting machines effected a saving in this operation amounting to the wages of 15 men. Such operations indicate the versatility of this equipment in the widest variety of conditions to be met.



Fig. 10. For hot loads the box skid with a bottom ventilated by old sections of boiler tube has been found useful—here shown in the plant of a leading automobile manufacturer.

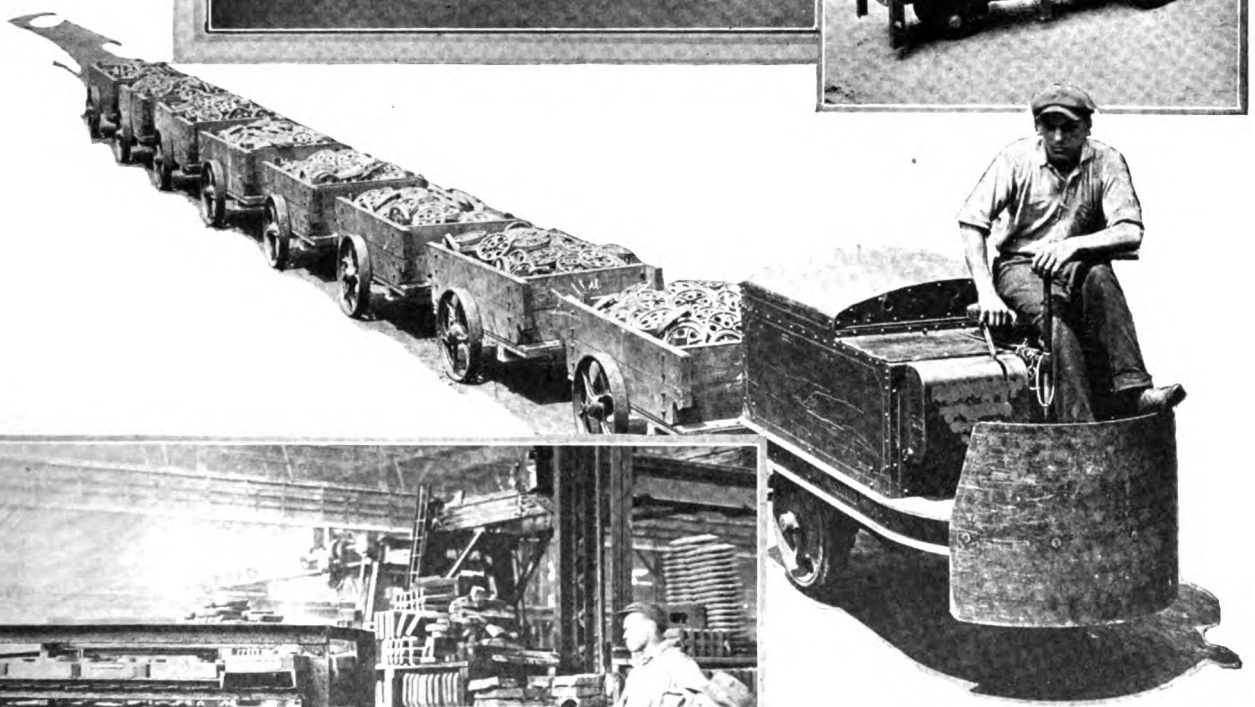


Fig. 11. The tractor-trailer method of handling finds many most profitable uses in automotive plants. Eight men could not accomplish the work done by this unit with like dispatch.

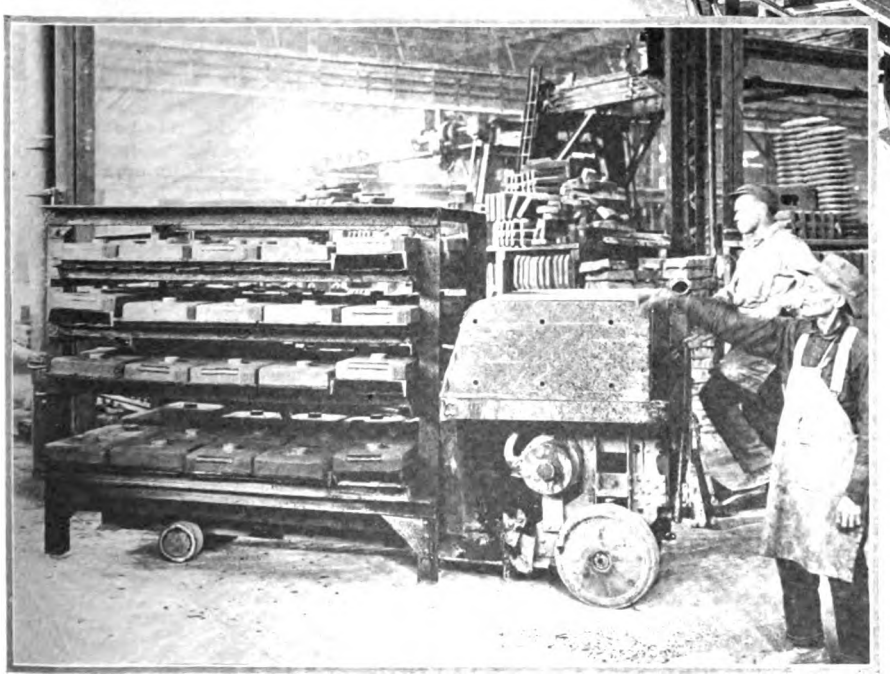


Fig. 12. Core handling in and out of ovens on rack skids similar to that shown here not only cuts down on the labor requirement but also results in a marked decrease in breakage of the product.

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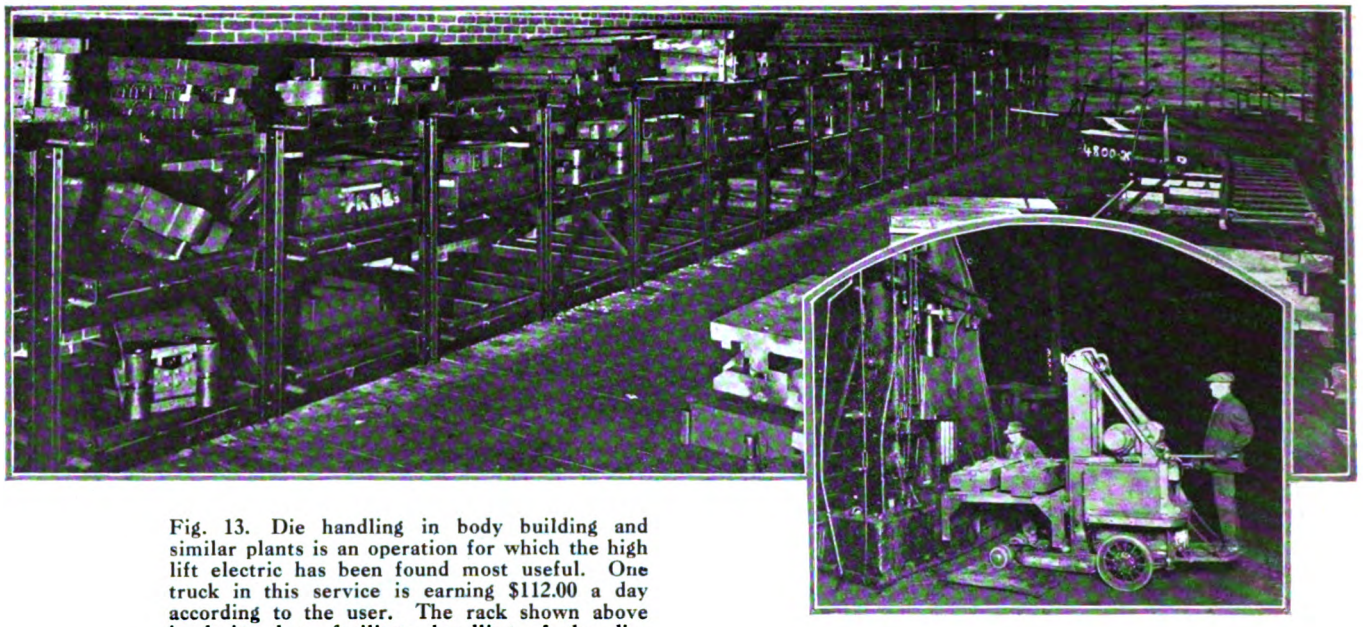


Fig. 13. Die handling in body building and similar plants is an operation for which the high lift electric has been found most useful. One truck in this service is earning $112.00 a day according to the user. The rack shown above is designed to facilitate handling of the dies which may run to six tons.

forgings, finished motor assemblies, tires and huge dies. We find tiering trucks carrying their loads to storage 10 feet above the floor, chisel lift trucks carrying slab steel, cradle trucks carrying heavy cases or bales, special purpose trucks picking up and moving tote cans or tumbling barrels as their unit load.

At the moment a trend is to be observed toward higher capacities in practically all types of the electric industrial—up to 10 tons in some cases. Even as there is this upward trend, there is another downward, if not in capacity then in dimensions to fit the power unit for carrying the skids that could formerly be moved only with the hand lift truck—having a clearance of only 6 or 7 inches. At the same time the most significant development of the skid shipment of materials in transit is taking place—born in the paper industry but now being fostered in the automotive field.

Wherever the electric is consistently used, remark-



Fig. 14. The tiering truck has now been perfected for lifts to 122 inches, carrying loads of 2 to 3 tons. Boxes and kegs can be effectively handled in and out of storage in this manner. Complete flexibility for horizontal work combined with this lifting feature fit this unit for many types of service.

Fig. 16. A crane that is completely portable, operating satisfactorily with little head room, carrying its load over a zig-zag narrow course if need be. Cases of plate glass, heavy plant apparatus, motors—these are a few of the materials handled advantageously with this unit.

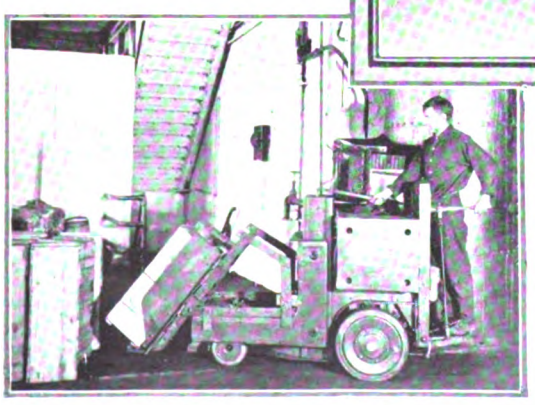
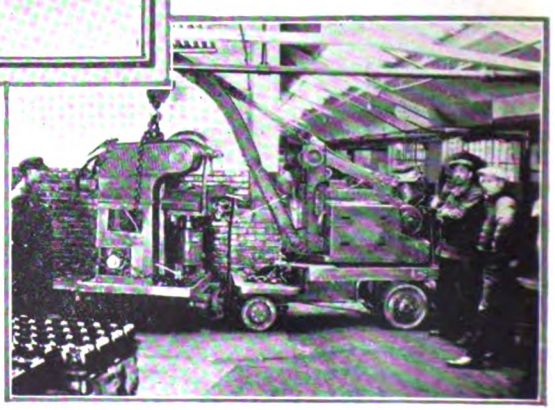


Fig. 15. The cradle attachment for this otherwise standard truck has been found worthwhile in handling heavy cases of bolts, hardware, etc., in the plant where this picture was taken. The truck is a high speed, high capacity power unit, similar in function to the hand truck.



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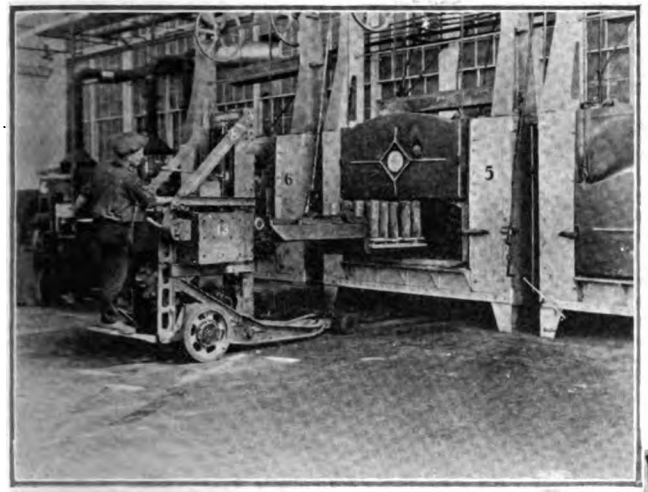


Fig. 17. Heat treating capacity of furnaces is multiplied by the elimination of idle time, made possible by the rapid transfer of the load in and out, without cooling. In automobile building plants the box charger similar to this increases the driver's capacity 6 to 12 times.

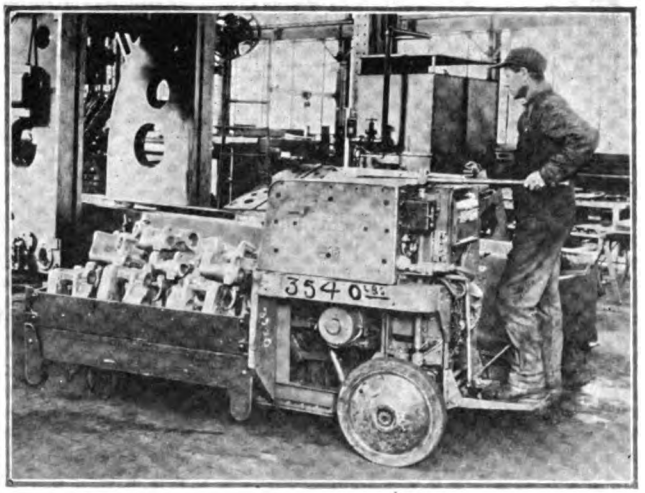


Fig. 18. Handling parts to be machined into and through the machine shop is common practice with this equipment. When the plant layout is changed, the equipment serves between the new points, thus retaining its full utility—above all the electric is flexible.



Fig. 19. Bulk materials lend themselves well to handling in dump bodies that may be built on skids, on trailers or directly on the truck chassis.

able savings are shown. While some such units are misapplied, it is more often true that the electric is not used where it might profitably operate. At a total hourly cost of operation, aside from the driver's time, of not more than 50 cents the average unit of this equipment increases the worker's production from 5 to 35 times. A flat strip handling operation is shown in which the equipment is earning 1,200 per cent. on investment; an automobile building plant reports a saving of from 30 to 35 workers for each of four crane trucks in millwright service; a high lift truck moving dies earns $112 a day. Seldom if ever in this field a single truck earns less than $6,000 a year. Appraisal of returns from the electric truck as from other types of handling equipment depends not only upon measuring the direct increase in output of the driver but also upon measuring the decreases in



Fig. 20. Picking up and moving tote cans, tumbling barrels, etc., without any rehandling whatever represents the modern trend in handling—a trend made possible by such units as this.

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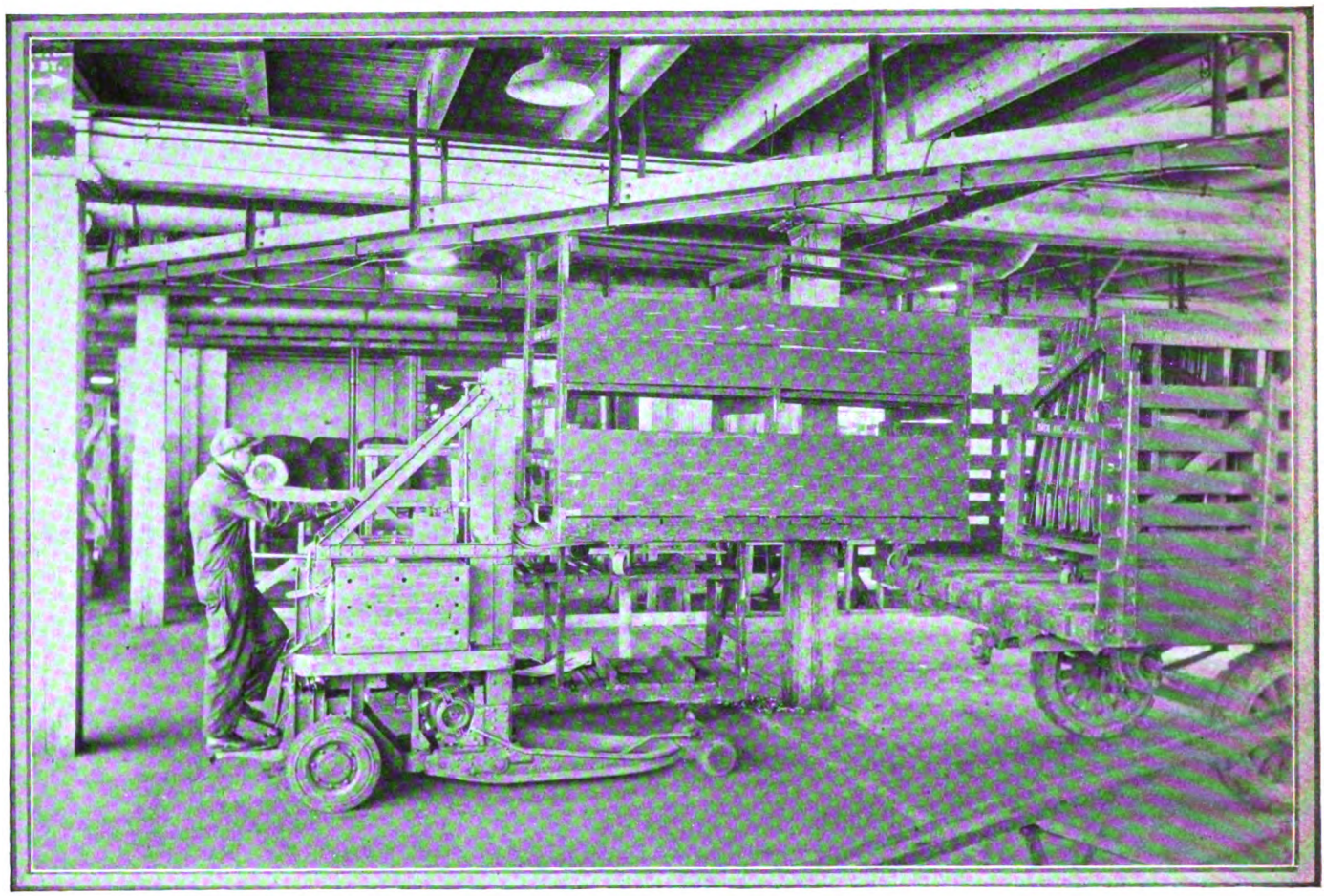


Fig. 21. Loading street trucks and railroad cars in the absence of a platform is readily possible through the use of the high lift truck. In this case live skids are being moved into the body of a heavy trailer for intra plant transfer. Frequently the per ton cost of handling is cut from 20 cents to 50 cents by substituting such a scheme for straight manual operation.

necessary manufacturing and storage areas, in labor turnover, in breakage or spoilage of product, in time lost by skilled operatives dependent upon the materials handling system, in inventories, in the cost of maintaining inventory records, in hazard to workers, in managerial overhead and the increased efficiency of equipment.

When equipment is sound in construction, economical in operation, certain in earning capacity, nearly universal in applicability, only time is required for it to come into its own. The electric industrial truck—in step with other types of modern materials handling equipment—is on its way to wider recognition and use. Sound organization in the light of present industrial economics points clearly to progress in this direction.

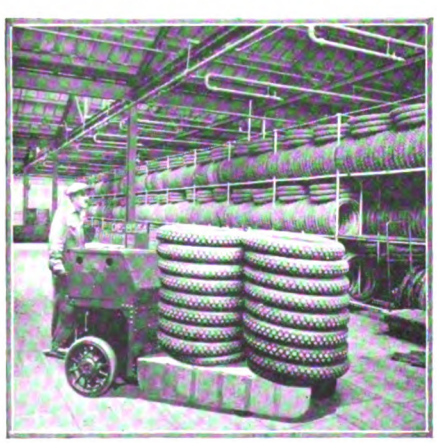


Fig. 22. The rubber industry is a leader in materials handling methods. One plant using 21 electrics estimates the saving made at close to a million dollars a year.

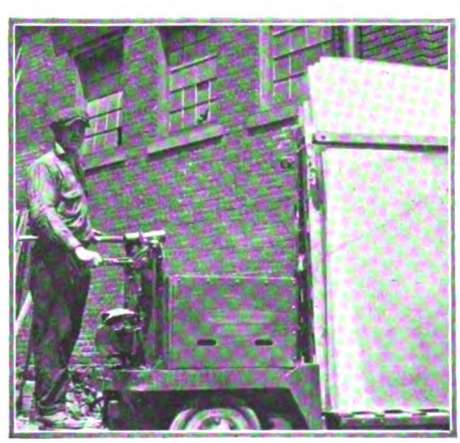


Fig. 23. Plate glass breaks readily but the rack skid shown here prevents jarring and the operation shown has found acceptance. A similar skid is used for handling the frames on which upholstery leather is sunned.



Fig. 24. Loads are readily moved in and out of freight cars on skids and at the present a significant development is the use of these skids for carrying materials in transit.

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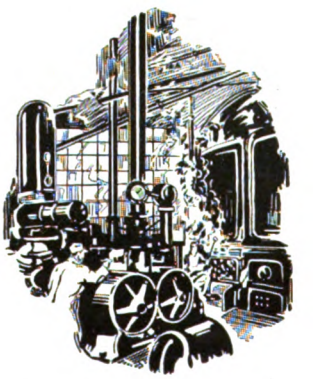
Have you found it?

You have some mighty hard problems to contend with and painting is one of them. Undoubtedly you have tried many paints—you're a little discouraged at the outcome. That is why we are bringing VALDURA to your attention.

You don't really need to test VALDURA, because it has already been put to the most severe tests peculiar to industrial requirements, but we want you to try it out and see for yourself how it will settle your painting problems for all time. And if it will meet your most difficult conditions, isn't it logical that it will take care of your other requirements?

Waterproof, weatherproof, alkali and acid resisting, VALDURA has proven again and again its ability to meet the most exacting conditions. The very nature of its base—99.5% pure Gilsonite Select Asphalt—qualifies it to meet the unusual demand made on preservative paint.

Let us send you a sample and give you further information.



AMERICAN ASPHALT PAINT CO.

844 Rush Street Chicago, Ill.

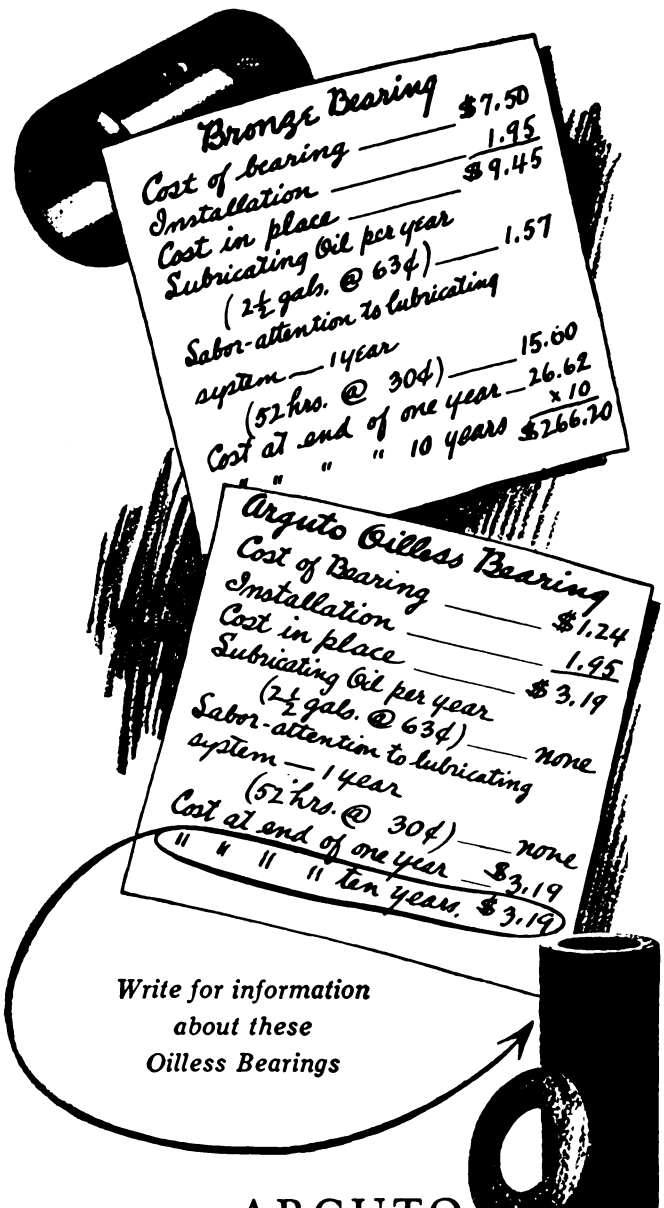
Factories: Lincoln, N. J.

Distributors all over the United States and Canada

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$263.01 saved by each ARGUTO OILLESS BEARING!

WHETHER you expect to be in business one year, ten years or twenty years from now, it will profit you to read the following cost records of two bearings. They were compiled from records taken on the same shaft, the same machines, speed and work.



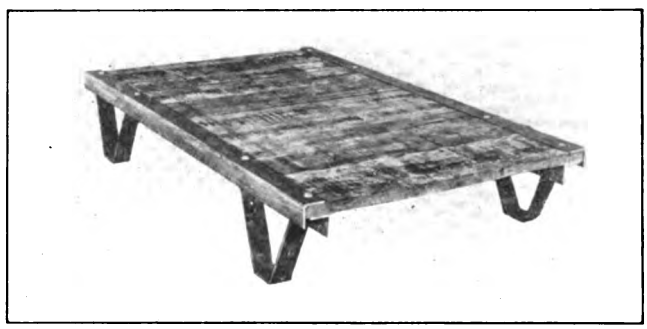
Write for information about these Oilless Bearings

ARGUTO
OILLESS BEARING CO.
Wayne Junction
Philadelphia

A Recent Development in Lift Truck Platforms

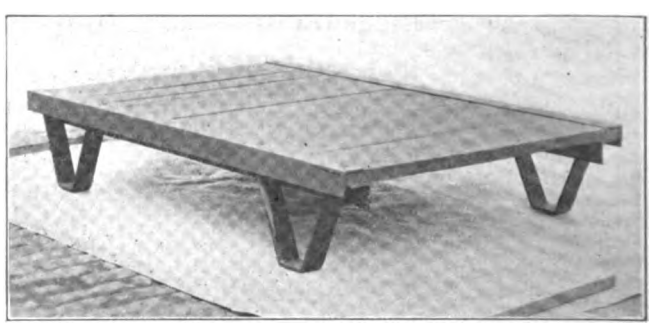
THE increased popularity of the lift truck system for handling materials on platforms has brought forth some interesting developments. Several millions of various types of platforms are in use today. Many users have resorted to makeshift platform constructions because it appeared that no standard construction was available.

A steel-bound platform was recently originated by Mr. W. R. Stuebing of the Stuebing Truck Company, of Cincinnati, Ohio, and patents covering the construc-



tion and trademarks protecting the name have been granted. It has many distinctive features that are claimed to make it the most economical platform unit and the most universally applicable unit known. The principal feature is the method of clamping the wooden top between the jaws of the two steel angle rails which gives a viselike gripping action that is said to result in extreme rigidity and strength.

The makers point out that this construction also makes the platform as flexible to changing requirements as a sectional bookcase, permits the instant application or conversion into bin types for handling small parts, stake types for long material, rack and table types, or the use



of crane hooks where the load is to be handled overhead during certain phases of production.

It is claimed that the design enables these platforms to withstand punishment, which would make kindling wood of ordinary types, and to carry with absolute safety 10,000 and even 20,000-pound loads.

This Stuebing product is being made by the Stuebing-Cowan Company with main offices and plant at Cincinnati, Ohio, and the Cowan Truck Company plant at Holyoke, Massachusetts, the latter company having been recently acquired by the Stuebing Truck Company.

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These Bronze to Bronze Seat Rings

Insure Tight Unions

The two Bronze Seats, ground face to face in a true spherical contact surface to insure tight seating, protects your steam lines even if one or two pipes become slightly out of line.

Dart Unions always stay tight—Bronze cannot corrode or rust. No matter how often you use the Unions, they'll stay tight.

We guarantee this unconditionally. If any Dart Union leaks through a defect we will replace it with two Dart Unions of the same size, without charge.

Ask for booklet.

E. M. DART MFG. CO.

Providence, R. I.

Sales Agents
The Fairbanks Co.

Canadian Factory
Dart Union Co., Ltd.
Toronto, Canada

DART UNIONS

Nitrose costs less to apply!









Right over wet surfaces!

Here's a big saving. A wet surface **is no** hazard for the man brushing on Nitrose **Metal** Coating. Nitrose sticks despite the moisture.

Right over rusty surfaces!

With half the usual surface preparation, **your** men apply Nitrose over rust. Only one **coat** needed. It sinks through the rust to the **bare** metal.

Right over oily surfaces

Oil and grease don't bother Nitrose **Metal** Coating—it grips the metal despite **them.** There's no substitute for Nitrose for **oily,** greasy surfaces.

Right over hot surfaces

Nitrose Metal Coating does not crack, **blister** or peel on hot surfaces. It resists heat. **It** can be applied while the metal is hot.

Give Nitrose Metal Coating a trial. **Get a** trial can or drum—see the glossy, black **coating** conquer corrosion—in your own **plant!** It's applied with a brush without mixing—and only one coat is needed.

THE NITROSE COMPANY

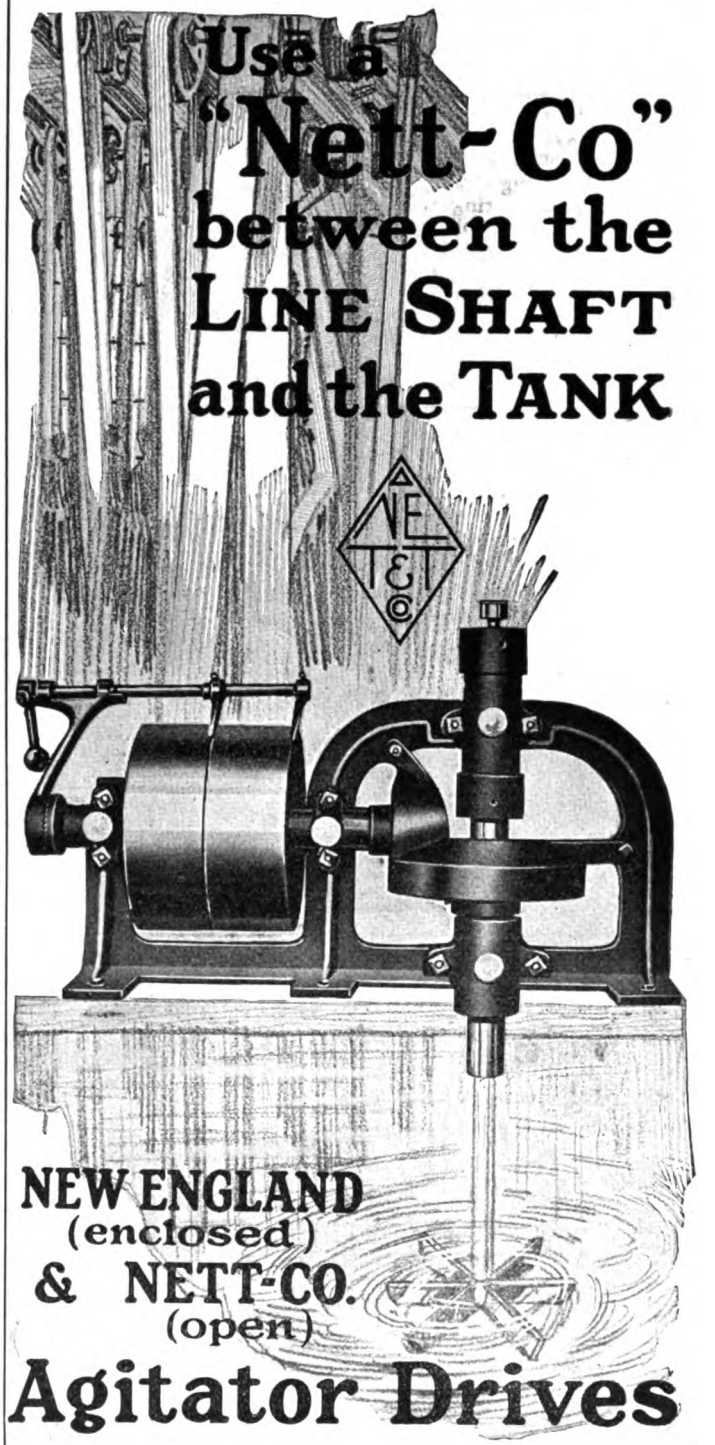
Peoria Life Building, Peoria, Illinois

See phone books for representatives in:

Chicago, Illinois
Cleveland, Ohio
Detroit, Michigan
Kansas City, Missouri
Los Angeles, California
New York City
Rochester, New York
Saginaw, Michigan
San Francisco, California
Seattle, Washington

NITROSE *Metal Coating*

IIS-Gray



NEW ENGLAND (enclosed) & NETT-CO. (open)

Agitator Drives

Standard Units for
All Types of Stirrers
Adaptable — Rugged
Simple—Trouble Proof

Send for Complete Specification Portfolio

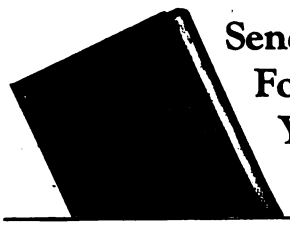
NEW ENGLAND TANK & TOWER CO.
EVERETT, MASS.
30 Church St., New York

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The Ideal
TRUCK CASTER

is one where dependence may be safely placed. Where long hauls, good floors and bad, leave little impression upon either caster or load.

Because Lansing-Company caster wheels are ball bearing (not disc) and anti-friction they roll more easily, quickly and smoothly. Replacement expense is costly. Because of the way they last—and wear—Lansing casters cut replacement costs, often a big item in many industries.



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KEEP YOUR PRODUCT ON WHEELS



No. 524



Lansing Casters



are made in many sizes and models. Rubber, fibre or cast iron wheels, single and double casters. If you want the latest general Lansing catalog.

Handling Cars

No time wasted — one man with a New Badger can spot cars quickly and easily. Handling equipment can be changed from one car to another with but little time lost.

The power developed thru the patented "New Badger principle" of compound leverage will move the heaviest of cars. A 30 day free trial will convince you.

Order from your jobber

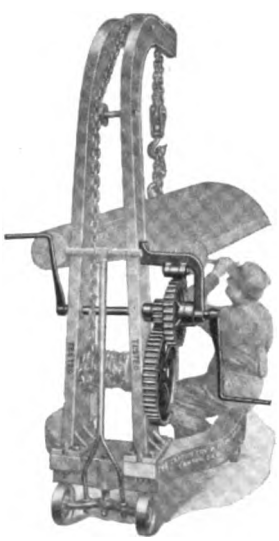
THE ADVANCE CAR MOVER COMPANY
934 E. John Street
APPLETON, WISCONSIN



NEW BADGER
SLIP PROOF CAR MOVERS

The "CANTON" PORTABLE CRANE

Does the work of six men, and in less time, too



The "Canton" Portable Crane, known as the "Handiest Tool in the Shop," is indispensable for the quick and economical handling of those heavy and awkward loads. It's an easily handled Hoist that goes quickly to parts of your shop where nothing else can reach.

Those who are using it tell us this "Handy Tool" does away with the six and eight man job—it saves them no end of time and labor—and that they wouldn't be without it for many times the cost.

These Cranes are made in various sizes and capacities and when desired, can now be furnished with the NEW SAFETY FRICTION LOAD BRAKE shown on illustration.

Shipped on thirty days' trial.
All good jobbers handle them.
Write for price and descriptive catalog IN.

THE CANTON FOUNDRY & MACHINE CO.
CANTON, OHIO
New York Office, 203 E. 15th Street

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They'll Report to Your Headquarters

Machines will *wire* you how they're running—if connected with Veeder *Magnetic* Counters. From the shop they'll send their production-reports to your office.

Visible on the dials over your desk—or at a centrally located Counter Board—you can *watch the records* and "boss" operations with this new

Veeder

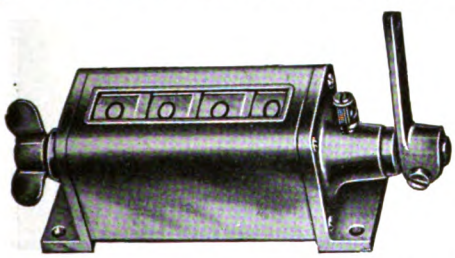
This "Form UM" Magnetic Counter counts operations or units of output, from any distance that wires connect with machines.



Installed in your office, it indicates work being done by the man and machine out in the factory.

Mechanical contacts on your machine make and break the electrical circuit which operates the counter. The electro-magnetic drive can get its current from your regular lighting circuit (direct current, 110 volts), or from storage battery.

The *Revolution Set-Back Counter* below records the output of any machine where a shaft-revolution indicates an operation.



Goes directly on machine; non-magnetic. Sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as required. Price, with four figures, as illustrated, $10.00—subject to discount. Large Set Back ROTARY RATCHET COUNTER to count reciprocating movements where these count the product, $11.50 (list). Cut ½ size.

Write for the full-line Veeder booklet

The Veeder Mfg. Co.

31 Sargeant Street, Hartford, Conn.



Metzgar Wheels Keep Trucking at Highest Efficiency

Notice the solid End-Wood butcher-block construction of this Heavy Duty Wheel.

Built and Guaranteed

to stand hard and long-enduring service.

No Floor Too Bad

where Metzgar Wheels will not stop further damage.

No Floor Too Good

for Metzgar Wheels to protect and keep in perfect shape.

Made In All Sizes

to fit any caster-fork, warehouse truck, platform truck, lift-truck or trailer, and the worse the condition the better they apply.

Write for booklet and learn why it is cheaper to use Metzgar wheels for all replacements and on all new equipment than to do without them.

Metzgar Co. Inc.

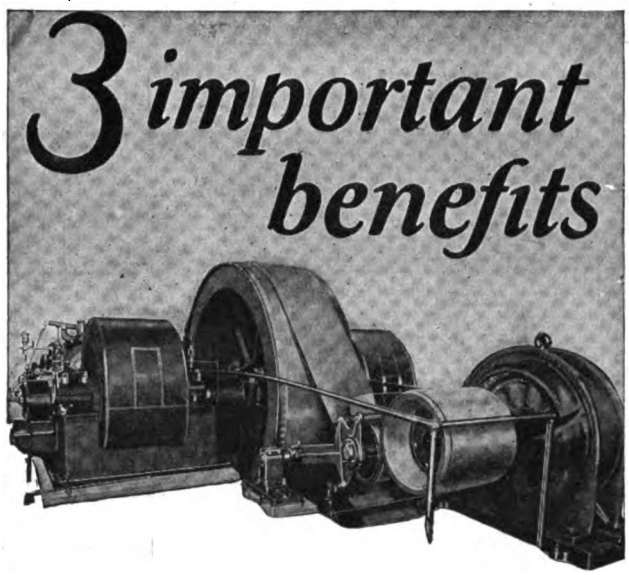
GRAND RAPIDS, MICHIGAN, U. S. A.

METZGAR

End-Grain Wood

WHEELS

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Take any drive. Increase the power, save floor space and save belting and you have accomplished something. That's exactly what the Lenix did for the Huron Light & Power Co. It increased the capacity of the same unit 25% and saved 31 ft. of floor space and 62 ft. of belting. Mr. Ward, general manager of the company, tells the story in the following letter:

"We have this drive in operation on a 300 H.P. gas engine belted to a 225 kilowatt revolving field type alternator. We were able to shorten our belt centers approximately 31 ft.; this has meant a great saving to us in room and permitted room for an additional unit. The drive has also been very helpful by eliminating belt slippage and belt troubles generally, increasing the capacity of the unit about 25%, as it has also increased the life of our belt. We are highly pleased with the operation of this drive from that standpoint as well as the saving of space."

The saving in belting alone on this drive was more than sufficient to pay for the Lenix and when you add to that the saving in floor space and the 25% increase in capacity, you can readily see where the Lenix made a handsome profit for this company.

Our engineers have installed more than 6000 Lenix Drives ranging from 1 to 1400 H.P. Each one solved some problem. All their experience is at your disposal. Why not take advantage of it?

Send for Catalogue

F. L. SMIDTH & CO., Inc.
50 Church St., New York

The LENIX DRIVE
TRADEMARK REG.

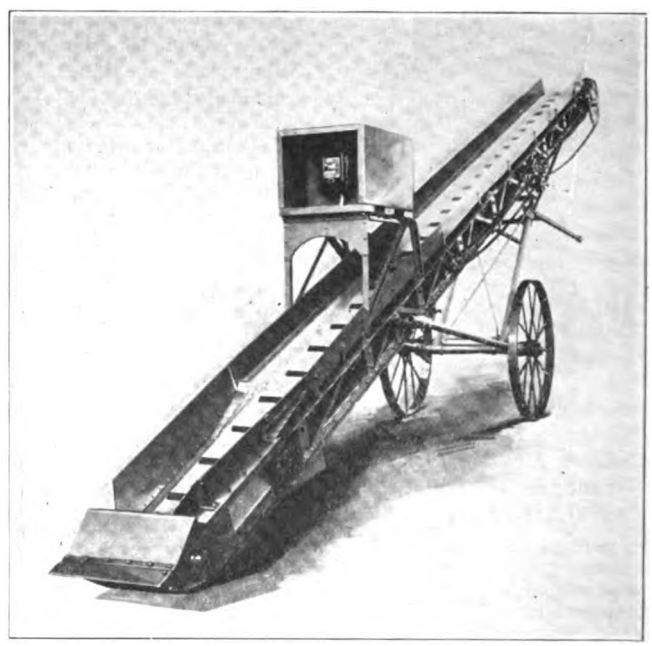
An Improved Type of Jeffrey Portable Conveyor

THE Jeffrey Manufacturing Company, of Columbus, Ohio, has recently put on the market an improved type of Portable Belt Conveyor for handling sand, gravel, crushed stone, bricks, tile, boxes, coal, coke and similar materials.

The improvements are designed around the idea of providing a machine more suitable for road construction service, building material yards, and industrial plants where it is desired to handle materials from hopper bottom railroad cars to storage piles or trucks, and for reclaiming from storage piles.

The new features consist of four important developments:

1. Steel side boards which are bent to extend under the side of the belt forming with belt a moving trough which provides larger capacity and prevents lumps from rolling off.
2. An improved type of carrying idler to support the loaded portion of the belt.
3. An extended and flared loading leg at the bottom, edged with belting material to form a seal with the moving belt. The flared hopper also centers the load on the conveyor.



4. An efficient gate at the foot of the conveyor to prevent material from falling into the enclosed boot housing.

The conveyor is built in 18, 24 and 30 foot lengths, and is furnished with electric motor or gasoline engine. A screw adjusts the elevator to any convenient height. Different holes in the pipe struts allow wheels to be adjusted forward or backward to balance the load. The foot of the conveyor is low so that it will readily enter a pile of loose material. Foot pulley has aligning screws to bring belt in center. Belt furnished is 16" rubber covered, troughed.

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Coal Bills go Down *when the* SARCO goes in



Keep condensate out of the radiators and you greatly increase the heating efficiency of all the fuel consumed.

The Radiator Trap Sarco automatically expels condensation without the loss of any of the heating medium.

It prevents noisy, airbound, water-hammering radiators and ensures maximum heating effect all the time.

Radiator Trap SARCO

is adjusted at the factory for vacuum and steam pressures up to 20 lbs. It has heavy, substantial brass castings, free from blowholes and defects.

Is easy to clean. Elements can be lifted out without affecting the adjustment, as they are not attached to the body or cap.

Booklet R-127 gives additional features. Send for it.

SARCO CO., Inc.
183 MADISON AVENUE, NEW YORK
Buffalo Chicago Cleveland
Boston Detroit Philadelphia
Peacock Bros., Ltd., Montreal

Planing the Point



If you had known about this before

You might have saved some of those belts. But now you can get the last drop of service out of *every* belt.

Our new booklet tells you how to do it, and makes it a *simple* job. With this booklet it's an easy matter to keep every belt in the pink of repair. And we know the G. M. will be tickled pink when you repair to his office with the results. Send for the booklet and pass it on to your belt man.

OAK BELTING TRADE MARK

Chas. A. Schieren Company

Tanners
Belt Manufacturers
31 Ferry Street, New York

CHAS. A. SCHIEREN COMPANY,
31 Ferry Street, New York

Gentlemen: Please send me one of your booklets, "There's money in this for you."

Company Name.....

Address .....

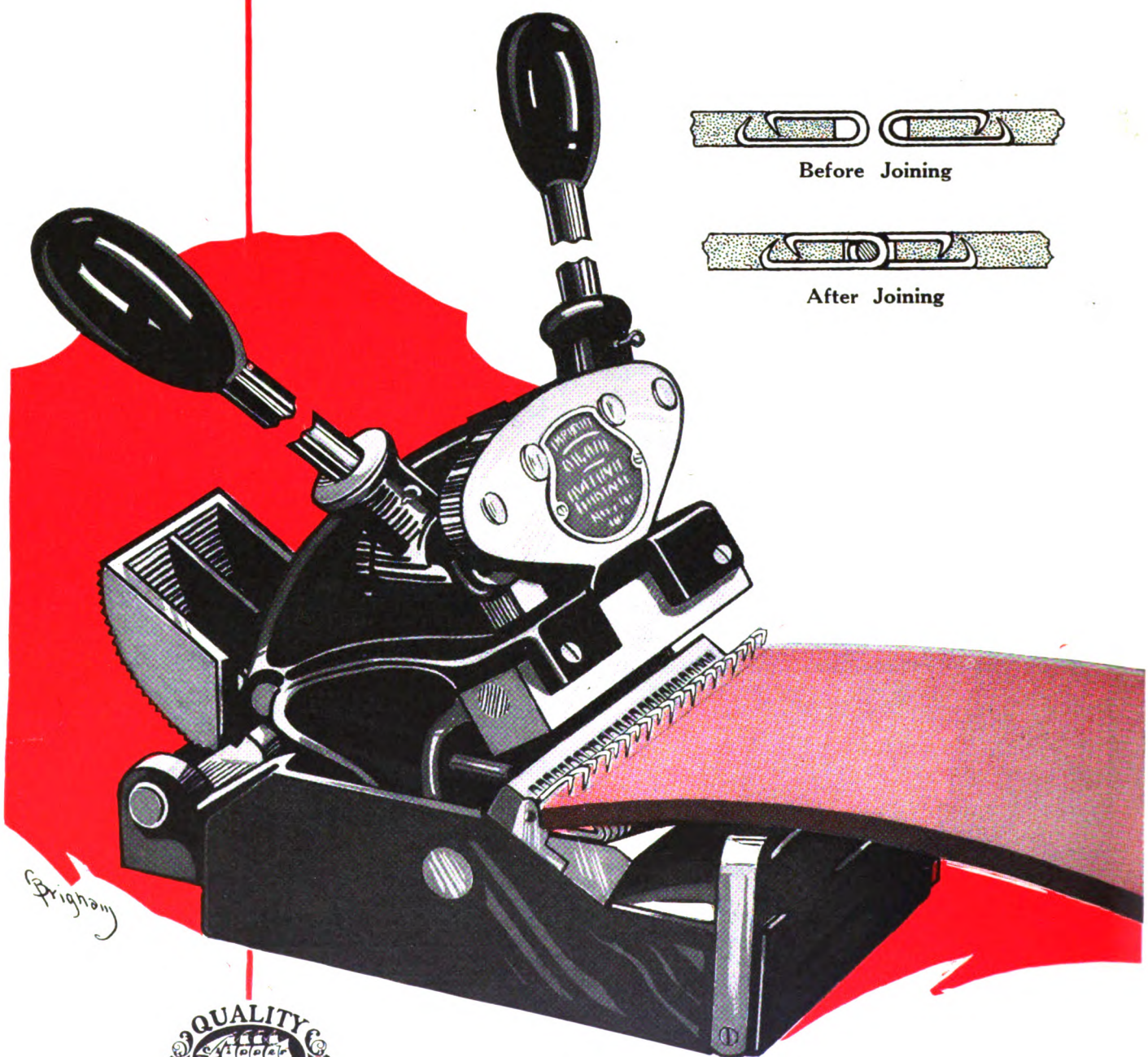
Individual .....

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Join with

Before Joining

After Joining



QUALITY Hood BELT LACING

For products not advertised in this issue write Industry Illustrated

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Clipper Lacings

In nearly every branch of manufacturing the proper connection of joints is a problem worthy of serious consideration—and each manufacturer has his own individual joint problem.

Practically every factory man is familiar with the present accepted method of joining machinery belts with Clipper Lacings. He recognizes the superiority of Clipper Hooks, Clipper Pins and the Clipper Lacer.

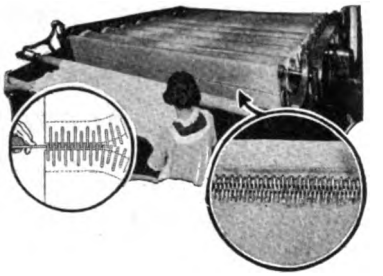
But why apply the wonderful efficiency of Clipper Lacings only to belts? A Clipper Lacing can be used with equal success in many other cases where flexible materials require a smooth, firm, quickly joined connection.

Study the joints in your factory equipment or in your product itself and consider them in terms of Clipper Lacings. Experiment with your Clipper Lacer where you now glue, nail, rivet or sew. You may find in Clipper Lacings, as many have already found, an ideal solution to your joint problem.

We will be glad to cooperate with manufacturers in the application of Clipper Lacings to their purposes.

Clipper Belt Lacer Company
GRAND RAPIDS MICHIGAN

New Uses Found for Clipper Lacings



How the Laundry Industry "Joins with Clipper"

Clipper Lacings are rapidly replacing old methods of joining Laundry Aprons. Inestimable savings in time, efficiency and costs are being made.

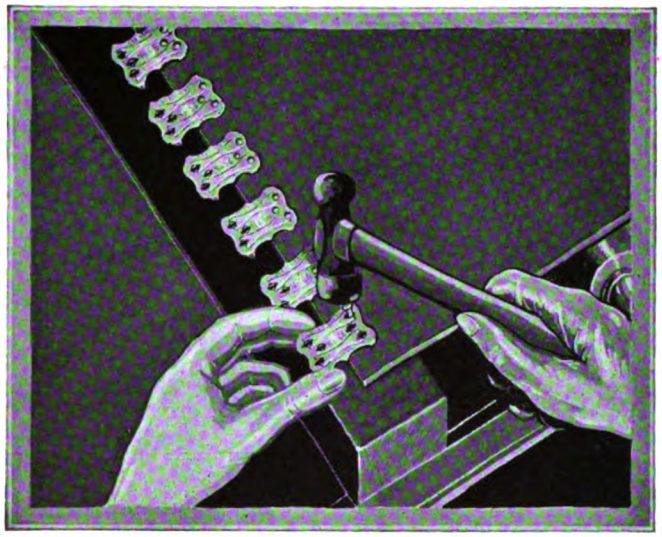


Clipper Lacings Prove Invaluable in the Automotive Field

Automobile accessory manufacturers sought a smooth, flexible inexpensive lacing for Blowout Boots. Clipper Lacings proved exactly suited to the purpose.



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Standard Self Aligning

Belt Fasteners

Eliminate Time Losses and Reduce Belt Trouble on Conveyor Belts



Use Standard Self-Aligning Belt Fasteners on your transmission belts; it will pay you.

"Eliminate time losses and reduce belt trouble."

By using Standard Self Aligning Belt Fasteners Special Rust Proof No. 66 for 6 to 10 ply Conveyor Belts any width.

You can't go wrong.

Self Aligning hold the plate firm and square on the belt while Rivets are being driven.

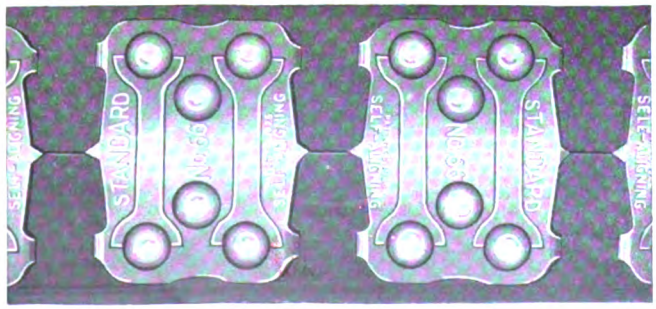
It is not necessary to use a Rivet holder. Nibs in the rivet hole align the rivet lengthwise of belt, the right way.

Self Aligning No. 66 are rust proof and last indefinitely in wet or damp places, and you don't throw them away every time you take up a belt.

You need not turn your heavy wide Conveyor Belt over to clinch. Rivets may be clinched by driving against a block of metal on the under side of the belt.

Send for sample fastener for comparison with what you are now using.

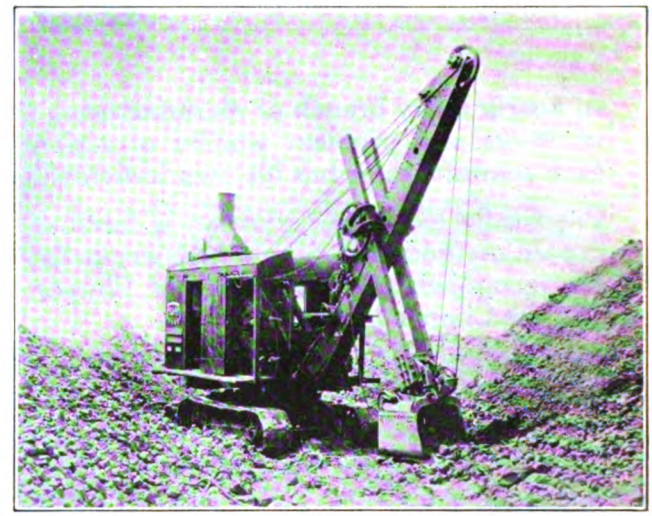
THE BOURNE-FULLER COMPANY
UPSON WORKS
UNIONVILLE, CONN., U. S. A.



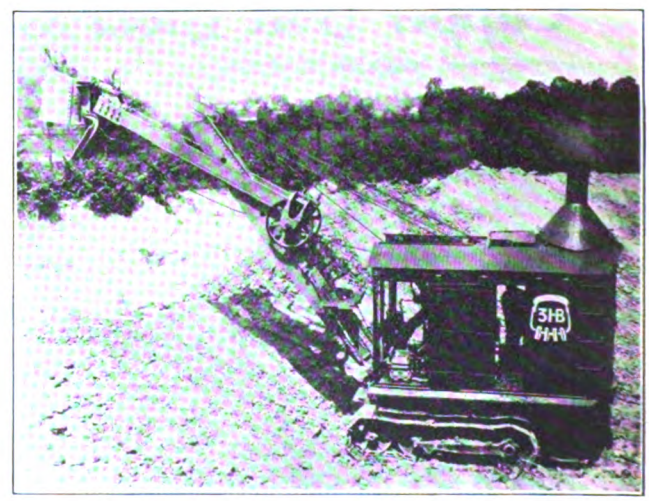
A New 1-Yard Shovel

BUCYRUS COMPANY of South Milwaukee, Wisconsin, has recently announced a new Bucyrus Steam Shovel, the 31-B. It is a one-yard full revolving shovel for contractors and general use, and two views of it are shown here.

Speaking of this new Bucyrus, Mr. G. A. Morison, Vice-President and Secretary of Bucyrus Company, says: "Close contact with shovel users in the field has shown that the excavating tool most in demand today is a one-yard shovel with very definite qualities; accordingly, we have built the 31-B to meet these conditions. The over-



all dimensions of the shovel are no greater than those of most ¾ yard shovels built today, but this new Bucyrus is a real 1-yard shovel, built from caterpillar track to boom sheave for work with a one-yard dipper. Thus built, the clearances of the shovel are such that it can manouver in and out of odd corners handily and work to advantage in extremely narrow cuts. The rear end radius



is just 9′ 6″. This with the strength for any sort of digging on any job that a small revolving shovel might be reasonably asked to do and the dipper capacity of one cubic yard will, we believe, make the 31-B a most efficient tool for general excavation.

"The Standard machine is built to cut a wide level

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The Lift Truck with the Maximum Load Stability

Plimptons are the *only* trucks fitted with steering knuckles, providing maximum width of wheel base,—perfectly cradling the load.

They are the *only* trucks whose wheels are perfectly aligned with platform legs providing maximum clearance with minimum lift.

They are the shortest trucks on the market; lower and raise vertically, and require the least operating space.

Plimpton Trucks will definitely lower your handling costs. Write for particulars.

The PLIMPTON LIFT TRUCK Corp.
Elmcourt, Stamford, Conn.

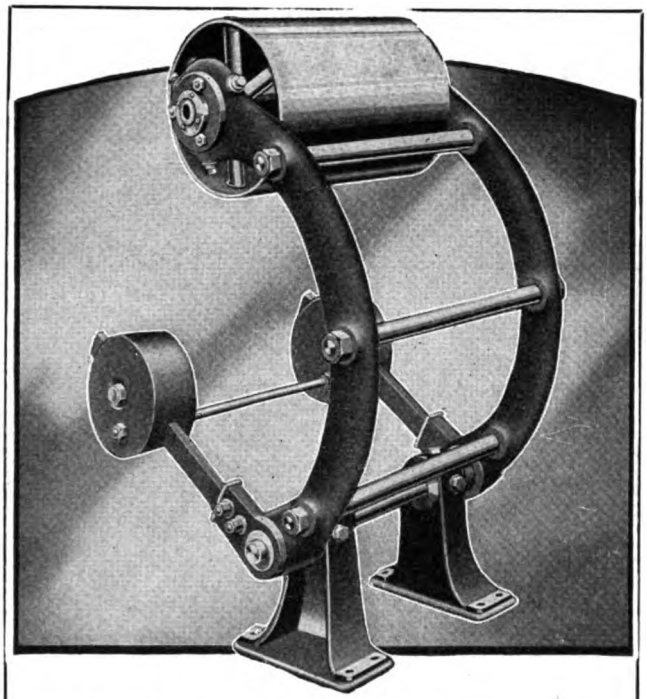




for
HEAVY DUTY
week after week~

WARREN TRAILERS

The Warren Manufacturing Co.
Springfield ◆ ◆ ◆ Massachusetts



This Short-center Belt Adjuster
Automatically Equalizes Belt Tension

Wherever short-center belt drives are desirable—Medart Belt Adjusters are *specially* desirable. Eliminating the shortcomings of open belt drives, they possess the good features of other drives. They solve high speed reduction problems, reduce bearing pressures, increase arc of belt contact, reduce friction losses and save space. Widely used for driving line shafts, jackshafts, generators, air compressors, centrifugal pumps, blowers, extractors, conveyors, machine tools and similar equipment.

Built to the Medart Standard

The Medart Belt Adjuster consists essentially of an idling pulley, swinging arm and weights, which may be so adjusted as to provide constant, uniform tension on the slack side of the belt. Swinging arm may be set horizontally, vertically or inverted. Automatically compensates for varying loads and varying tensions. Idling pulley pressure may be quickly varied by shifting the weights.

Call on Medart for engineering and delivery service on Short-center Belt Adjusters and "Everything in Line Shafting Equipment."

THE MEDART COMPANY
(Formerly Medart Patent Pulley Co.)
General Offices and Works, St. Louis, U. S. A.
Offices in Chicago, Philadelphia, Pittsburgh, New York and Seattle
Office and Warehouse in Cincinnati
Manufacturers of Power Transmitting and Kindred Machinery

MEDART
Everything in Line Shafting Equipment

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Because it's a Bear!



LINK-BELT have adopted the Conway Clutch for their grizzly loaders.

The Conway Clutch is a prime mover of enormous leverage and full contact. Its power capability, easy engagement, instant release, one point adjustment, and free idling can not be surpassed.

It's a Better Clutch; and the proper one to start and stop your machine. A performance test on your drive will prove Conway Clutch superiority in five minutes.

HAVE YOU OUR BULLETINS No. 26 and 35?

The Conway Clutch Co.
Storrs Station
Cincinnati, Ohio

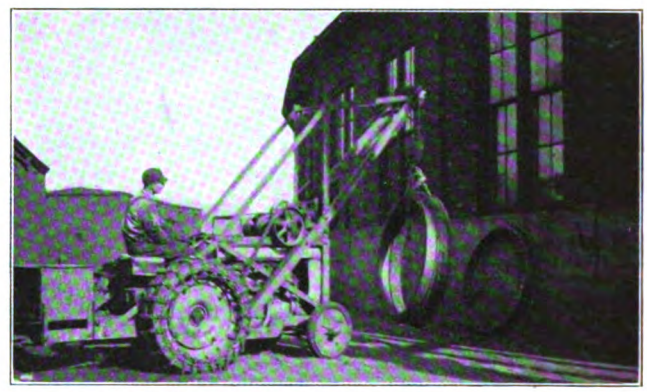
floor 16′ 7″, dig 4′ 11″ below grade and dump 12′ 6″ above the floor level either to spoil or in trucks.

"The shovel is also available as a high lift shovel of 1-yard capacity dumping 18′ above the floor and extra high lift, ⅞ yard dipper, that reaches its extreme dumping height of 21′ 7″.

"The 31-B is quickly and easily convertible to a dragline, with a 40-foot boom. It is also offered as sewer excavator, Clamshell or crane."

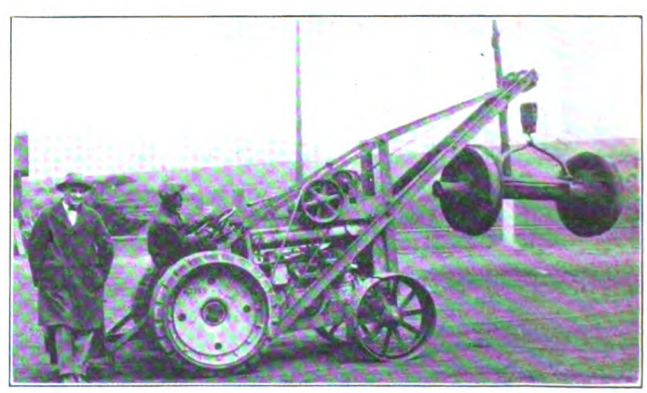
A Hoisting Unit for Fordson Tractors

THE hoisting unit shown in these illustrations is designed to fit on the Fordson Tractor without the necessity of drilling holes or altering the letter. It is manufactured by the Squier-Rix Company, of Mil-



waukee, Wis. A ballast box is placed on the rear frame, which is said to relieve the load pressure on front wheels and to aid in traction.

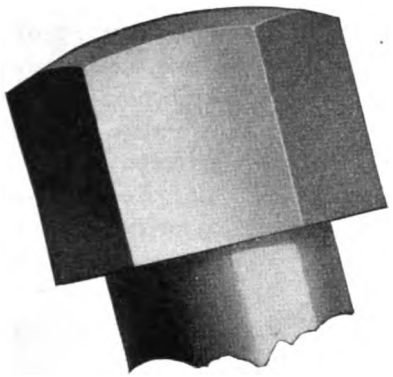
The hoist is operated by means of a lever conveniently located in front of the operator's seat. It is built with



lifts of 5, 8, 10, 12 and 14 ft.; the hook travel of the hoist is 32½ ft. per minute; and it is said that the hoisting of maximum loads requires not more than 10 horsepower of the tractor's power.

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Cap Screw Heads that are consistently perfect



"If it's upset—
it must be heat-treated"

A broad statement to make—but one that any user of Ferry Heat-Treated Cap Screws will admit.

The heads of Ferry Cap Screws are clean cut, smooth, and true.

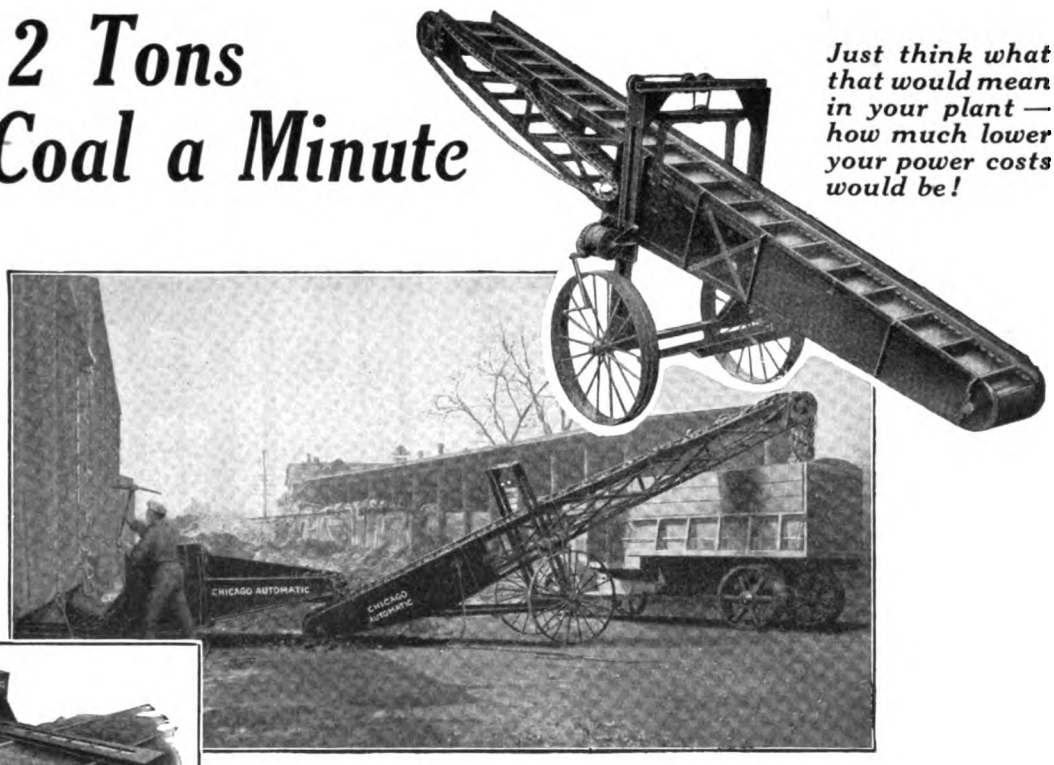
Made so by the famous Ferry patented die compression principle of forming heads and the careful machining of them.

When in need of cap screws, ask for Ferry Cap Screws and get the best at no additional cost over ordinary screws.

THE FERRY CAP & SET SCREW CO.
2151 Scranton Road **Cleveland, Ohio**

FERRY
PROCESS SCREWS

Unloads 2 Tons of Coal a Minute

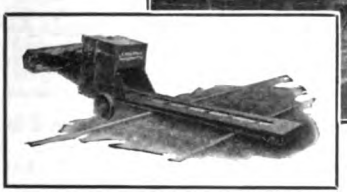


Just think what that would mean in your plant — how much lower your power costs would be!

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Enter the edge about 2½ inches back from the point so it can be gradually opened without tearing.



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You can double the life of a good belt if it is installed properly. With the aid of this new booklet, "There's money in this for You", you can prolong the life of your good belts indefinitely.

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31 Ferry Street, New York.

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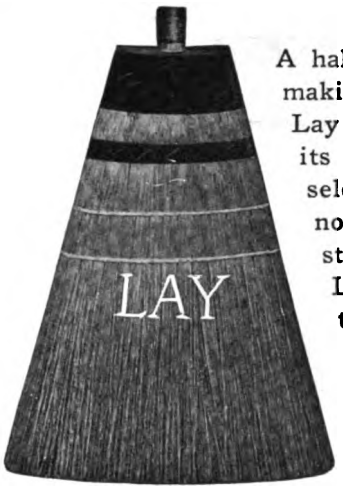
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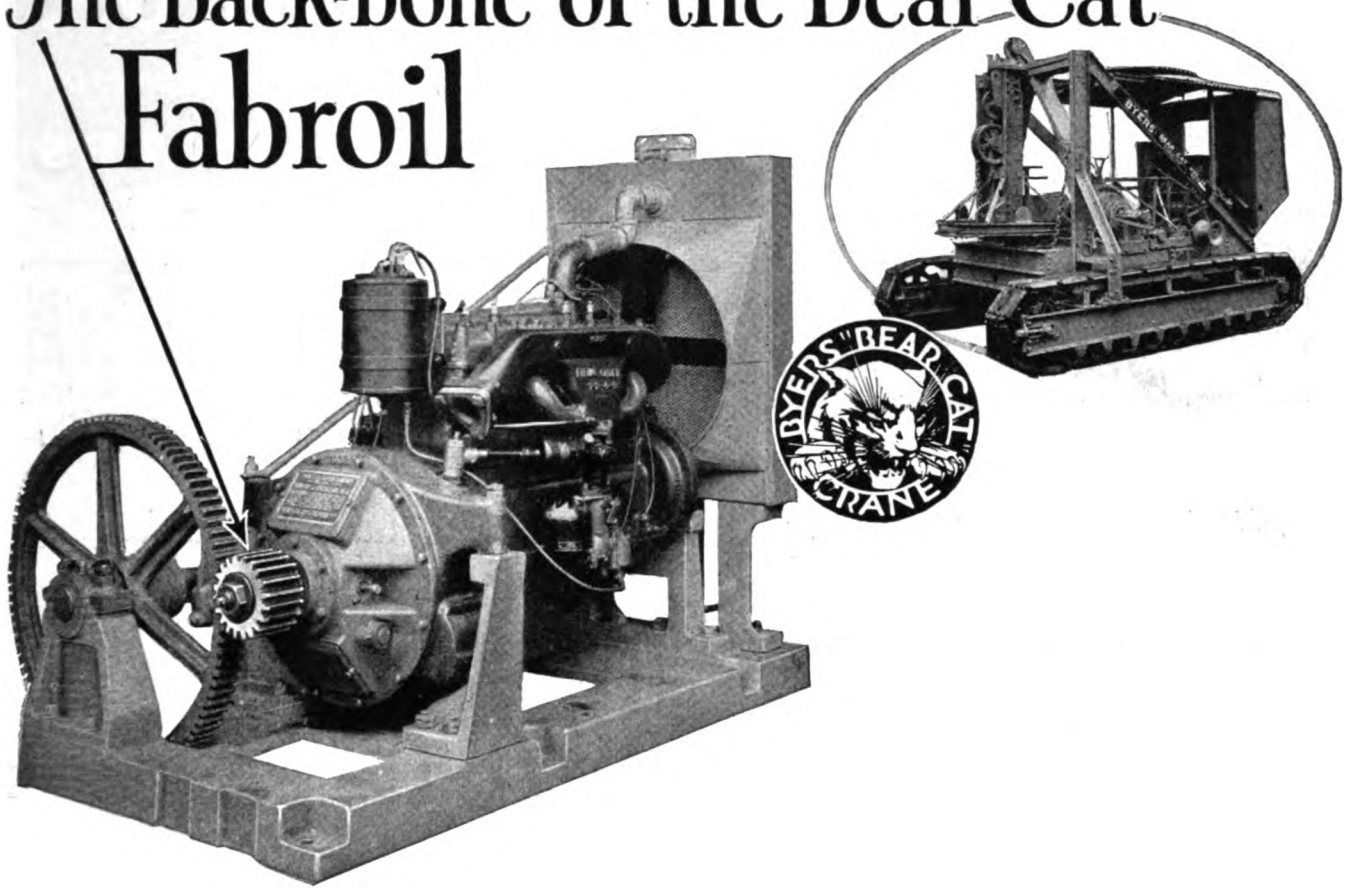
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The back-bone of the Bear Cat Fabroil



CLAY, shale, crushed rock, boulders—everything must give before the fierce onslaught of the Bear Cat shovel. What a job for Fabroil—for it is a Fabroil pinion which transmits the power from the gas engine to the shovel mechanism.

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No job is too severe for Fabroil—it stands up under terrific pounding and stresses. Atmosphere, oil, water, and abrasive dust do not affect it. Fabroil takes up the shocks and protects the engine from punishment. Fabroil operates noiselessly at high pitch-line velocities.

All industry is turning to Fabroil for its toughest pinion jobs. Fabroil is rapidly earning recognition as the universal pinion for noiseless, smooth, and enduring operations.

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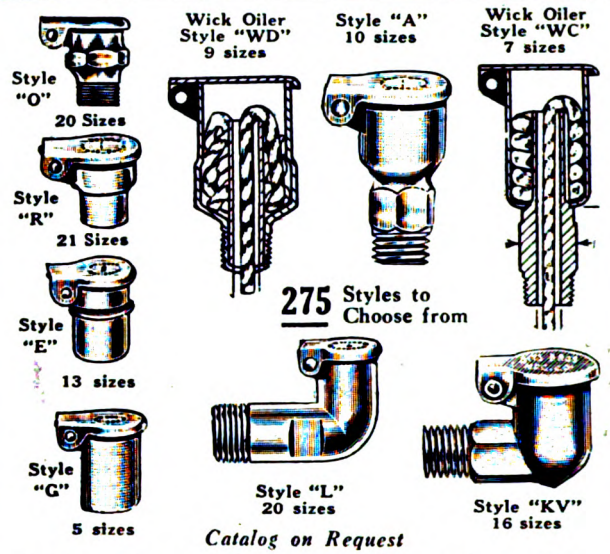
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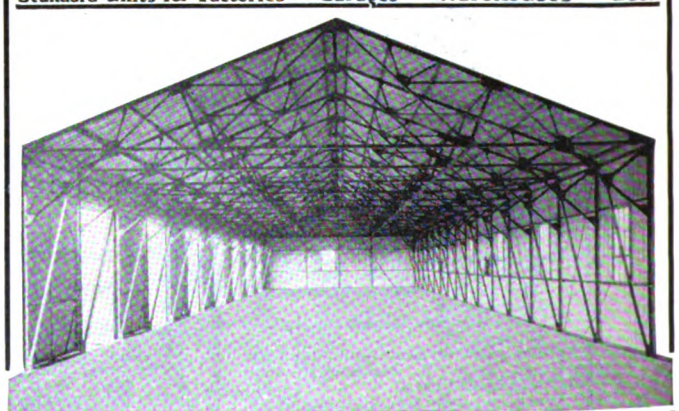


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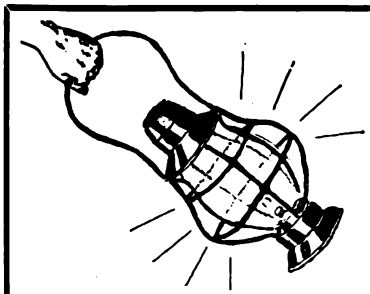
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Investigate for yourself. Mail coupon today. Cling-Surface—preserver of belts—has been made for thirty years by the only company whose sole product is belt treatment. It is used in every country of industrial importance in the world. It saves belts and machinery. It increases transmission efficiency and prevents all loss due to slipping.



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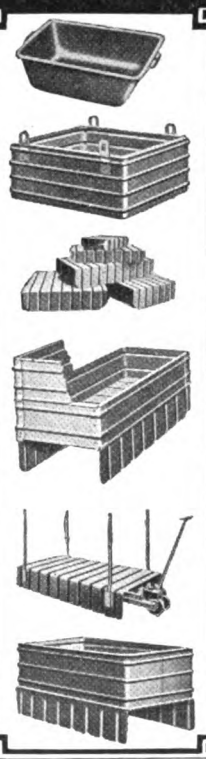
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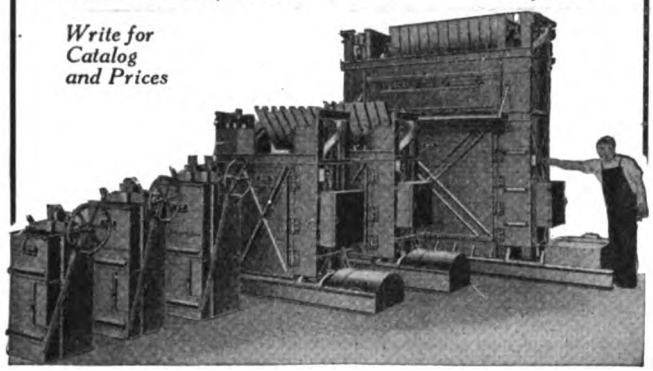
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"LENOX" Screw Drivers are forged in one piece from handle to tip, of the highest quality special analysis steel.

Points are heat treated to stand the strain without bending. And the handles cannot loosen.

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"The Tools in the Plaid Box"

Rolling Car Dumper Unloads 75 Cars Per Day

A CAR dumper with many interesting features was recently put into operation at the "Nine Mile Run" slag disposal plant of the Duquesne Slag Products Company of Pittsburgh.

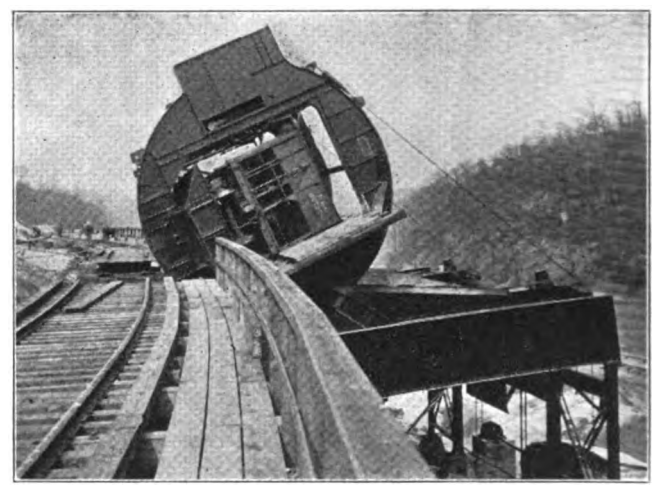
The problem is to dump steel mill slag from standard gauge railroad cars into industrial cars of the self-dumping type.

The natural topography of the ground, and the fact that the installation was to be of a somewhat temporary nature, were the conditions which determined the type of dumper to be used.

The cars of slag,—which means anything from granulated slag to brickbats and mill refuse of all kinds,—are served to the dumper by a yard locomotive, the oncoming car pushing the empty car off the dumper.

In general, the design of the rolling car dumper is not materially different from the standard revolving type. In the following brief description of the operation of this dumper some of the principal differences will be pointed out.

The dumper with its car, which is supported on the dumping side and clamped at its top, is rolled up a six



degree incline until the material in the car is dumped into a receiving hopper, through which it is transferred to industrial cars, thirty-five feet to the side of the dumper track.

This transfer is accomplished without spilling any material. The dumper is rolled up the incline by means of two steel cables, dead-ended to the structural steel roller rings, from which they lead over sheaves at the outer end of dumper runway down to the operating drums.

The two drums are connected by a shaft which is driven at its center through a train of cut steel spur gears, by a thirty-five horsepower motor. The motor is equipped with a solenoid brake for holding the dumper in any position when the current is off.

The small power requirements for the rolling operation of the dumper were made possible only because of the careful counterbalancing of the unbalanced parts. Unusual care was used in determining the proper location and correct amount of this counterweight, the governing condition being what the dumper must roll back into its normal position under all conditions of loading

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No electric motor can successfully play the role of "jack of all trades"—serving a wide variety of appliances equally well.

Knowing this, the Domestic Electric Company has never attempted to cover all industrial applications with a line of "general utility" motors. Instead, we have concentrated upon a few types which give the widest possible range of use to the appliances for which they are designed, and which can be put on a volume production basis in fractional horsepower sizes.

Every Domestic Electric motor is a *special* motor —specially designed after an intimate study of the one appliance it is to serve, specially manufactured to meet every possible demand that will be made upon it, specially tested under the conditions of service to which it must conform.

Only because they are so designed and so built, can Domestic Electric motors deliver the unusual type of service they are today giving to thousands upon thousands of industrial, commercial and household users. The advantages of Domestic's "special" manufacturing policy are quickly evident in higher efficiency, lower service cost and longer life.

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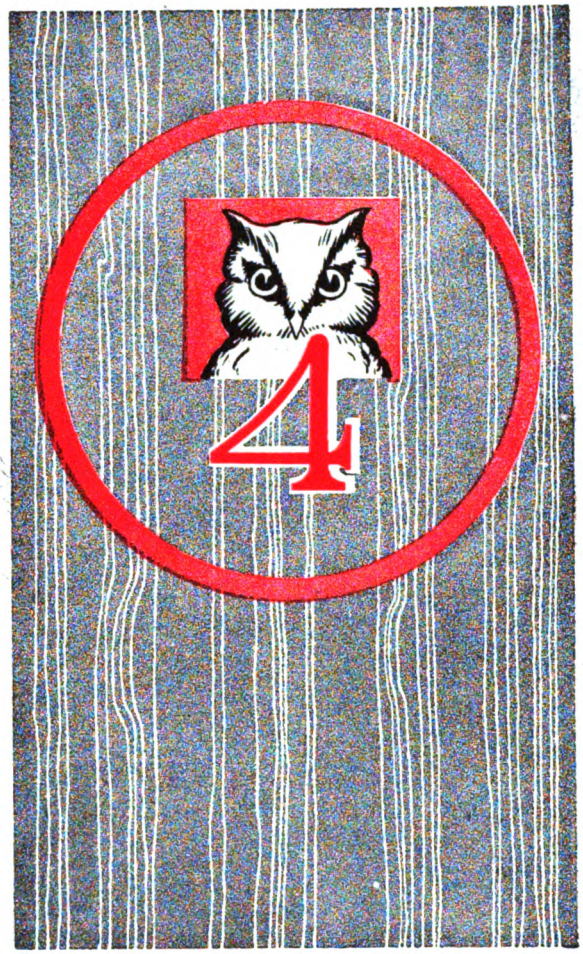
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Jacobs Chucks are used as standard equipment pretty much the world over.

Greater Accuracy
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Gripping Power
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It is not so much any one of these points, as it is the balanced combination of the four in one—in one Jacobs Chuck. These are just four reasons why Jacobs Chucks are Standard, and that's all there is—there isn't any more.

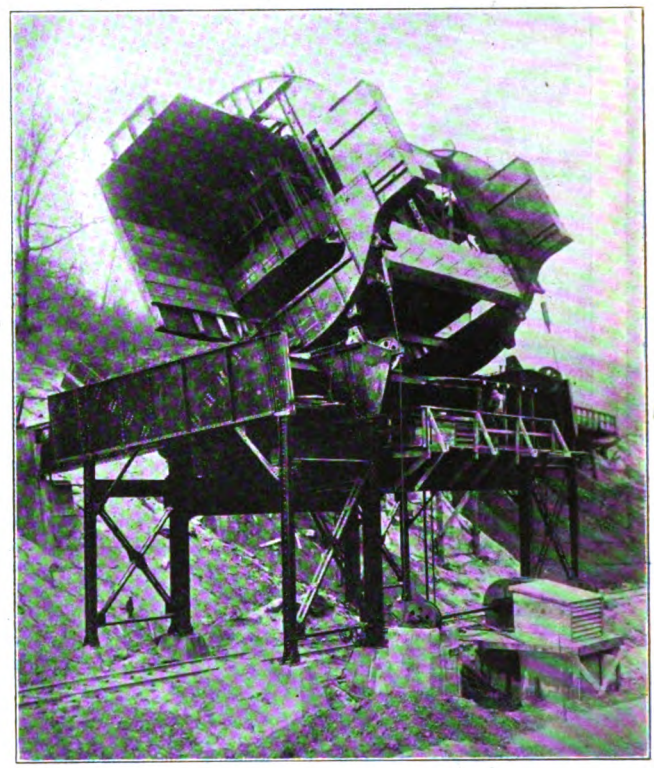
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on nearly every Portable Tool made in America, and many of those made abroad.

The Jacobs Manufacturing Co.
HARTFORD, CONN.
The World's Largest Producers of "Drill Chucks"

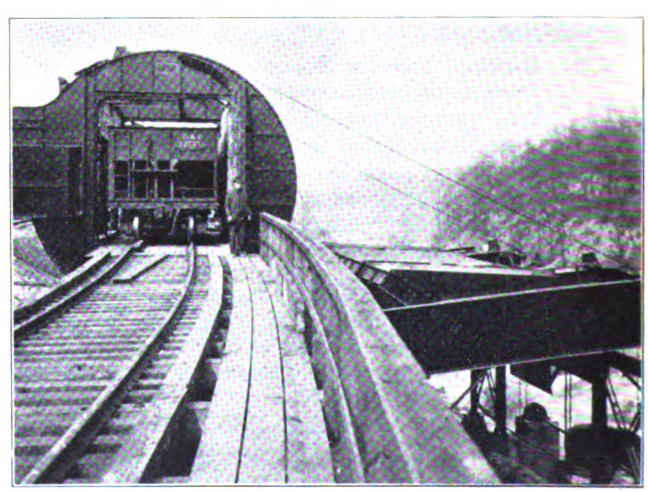
without imposing an unnecessary burden on the motor and dumping machinery during the dumping operation.

The transfer table on which the car is supported is operated entirely by gravity. It is supported on four rollers located in the cradle structure, and moves the car laterally into contact with the side supporting frame,



simultaneously with the rolling operation, during the first few degrees of movement.

On the return movement the transfer table with its empty car is moved back into its normal position by means of a link mechanism at each end of the dumper, mounted on the foundation and operated by the depres-



sion of a lever, which is an integral part of the operating system.

The car is clamped at its top by two independent clamping systems. Each system contains two clamps, which are equalized by means of a loop system, permitting the clamps to adjust themselves to any inequalities in the sides of the car. Each clamp consists of a

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Makers of power machines of all kinds find that it pays to put on Pyott Red Face Pulleys. Seems like a little thing—a pulley—yet such is the high standing of Pyott Pulleys that their uses carries with it a feeling of quality in all other parts of the machine. Even though they may cost a little more, they quickly prove their worth.

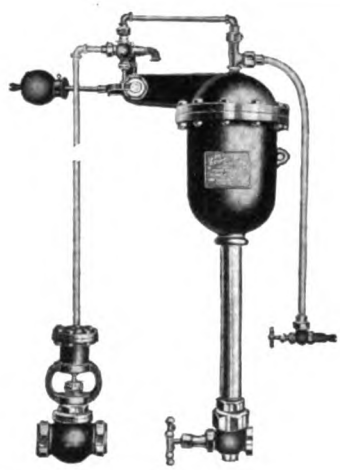
And in factory equipment, power lines give an evener flow of power with longer belt life when Pyott Red Face Pulleys are used—strong claims, yet substantiated by figures.

Write for prices on your requirements

PYOTT FOUNDRY CO., 332 N. Sangamon St. CHICAGO, ILLINOIS

Leaders in Quality Pulleys for over 25 years

O.K.



The experienced power plant engineer knows that a constant water level in boilers is essential if the plant is to be run economically.

So he puts his O. K. on

VIGILANT

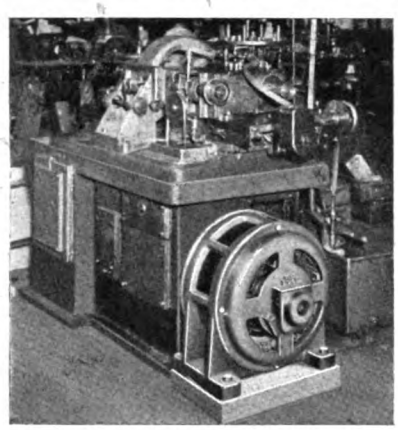
Feed Water Regulators

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When heavy cuts are to be made on lathe or planer, the DIEHL motor driven tool responds with a full pressure of power. Then again on high speed grinders and drills driven by DIEHL motors a sure steady flow of power speed is secured, singularly free from fluctuation. The DIEHL motorized machine shop never falls down in production because DIEHL motors keep running.

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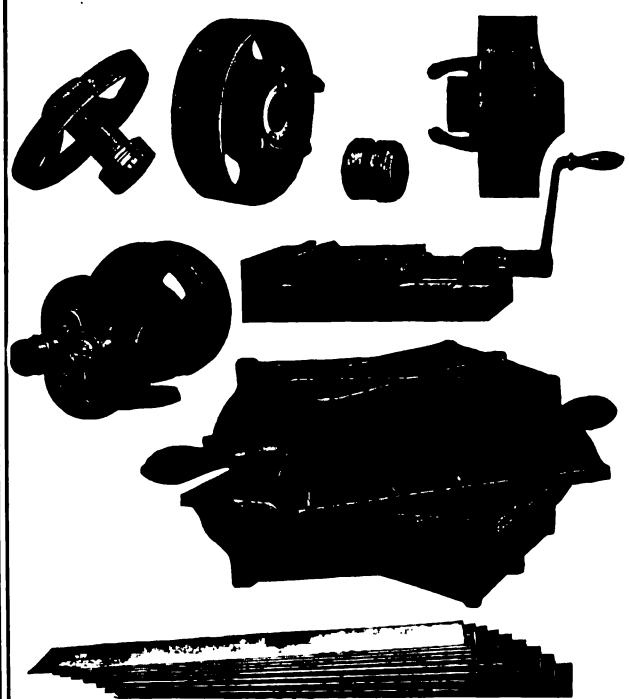
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Brown & Sharpe Products, designed for the greatest possible Utility, lower production costs in any factory. Their use improves the work of the mechanic and increases the production of the shop.—For the greatest Utility and Adaptability in shop equipment, it always pays to specify Brown & Sharpe.

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BROWN & SHARPE

"Standard of the Mechanical World"

hook-shaped steel casting made to travel vertically in guides. The clamps are operated by cables and the car held in its overturned position by locking the drums over which the cables operate. The holding medium consists of a band brake, the brake wheel of which is cast integrally with the drum. Tension is applied to the brake band automatically by a counterweight and the holding power of the clamps increases with the angle of tip reaching its maximum in the extreme dumping position.

The complete operation of the dumper is extremely simple. Two movements, forward and reverse, of a single control lever are the only manual operations necessary to make a complete cycle of operation. The supporting of the car at its dumping side and clamping at its top are both automatic operations which depend only upon the rolling of the dumper.

The dumper will handle all sizes and types of open top cars, with equal facility, at the rate of fifteen per hour providing they are spotted on the dumper at that rate. The cycle time of operation, for the dumper alone, is approximately 1½ minutes. The power required for the complete dumping operation is supplied by one thirty-five horsepower motor.

The Duquesne Slag Products Company expects to unload with the car dumper at this plant during their busy season, an average of seventy-five cars per day.

The car dumper was designed and built by the Link-Belt Company of Chicago, Ill.

THE great saving in the amount of human energy necessary to turn out a given quantity of manufacturing production, which has made itself felt particularly during the last few years, bids fair to be the most significant industrial-economic development of the twentieth century, according to the National Industrial Conference Board, 247 Park Avenue, New York. So pronounced has been the change in the quantitative relationship between labor and production that, in the light of an analysis of this phase of our recent industrial history contained in the Board's recently completed report on "Wages in the United States," it heralds far-reaching betterment not only in our economic affairs, but affords a foundation for wide social and cultural advance as well.

The difference of fluctuation between volume of production and employment since 1921 is so marked, the Board declares, and substantiated to such an extent by the experience in individual plants, that the conclusion of a great saving in human energy in manufacturing production cannot be escaped. As the change in relative volume of employment is measured in proportion to individual plant capacity, the Board emphasizes, it does not indicate increasing unemployment. It is to be interpreted rather as the opening up of opportunities to work in other fields, to the degree that the machine relieves men and women from having to earn their living with manual labor.

Significant in this connection, the Board points out, is the fact that the general price level during the past five years has been declining along with greater productive activity, a symptom contrary to general previous experience, and making possible higher living standards.

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Vorcolite Lights the Electrical Industry



OUR giant electrical companies understand lighting. Their laboratories have evolved most of the known data as to the value of light reflection and diffusion in painted interiors.

It is with a sense of high compliment, therefore, that we receive continual orders for Vorcolite from the leading electrical manufacturing concerns of the nations. Two of the largest have, between them, used over 400 barrels of Vorcolite within the past two years.

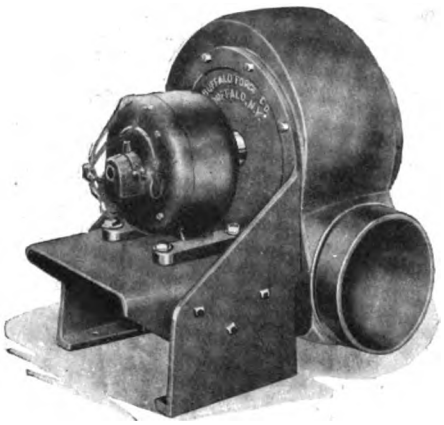
Learn about the Vortex Painting Method, based on (1) *Vorcolite flat white,* (2) *Our painting equipment, loaned to you,* (3) *Your own handy man.* Write to—

THE VORTEX MANUFACTURING CO.
1977 West 77th Street CLEVELAND

VORCOLITE and the Vortex Painting Method



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Industry uses thousands of "Buffalo" Baby Conoidals

A New Catalog

describing Buffalo Baby Conoidal Fans, with complete specifications and capacity tables, is just off the press. This booklet shows various applications of Baby Conoidal fans and makes it easy to order the fan you require.

Write for your copy, NOW.

Thousands of Buffalo Baby Conoidal motor-driven fans are in use in the industries, supplying air to oil burners, exhausting fumes, smoke and odors, cooling motors and generators, ventilating and exhausting.

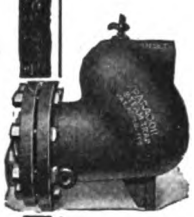
The complete range of sizes available, with three different types of wheels, gives a capacity range of 78 c.f. of air per minute up to 6850 c.f.m.

Construction of the entire unit is very rugged; motors are large and equipped with an improved method of lubrication. Housings are adjustable to eight positions of discharge.

Buffalo Forge Company

440 BROADWAY BUFFALO, N. Y.

In Canada: Canadian Blower & Forge Co., Ltd., Kitchener, Ont.



—a 2-year guarantee against repairs

You run no risk as to error in judgment when you buy Paracoil Steam Traps — for they are sold with a 2-year guarantee against repairs.

No repairs for 2 years—4 years—many years—is industry's experience with Paracoils.

Many of industry's largest and most discriminating buyers have switched to Paracoil Traps and are repeating their orders again and again. A trial in your plant will make you a regular Paracoil user, too.

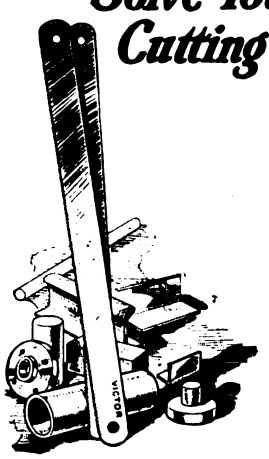
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Solve Your Cutting Problems!



There are no obstacles in metal cutting with Victor Blades. In shops that require hack saw cutting on all kinds of metals these blades have proven an economical and essential factor.

The Victor Special Flexible Blade has the same cutting efficiency combined with the perfected flexible qualities, and is recommended for general use on all soft and tough cutting metals that produce breakage.

Let us send you free samples of this Wonder Blade

VICTOR SAW WORKS, Inc.
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The Peak of Small Motor Perfection



In an organization such as ours we can give *individual* attention to every motor we build. Hence it is not surprising that an ever-increasing number of prominent manufacturers regard MASTER GUARANTEED MOTORS as the peak of small motor perfection.

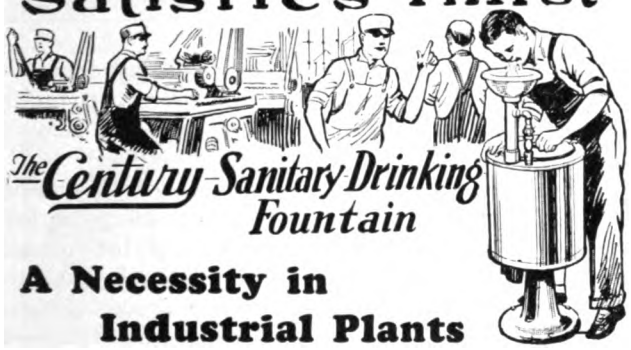
THE MASTER ELECTRIC COMPANY
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The Century Sanitary Drinking Fountain

A Necessity in Industrial Plants

You need them in summer to furnish your employees with properly cooled water and you need them as sanitary water dispensers in winter—The Century is an all year fountain.

The many exclusive features of Century construction makes it preferred above all others—the water circulates through tinned copper coils—it does not come in contact with the ice—the tank is lined with a thick layer of cork—the patented concealed regulator in the bubbler head can be adjusted in a few minutes with little effort—the stop cock is Century designed and is positive in action.

The fittings are nickel plated, other exposed parts are painted with a beautiful rust-resisting gray enamel paint.

Made in many sizes—Price $44.00 to $90.00.

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SIMONDS

How Many Teeth Do You Need In a Hack Saw Blade?



For economy in metal cutting select the Hack Saw Blade best suited to your work. If it is a Simonds High Tungsten Blade you are first assured of more service. After that the right number of teeth for different classes of cutting is the only question. For cutting cold rolled steel select a coarse tooth blade, such as 14, 12 or 9 teeth per inch. Be sure it is a *Simonds All Hard Blade* for power use.



For general hand use, cutting tool steel, iron pipe, hard metals, light angle iron, etc., use *Simonds Hard Edge* Non-breaking Blades, 18 teeth to the inch.

To get the best results in cutting thin metals, thin tubing, etc., demand the fine tooth Simonds Hard Edge Blade, one containing 24 or 32 teeth to the inch.

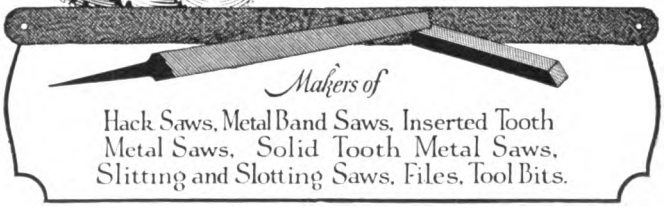


Buy your Hack Saw Blades with care. Get the best. They cost no more but give longer service. Write for a free copy of "Hacksawology" containing many valuable hints.

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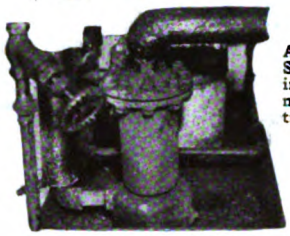


Makers of

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for—high temperatures —high pressures



An Armstrong Steel Body Trap installed in a big middle west central station.

the Armstrong Steel Body Trap

HERE is a trap that does not fail despite high temperatures and extreme pressures.

The body is of heavy and uniform steel castings. Each trap is tested to 3,000 lbs. Valve parts are of heat-treated chrome steel. And the advantages of the inverted submerged bucket principle—no clogging, no steam waste, no scoring, nor air-binding—are present as in all types of Armstrongs.

The steel body Armstrong is made for pressures up to 500 and 600 pounds, and higher in special cases. Armstrong Steel Body Traps are in use in many of the new super-power central stations. Complete information covering higher pressures will be furnished on request.

Try out an Armstrong in your own plant under your actual working conditions.

Please ship prepaid an Armstrong for 90-day test. It is understood that when test is completed **the trap is to be returned collect.**

Trap capacity ..... Size of pipe connections .....

Steam pressure ..... (Do not neglect to state maximum)

Firm .....

Address .....

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Signed ..... Position .....

☐ Send the catalog only; send no trap

Mail to ARMSTRONG MACHINE WORKS
326 Maple Street, Three Rivers, Michigan

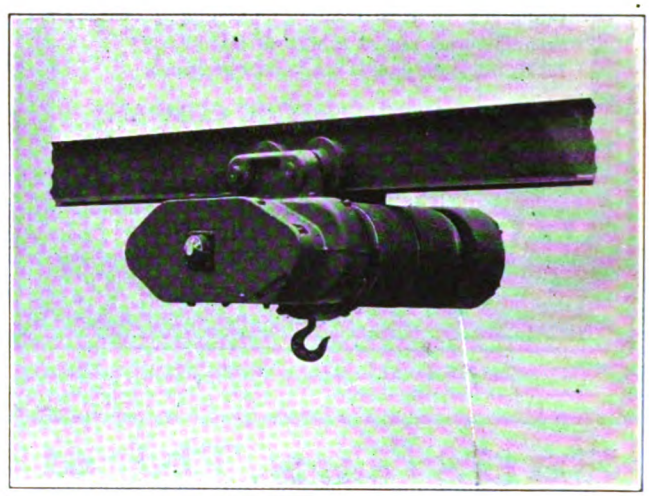
118-Gray

A New Electric Hoist

THE Northern Engineering Works, Detroit, Mich., has recently brought out a new type of electric hoist which is now ready for the market, known as the Northern Standard-ized Hi-Lift.

The new hoist is essentially the same design as their Standard-ized type "LE" crane trolley. The manufacturers state that all of the superior features of this crane trolley have been employed in the new hoist and adapted in such a way as to produce an equally remarkable unit for the electric hoist field.

The hoist is now in production and is described in their bulletin EH-101. The design embodies the high hook lift feature requiring only a minimum of head room and making it available for service in places of limited height. Among some of the outstanding features mentioned are hammered steel case hardened gearing, entirely enclosed and running in lubricant, Timken bearings throughout, exceptionally large hoisting drum and rope sheaves, insuring long life and protection for the steel wire hoisting rope, the application of any standard make of motor designed for hoisting service.

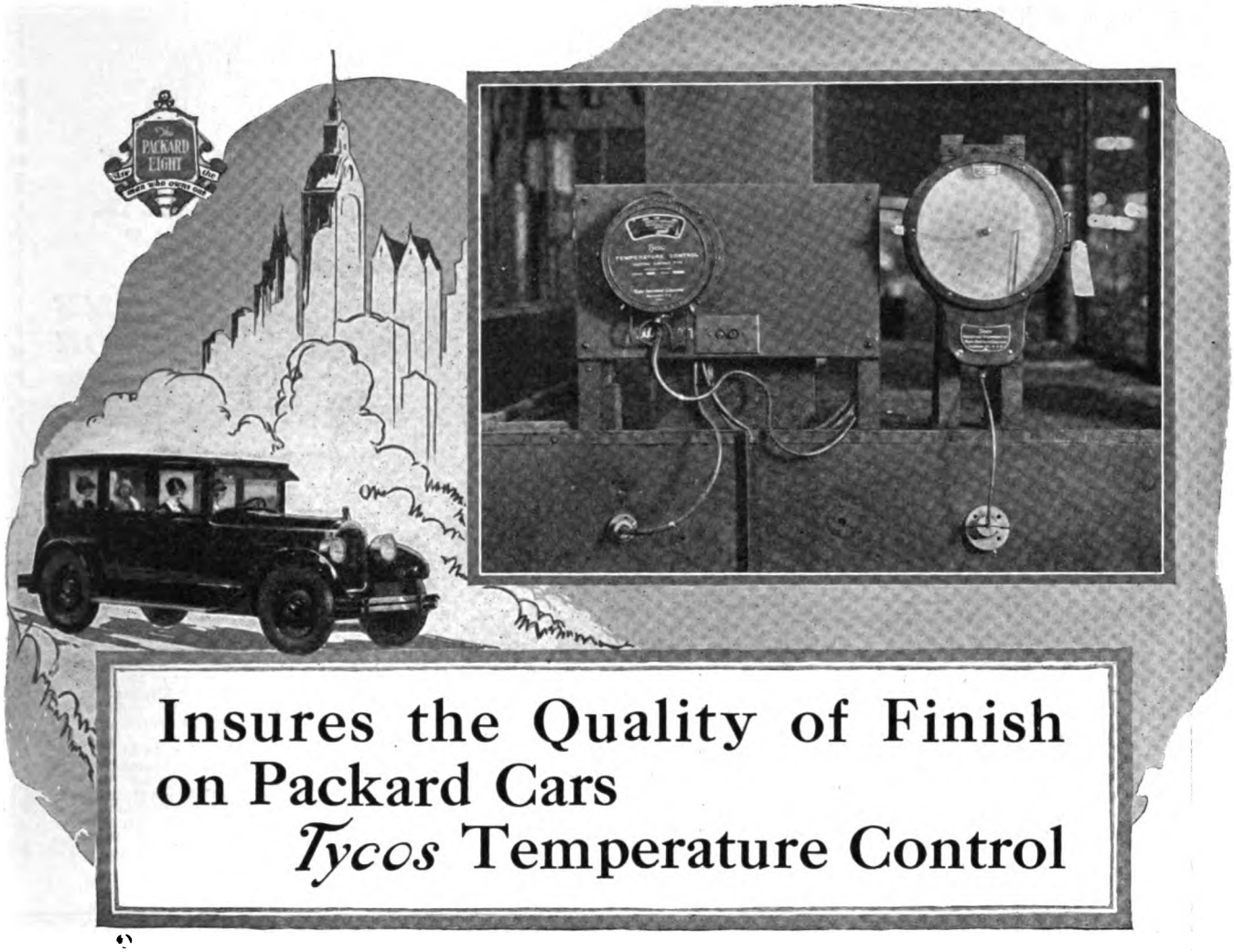


Safety features include the enclosing of all working parts, two brakes for holding and controlling the load, and a double set of automatic limit stops that not only limit the upward movement of the load hook, but interrupt the downward movement at the proper distance, thereby preventing injury and difficulties that often occur through allowing the entire length of hoisting rope to unwind and reverse.

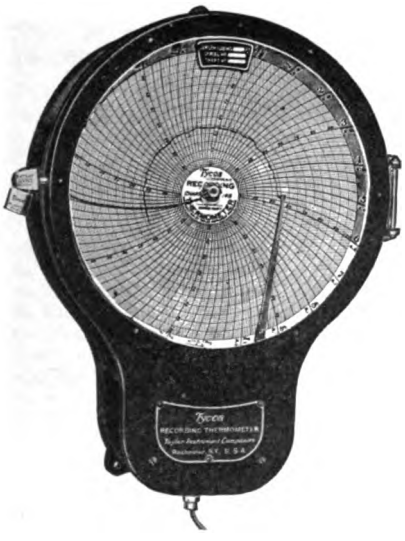
The hoist is claimed to be especially remarkable in the fact that it is a straight-forward, simplified design without any complex or intricate working parts. Spur-gearing is employed throughout.

IN 1918 the premium rate of the Willard Storage Battery Company to the Industrial Commission of Ohio was 99 cents per $100 of payroll. In 1925 it had been reduced to 30 cents per $100 of the payroll, a reduction 69 cents per, states the National Safety Council, which says that accident insurance is a good thing to have—without the accident.

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Insures the Quality of Finish on Packard Cars
Tycos Temperature Control



From chassis to the final finish, every part on a Packard is as near perfect as human engineering ability and modern machinery can make it. And the exceptional care taken in every step of the manufacture has resulted in the Packard performance and the Packard reputation.

We feel quite proud that *Tycos* Instruments have a part in insuring the high quality of finish that goes into Packard Cars. In all finishing ovens temperatures are checked with *Tycos* Recording Thermometers.

Says E. R. McPherson, Engineer Construction and Maintenance Department, Packard Motor Car Company, Detroit;

"Dependable *Taylor* instruments are helping produce the Packard quality finish. We are using *Tycos* recording thermometers in the deoxodine cleaning room, where the bodies are prepared for varnishing; the finishing preheat rooms; the color varnish room, and the floco room, where the final coat of varnish is applied.

"Other *Tycos* recording thermometers control the chasis oven, where the frames are baked after being enameled; and also the cylinder block enamel ovens. Thus *Tycos* are controlling very vital steps in our processes enabling us to hold temperatures within narrow limits day in and day out.

"Our various finishing processes require different temperatures ranging from 90° to 300°F. By the use of the recording thermometers we have a check on oven operation at all times, and also a check on each lot of finished work.

"As a result of this close supervision, more care is exercised by the workers, and a better, more uniform finish is assured."

***Tycos* engineering service is at your disposal to study the particular needs of your industry. May we send you a booklet describing some of the special apparatus made for your business?**

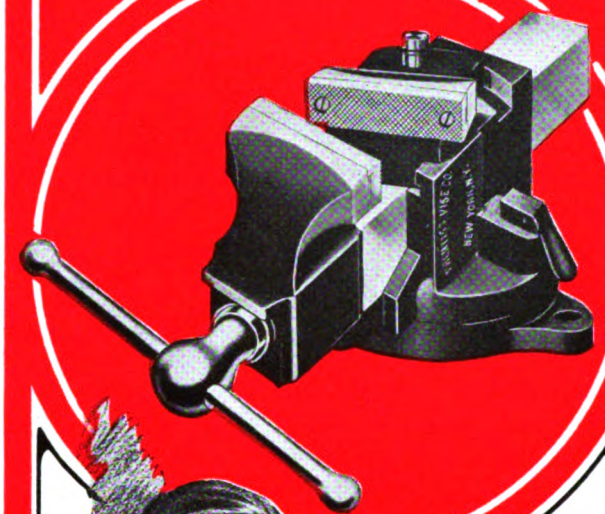
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INDICATING · RECORDING · CONTROLLING

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"I'm 'all for' a Prentiss Vise"

Every man who ever used a Prentiss says, "It's the *only* vise for me."

Men take to the Prentiss Vise because they know the front jaw can't work loose—the castellated collar fastening, an exclusive feature, prevents that. And they're wise to the fact that every other part of a Prentiss is especially designed to make the vise stand good hard work—and it does stand it, too.

For over half a century, the Prentiss Vise has headed the list of tool users' "trusties." The vise they can always bank on is bound to be their favorite—and that's a *Prentiss*, every time!

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DETEX "SERVICE"

Means Continuous Watchclock Protection

A watchclock is a mechanical device. Even the best requires attention sometime. When the occasion occurs that cleaning, replacement or repair is imperative you want your watchclock system restored to its protective function with the least possible delay.

DETEX SERVICE blankets the country. Wherever you are, there is a DETEX service station less than 500 miles away, competent to render complete aid. In most parts of the country there is a service station much closer.

All repair, replacement and cleaning orders are handled as emergency work to be shipped the same day, if within human power.

Consider the service you may expect. It's a factor in watchclock system satisfaction.

DETEX WATCHCLOCK CORPORATION

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Other DETEX Watchclock Systems

PATROL Portable—The latest and most versatile of all portable watchclock systems. Is satisfactory for 1 or 100 stations.

NEWMAN Portable—The best known and most extensively used watchclock system in the world. 1 to 30 stations.

ALERT Portable—Up to 30 stations. Initial cost moderate—maintenance extremely low.

ECO Portable—Most accurate watchclock; records practically to minute. Important in some cases 1 to 20 stations.

BOSTON [Magneto Type]—For large plants desiring records of a number of watchmen on one dial.

One night of faithful watching may prevent months of non-production. DETEX Watchclocks insure faithful watching every night

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Witt Oily Waste Cans bear the labels of approval of the Underwriters' Laboratories, Inc., and the Associated Factory Mutual Fire Insurance Companies. These are the highest character endorsements that can be won for industrial equipment.

In addition to buying positive protection in the Oily Waste Can you also gain the utmost in economical, long-lived service. The sturdy, simple construction of the Witt Oily Waste Can enables us to wire an iron-clad guarantee to the handle of each Witt Can —that it will outlast in service 3 to 5 ordinary cans.

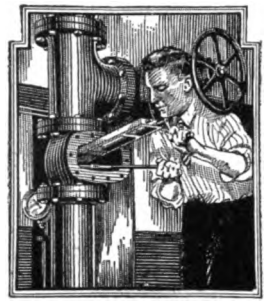
A conservative test order of Witt Oily Waste Cans will prove to you the reasons for their national acceptance as standard equipment in the leading industrial plants of the nation.

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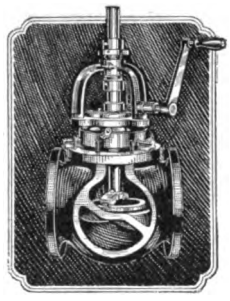


Dexter Gate Valve Reseating Machine

How Much Do You Spend on Replacing and Repairing Valves?

Valve upkeep is probably one of the largest items on your maintenance bill, unless you're equipped with a Dexter Valve Reseating Outfit.

Dexter Machines enable you to keep *all* your valves steam or fluid tight for years. The labor and expense of removing them from the pipe line is eliminated. Replacement and repair expense is cut 90% or more. And huge leakage losses are stopped.



Dexter Globe Valve Reseating Machine

A Dexter Outfit will probably pay for itself the first time it's used in your plant. Users say they wouldn't be without one for many times its cost.

Write for Catalog 23 for complete information and prices on outfits for globe valves, gate valves and pump valves.

THE LEAVITT MACHINE CO.
28 East River Street, Orange, Mass., U. S. A.

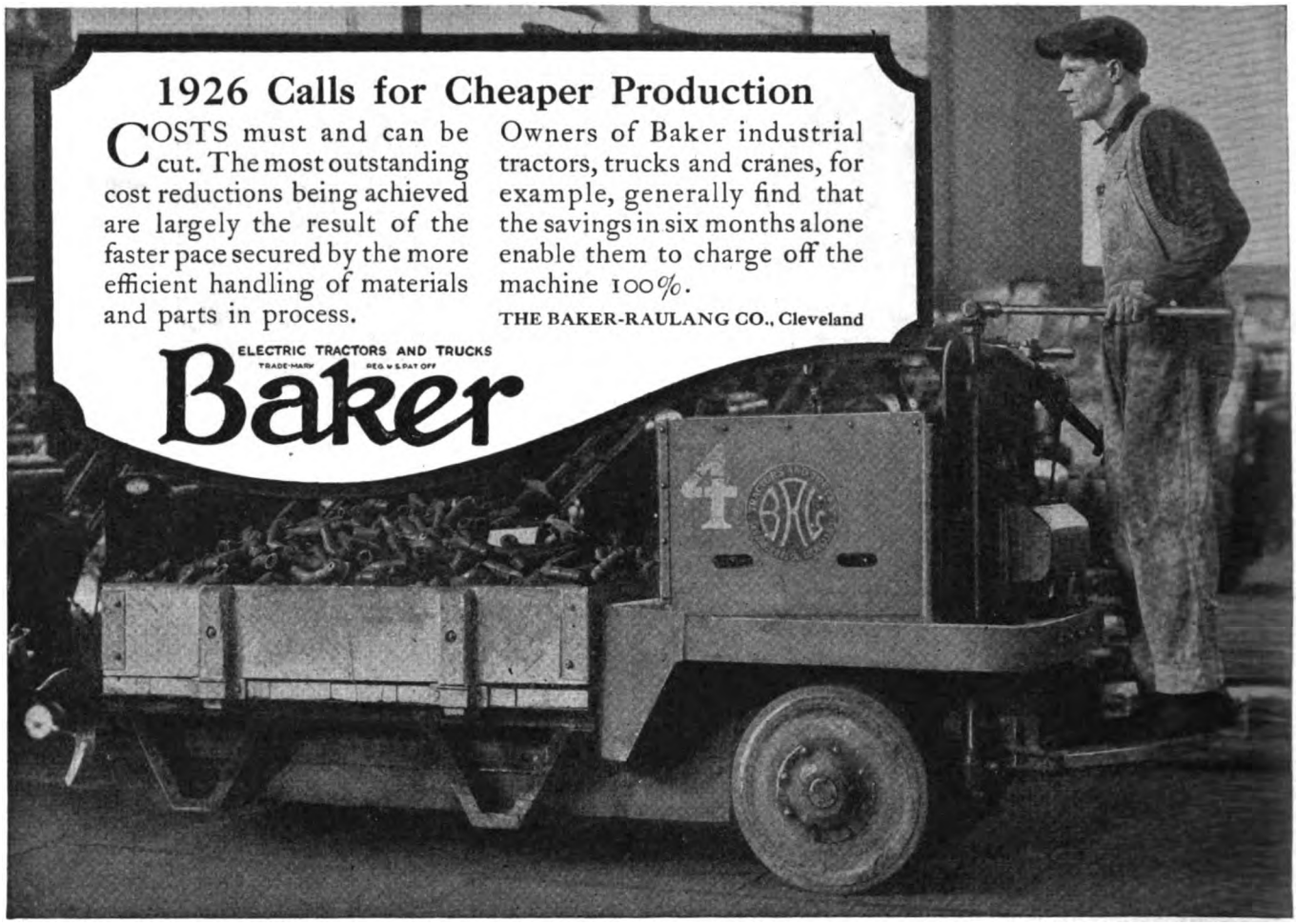
Canadian Agency: Darling Bros., Ltd., 120 Prince St., Montreal.

British Agency: Cromil Engineering Co., E. Floor, Milburn House, Newcastle-on-Tyne.

97

Valve Reseating Dexter Machines

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Modern Methods—Guaranteed Results



It Took Forty-one Years to Write this Book

—forty-one years' experience in building fans, blowers and blast heating equipment.
32 pages of valuable data on air moving with a description of the New Type ME Fan. Sent FREE upon request.

Drop us a line for YOUR copy

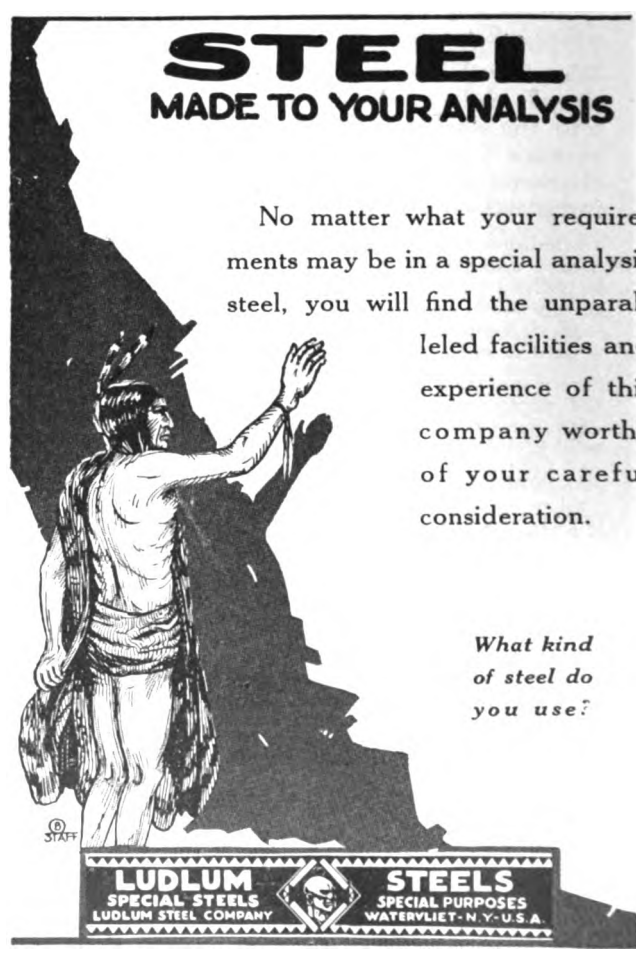
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MADE TO YOUR ANALYSIS

No matter what your requirements may be in a special analysis steel, you will find the unparalleled facilities and experience of this company worthy of your careful consideration.

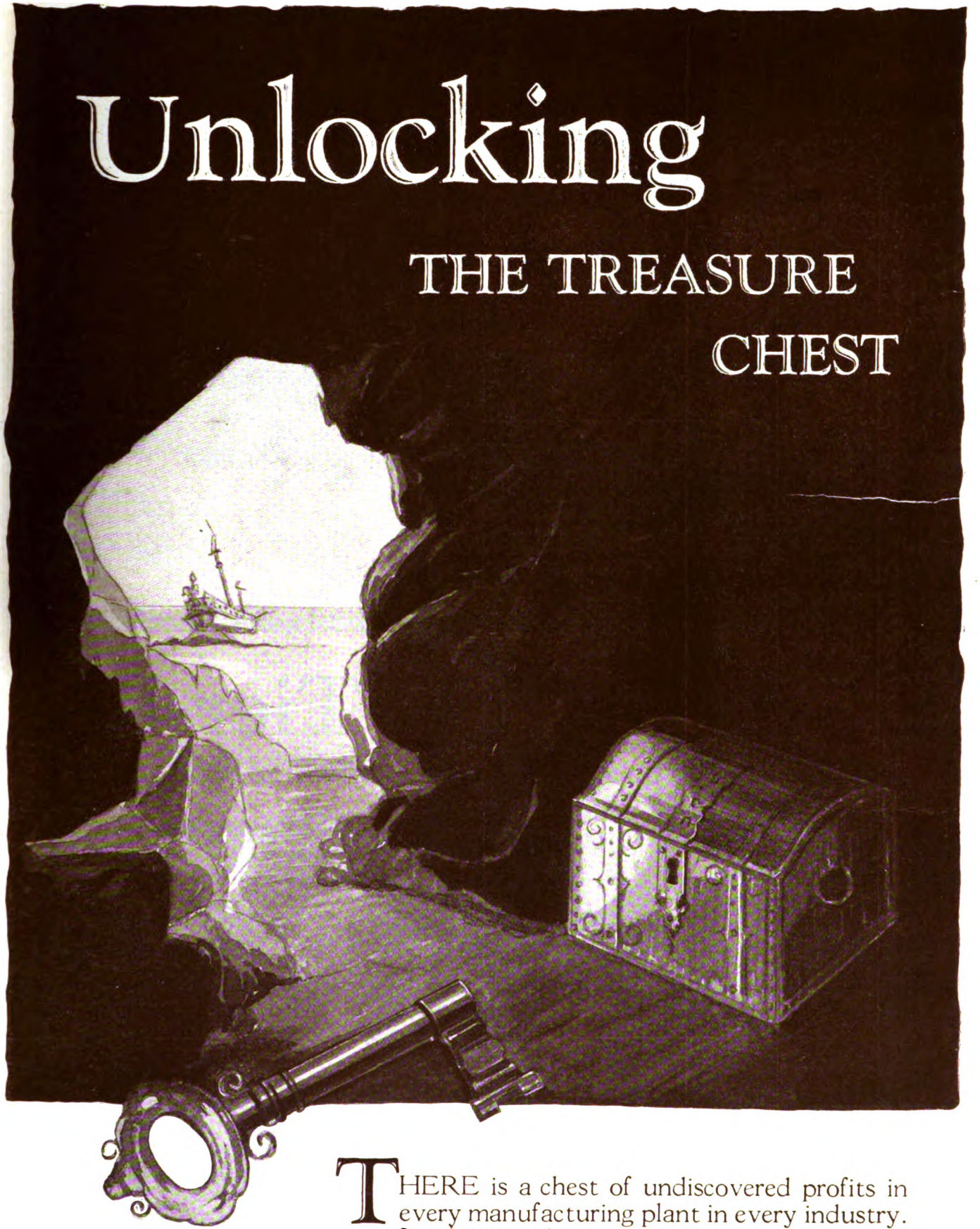


What kind of steel do you use?

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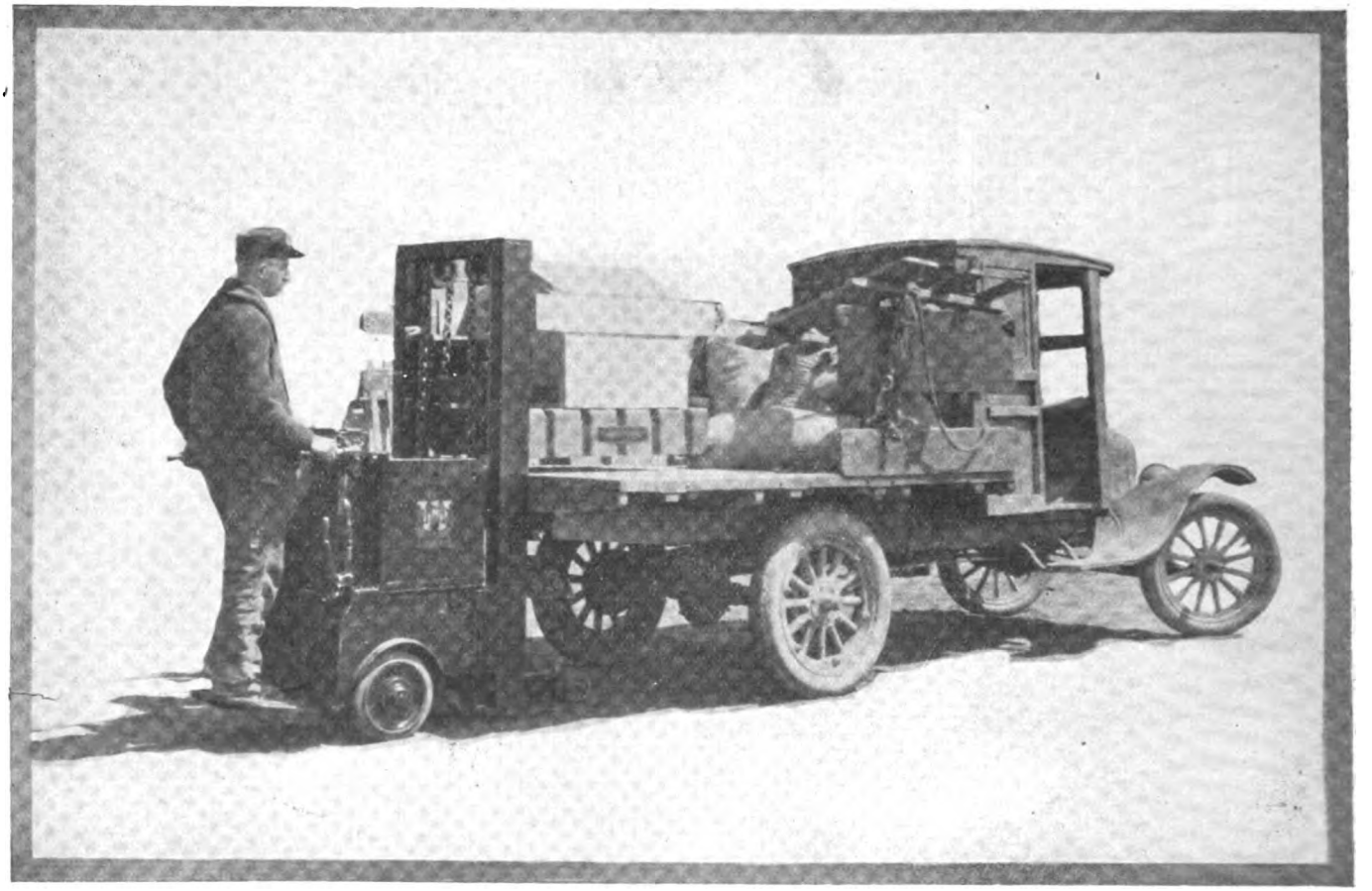
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Unlocking THE TREASURE CHEST



THERE is a chest of undiscovered profits in every manufacturing plant in every industry. It contains the additional cost savings and waste reductions that are made possible by better handling methods. This issue of Industry Illustrated will help you find the key..

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A New Wright Tier-Lift

for Narrow Aisles and Congested Places

NO longer is it necessary to go to the expense of a large machine for the dozens of jobs where lifting and tiering is required, and where the larger sized trucks are neither practical nor economical.

The New Wright Tier-Lift has an overall width of only 27½". It is easily maneuvered in the narrowest aisles, and has an exceptionally short turning radius. The New Wright Tier-Lift is easily handled and costs little to maintain. One motor does the lifting as well as the running.



Write for description and further particulars.

By a simple gear shift operation, the use of two motors, extra large batteries, and space is eliminated.

And when not in use for tiering, it can be used as an ordinary lift truck. The same platforms as used for the Wright Lift Truck or ordinary hand lift platforms can be used. The New Wright Tier-Lift has been designed and built to answer the demand for a low priced, small sized Tier-Lift Truck, which will find many uses in large or small plants.

WRIGHT-HIBBARD

INDUSTRIAL ELECTRIC TRUCK CO.

Main Office and Factory, **Phelps, N. Y.**

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Boston	44 Bromfield St.
Buffalo	1487 Hertel Ave.
Chicago	549 Washington Blvd.
Cincinnati	701 Union Central Bldg.
Denver	1226 E. 17th Ave.
Detroit	149 E. Larned St.
Indianapolis	606 State Life Bldg.
Los Angeles	430 E. Third St.
Louisville	513 Columbia Bldg.
New York	30 Church St.
Philadelphia	2401 Chestnut St.
Pittsburgh	412 House Bldg.
San Francisco	16 California St.
St. Louis	1122 Pine St.
St. Paul	516 Endicott Bldg.
Syracuse	404 So. Clinton St.
Toledo	2319 Elm St.

Handling in process **is much more than a matter of lifting and carrying. It makes the moving a part of the process itself. Cleveland Tramrail Engineers are material handling specialists whose advice and suggestions on the use of modern equipment will be invaluable to you.**

Many of the exclusive features shown here are protected by patents and can only be used in connection with the Cleveland Electric Tramrail System.

Men don't have to wait for the ovens to cool at this plant. They reach in with long bars and bring the warm contents out into the room—push a fresh charge in from the other end of the oven—close the doors and turn on the heat for another run.

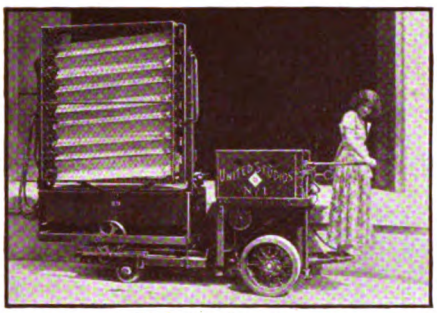
Cleveland Electric Tramrail
Division of
The Cleveland Crane & Engineering Co.
Wickliffe, Ohio

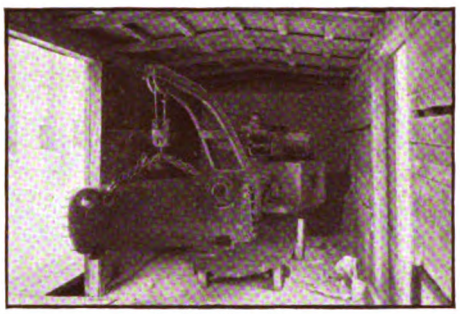


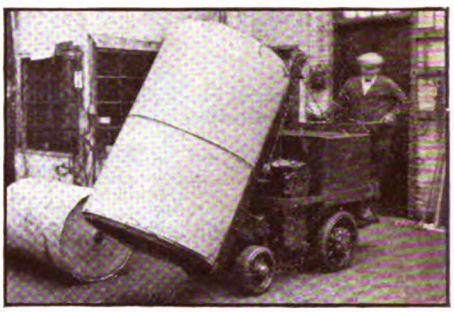
CLEVELAND TRAMRAIL SYSTEMS

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Another "Big Parade"


Hauling Lamps


Inside Box Car

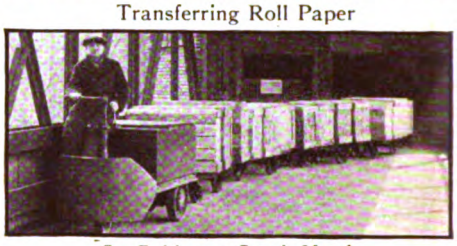

Transferring Roll Paper


Handling Tin Plate

JUST a few of the many Electric Trucks, Tractors and Cranes built by Elwell-Parker to serve *all* industry *in a big way* during the past 20 years.

In 20 years, Elwell-Parker has successfully developed 70 types of Electric Tractors.

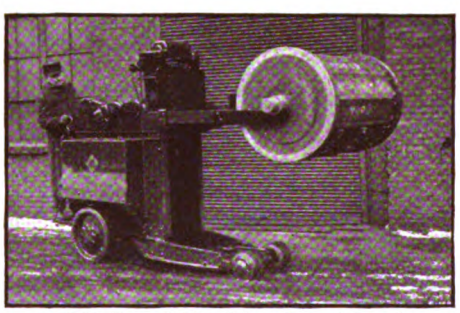
Whatever practical features have been introduced in Electric Truck Design are incorporated in Elwell-Parker Equipment. Interchangeable Parts of steel more drop forgings than in any other make. We'll gladly supply, without obligation to you, recommendations and estimate Please send detailed description of the work you want to do.

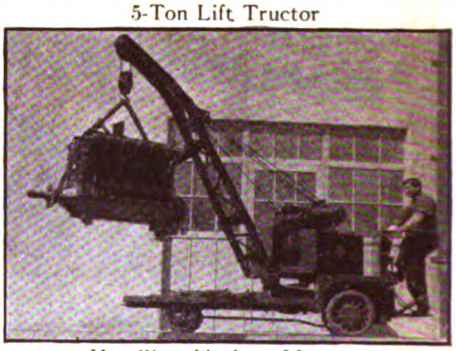

On Bridge at Stock Yard

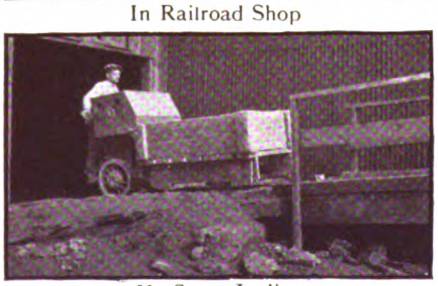


5-Ton Lift Tructor


In Railroad Shop


4000-Pound Tumbling Barrel Load


Handling Airplane Motors


Up Steep Incline


A Big Load of Pig

THE ELWELL-PARKER ELECTRIC COMPANY
Cleveland, Ohio


Pushing Lumber Cars



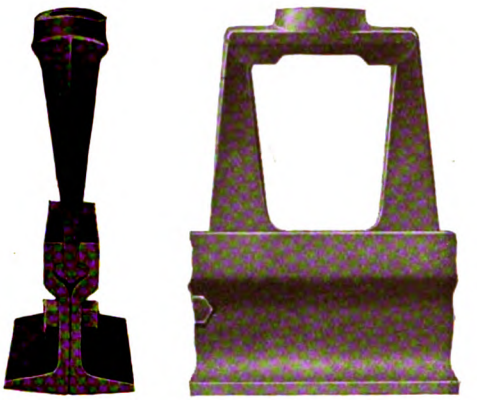
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An Important Development in MonoRail Systems of Material Handling Equipment—

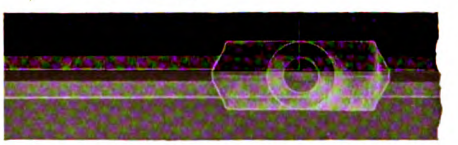
Stronger, Simpler, Longer-Lived

Sturdiest Track Built for Hand Operated Systems

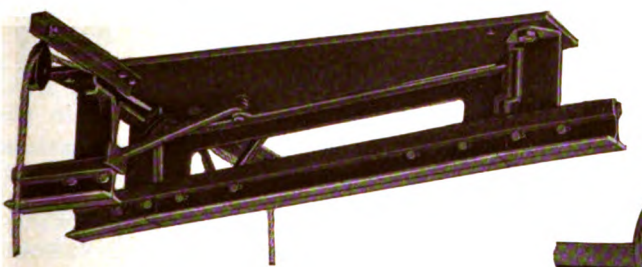
A TRACK of distinctive design and exceptional strength—two special sections bolted together to form a solid MonoRail unit. Made of high carbon railroad rail steel—the toughest steel for the job of handling heavy loads. Forged steel hangers are clamped solidly inside of rail head—cannot interfere with track wheels. No splice clamps required for joining sections. Assembled track sections have overlapping ends and when bolted together form a continuous runway without a complete break at any point. Each rail joint is supported by a forged hanger, which prevents rail deflexion. Track and hangers shipped assembled.



A—Showing cross section and side views of track and hanger.

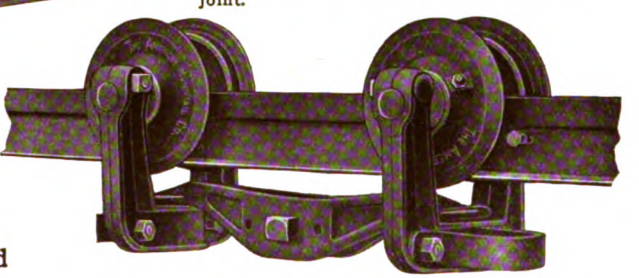


B—Showing American MonoRail exclusive splicing feature with over-lapping track sections and with hanger support at each joint.



The Switch—A Vital Part of Your Overhead System

The American MonoRail Switch is bolted rigidly to a solid steel mounting board—an exclusive feature. It is the simplest of all switches in construction, with every part built for quick positive action, and with strength to spare. It gives you accurate alignment of tracks, positive open rail guards, absolute safety—a switch that will last as long as any other part of the track installation.



Trolleys Built for Years of Continuous Hard Service

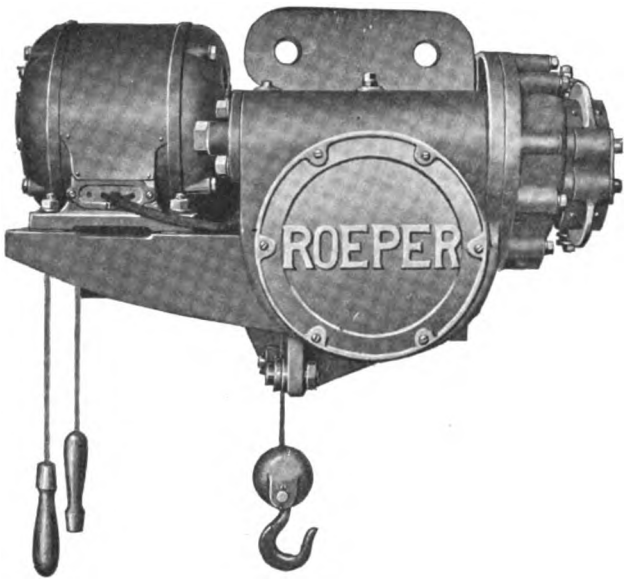
Built of steel throughout, for maximum strength and long life. Permits progressive unit assembly for loads from 5 lbs. to 2,000 lbs. Permits extreme low clearance dimensions between track and load hook. Smooth rolling ball bearing wheels move heavy loads with minimum man power.

Simple strength and long life are the outstanding values of American MonoRail equipment. Before you decide upon ANY overhead carrying system, it will pay you to get the facts about American MonoRail—and the advice of our engineers.

The American MonoRail Co., 1950 West 67th Street Cleveland, O.

Permits progressive unit assembly for loads from 5 lbs. to 3,000 lbs.

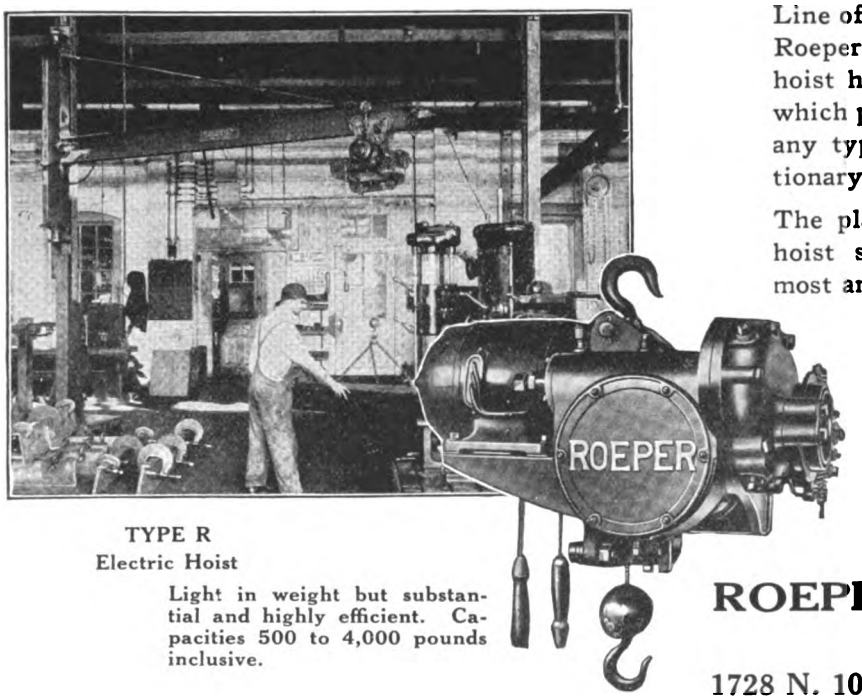
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The new ROEPER

Rigid connected type ELECTRIC HOIST

For more efficient material handling



TYPE R
Electric Hoist

Light in weight but substantial and highly efficient. Capacities 500 to 4,000 pounds inclusive.

A new hoist has been added to the Roeper Line of Labor Saving Electric Hoists, the new Roeper Rigid Connected Type. This new hoist has a *two point steel plate suspension* which provides a means of supporting it from any type of overhead crane, trolley, or stationary structure.

The plates extend above the main frame of hoist sufficiently to permit attachment in most any manner. If necessary, the shape of plates can be altered to meet conditions, without any change in other parts of construction.

Fittings can be furnished that will permit attachment of this hoist to trolleys of other than our own manufacture.

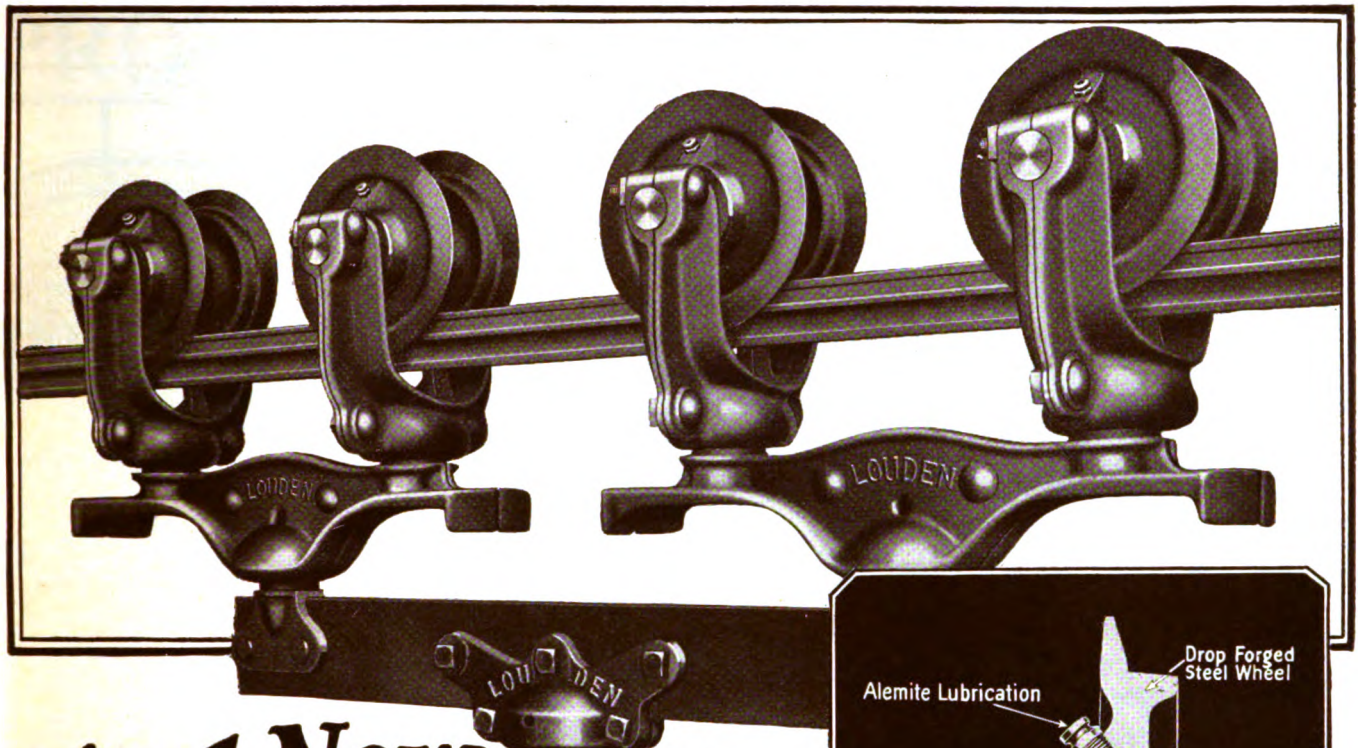
ROEPER CRANE & HOIST WORKS, Inc.
1728 N. 10th Street Reading, Pa.

CRANES - ELECTRIC HOISTS - TROLLEYS

R O E P E R

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And Now- the New

Easier Running— Greater Capacity— More Miles of Service

Ball Bearing Trolley Wheel

Never an announcement so important as this. Of all the improvements we have made, in developing Louden Overhead Carrying Equipment to its present high point of simplicity, adaptability and efficiency, this new, high-duty, double-row ball bearing trolley wheel is of greatest importance.

We have gained with this wheel new and amazing ease of operation; increased carrying capacity and a maximum load-bearing life that runs into thousands of miles. It has Alemite fittings and requires but one oiling each year. Dust-proof housings keep all dust, dirt and grit out of the bearings. Its thorough construction and extreme ease of operation adapt it to the most delicate precision work as well as to the heaviest and most grueling service.

Send Your Name for Full Details

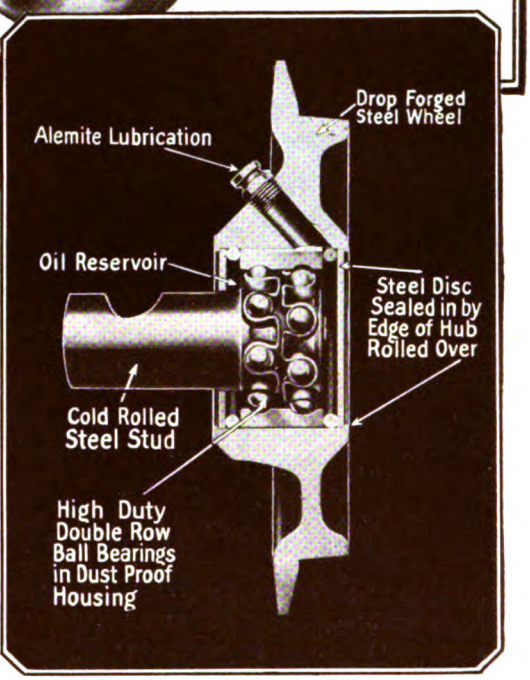
If you are considering the installation of an overhead carrying system to save time, labor, breakage, accidents, floor space, floor wear or labor turnover, let us give you full information with regard to Louden Overhead Track and Trolley Equipment in general and the new ball bearing wheel in particular. Just write us, *today*.

The Louden Machinery Company

5000 West Avenue (*Since 1867*) Fairfield, Iowa

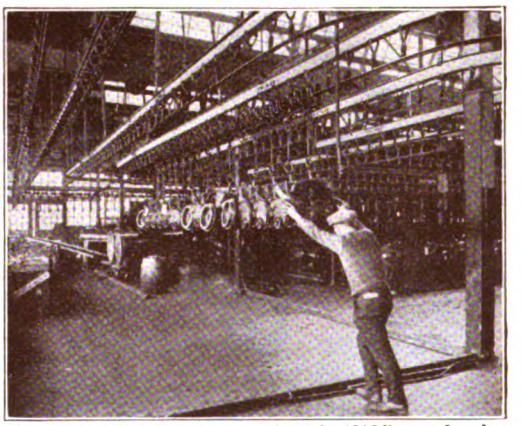
Albany—Boston—New York—Philadelphia—Pittsburgh—Buffalo—Cincinnati Cleveland — Toledo — Detroit — Chicago — St. Louis — St. Paul — Los Angeles

LOUDEN



Cut-away view of Louden high-duty, double-row ball bearing wheel. Balls and races are of alloy steel, machined, heat-treated and ground to precision with a tolerance of one ten-thousandth of an inch.

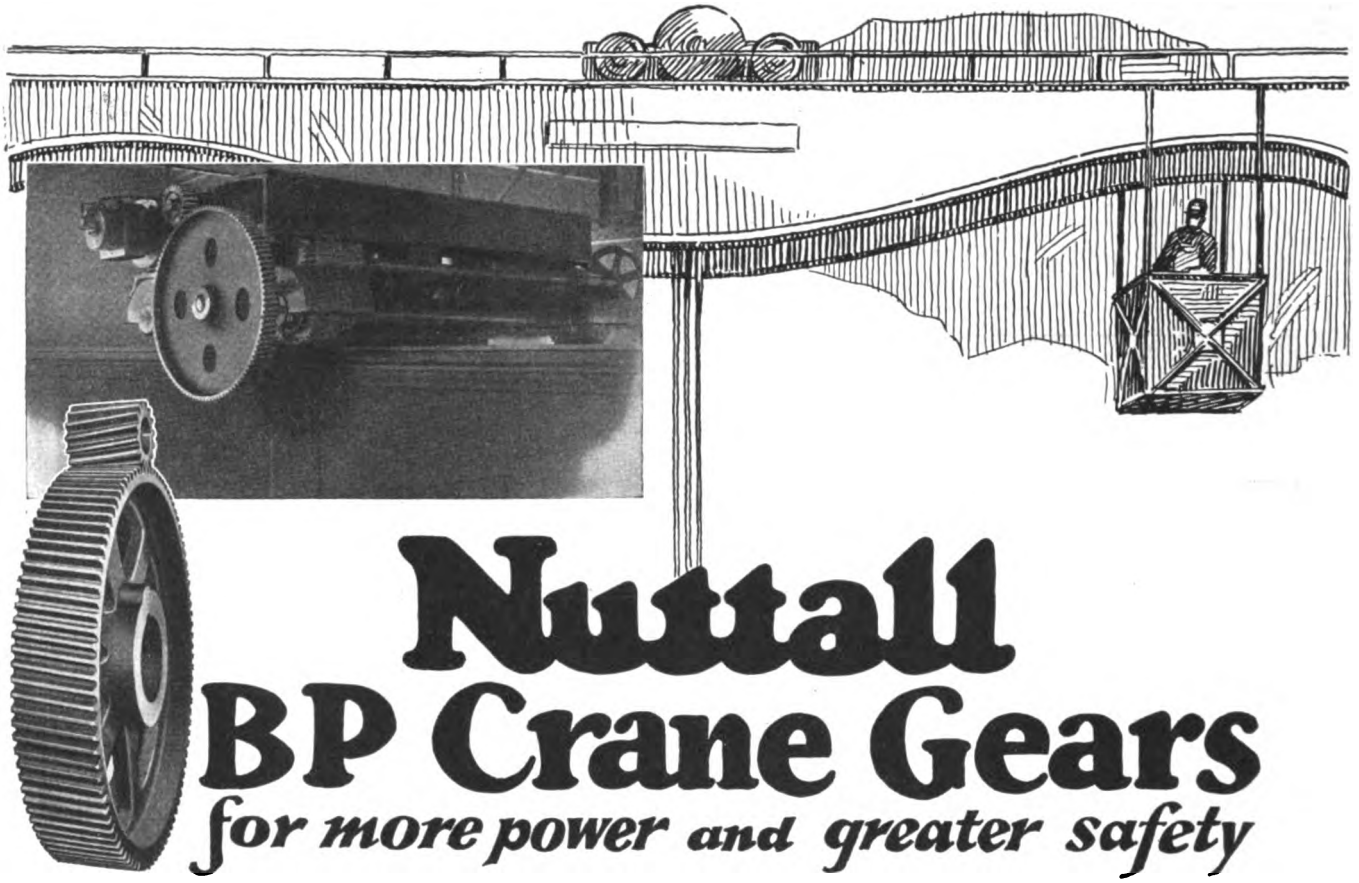
Wheel is drop forged steel, machined for the bearing. Every wheel is accurately gauged and must pass a rigid inspection for size and perfect centering of bore. True running and minimum friction are assured.



One man pushing 13 motors, total weight 4015 lbs., on Louden easy-running trolleys. Frequently this man pushes 18 to 20 of these motors down the straightaway and around a 4-ft. radius curve—a total weight of close to 6000 lbs.

OVERHEAD CARRYING EQUIPMENT

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Nuttall BP Crane Gears

for more power and greater safety

VERY often cranes are taxed to their capacity and sometimes beyond their rating. Then is when the gears must stand up unflinchingly, equal to any overloads with absolute safety.

Nuttall, Helical BP Gears are particularly adapted to crane service because of their design. The tooth contacting resembles that of a worm rather than a smashing, jarring action of a spur; avoiding vibrations, broken leads, open circuits and broken teeth.

If your cranes are not equipped with Nuttall Helical BP Gears, write us for details of our crane service.

Nuttall BP Gears have approximately four times the ultimate strength of untreated gears and are guaranteed to give four times the life of untreated gears in identical service.

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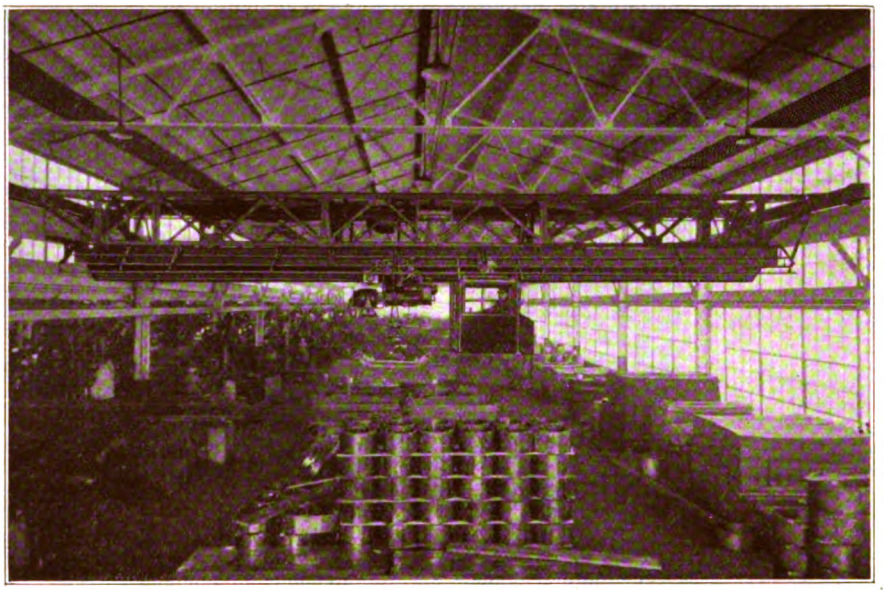
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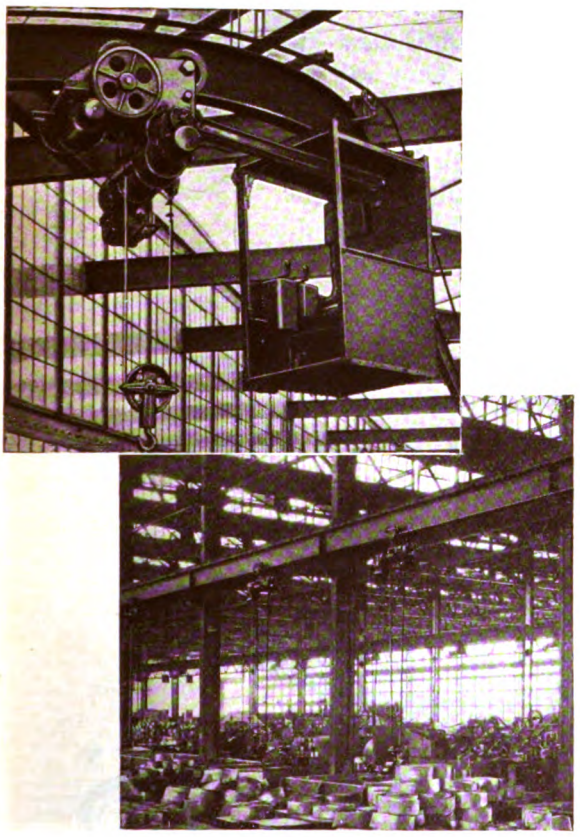
PRODUCTION-SPEEDING EQUIPMENT

DETROIT

Electric and Pneumatic

HOISTS and CRANES





A few of the many applications of Detroit Hoists pictured in our illustrated catalog.

During the past twenty years and more, Detroit Hoists and Cranes, both electric and pneumatic, have been showing industrial executives the way to lower handling costs.

There is something to consider in this experience. Our engineers have had the good fortune to encounter and solve various and diversified handling problems, and this experience is available to you in helping towards a solution to the handling requirements in your plant.

Detroit Equipment consists of

Electric Hoists, Portable, Stationary, Monorail—Electric Winches, Portable and Stationary—Electric Locomotive Turntable, Tractors and Winches—Electric Travelling Cranes—Electric Ice Cranes, Dumps, Lifts—Electric Operated Jib Cranes—Pneumatic Geared Hoists and Winches—Pneumatic Stationary Motors and Travelling Cranes—Pneumatic Operated Jib Cranes—Pneumatic Locomotive Turntable Tractors and Winches.

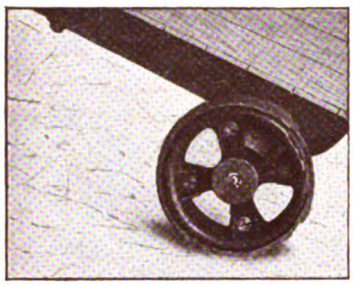
and many other special applications for labor saving service.

DETROIT HOIST & MACHINE CO.

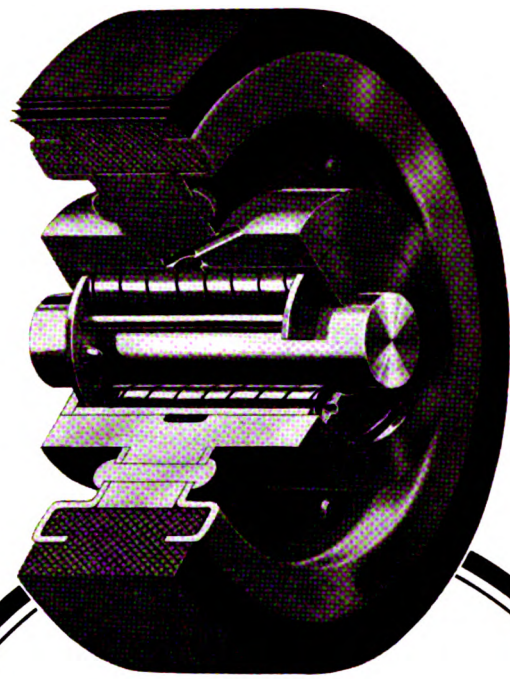
8201 Morrow St., Detroit, Mich.

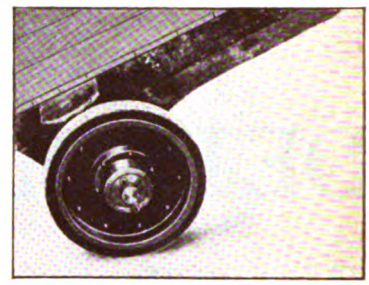
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A Rubber Tired Wheel After 6 Weeks Service





A Divine Canvas Cushion Wheel After 1 Year's Service

Truck Wheels That Wear Like Iron — Protect Your Floors — and are Noiseless

Divine Canvas Cushion Truck Wheels—and Casters—are practically as durable as iron or steel wheels. They will outwear many sets of rubber tired wheels.

Tire replacement cost is eliminated after you equip your industrial trucks with Divine wheels. Besides wearing like iron, the canvas tread cannot chip or tear; it never comes off and it is not affected by heat, cold, oil or grease.

They are noiseless. They give 100 per cent protection to your floors.

There is a Divine Canvas Cushion Wheel made for every type of truck. Send for further information on these wheels, definitely bearing on your particular needs.

Divine Brothers Company
INCORPORATED
Utica, N.Y.

DIVINE *canvas cushion* WHEELS

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A New TEXT BOOK on Factory Management



"Bearing the Burden of Industry"



A CONTRIBUTION by the Mathews Conveyer Company and representative users of its equipment toward the better understanding of interior transportation problems and cost-saving solutions.

It has taken years of thought, study, and practical application to produce this book. The experience of leaders in industry is invaluable as a guide—especially so this year with increased interest being rightly shown in cheaper ways of making better products.

The Mathews Conveyer Company is glad to put this most worthwhile information at the disposal of factory and business executives everywhere. "Bearing the Burden of Industry", the exposition of modern conveying, will take its rightful place among other authoritative works on systematic routine production.



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Increase Plant Profits

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Please send me my copy of "Bearing the Burden of Industry."

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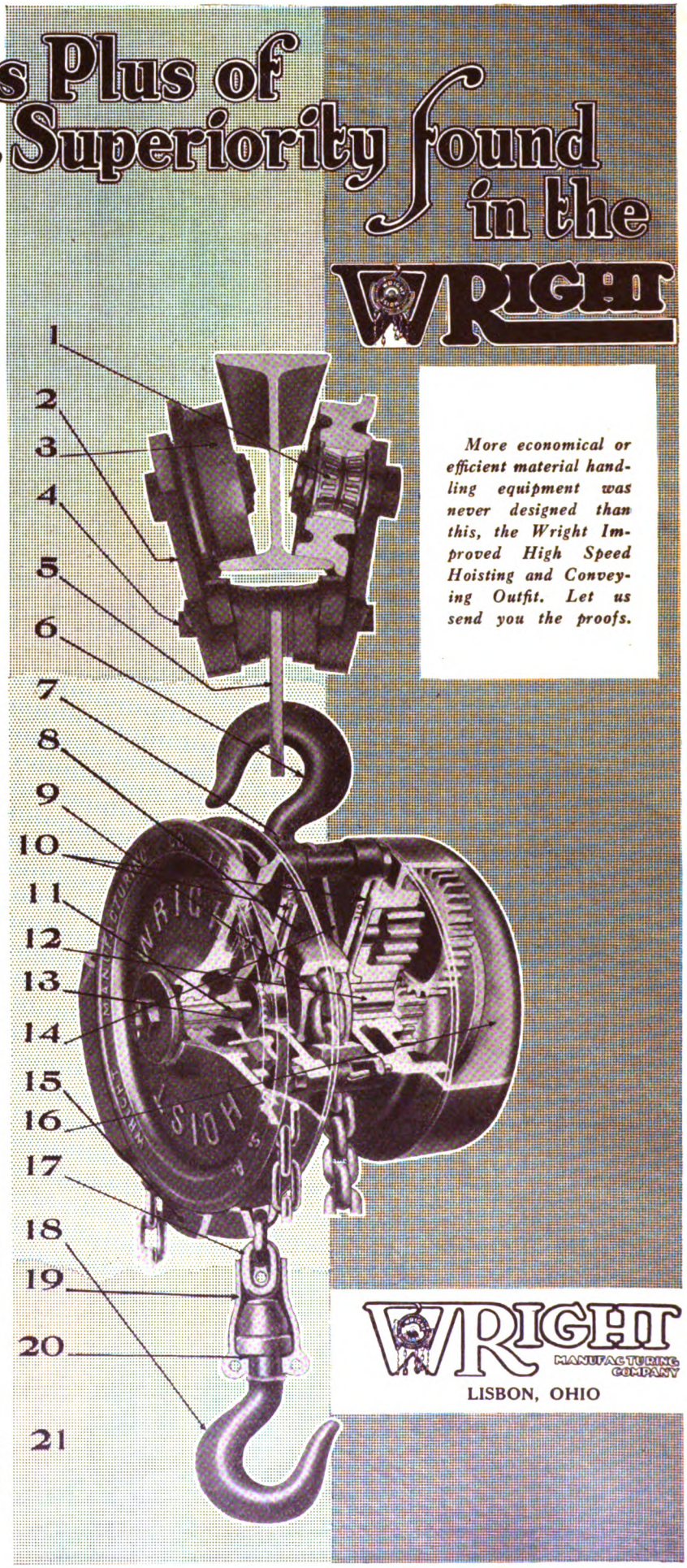
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21 Points Plus of Hoist Superiority found in the WRIGHT



1 **Timken Tapered Roller Bearings**
Act as combination thrust and radial bearings.

2 **Steel Side Plates**
Bumpers protect wheels and bearings from damage by collision

3 **Chilled Tread Wheels**
Insure absolute roundness and longer life.

4 **Steel Equalizing Pin**
Permits placing trolley on I-Beam at any point and insures equal distribution of the load on the four wheels.

5 **Steel Hanger Plate**
May be eliminated and hook hung on equalizing pin to save headroom.

6 **Upper Steel Hook—Drop Forged—Proof Tested**
The strongest part of the hoist. This hook never opens to drop the hoist and the load.

7 **Steel Drop Forged Cross Head**

8 **Safety Load Chain Guard**
Completely shrouds the upper half of load wheel. Prevents chains from ever riding out of load sheave pockets.

9 **Steel Load Wheel**
Special analysis electric steel casting, annealed.

10 **Oil Tubes**
To insure positive and easy lubrication at vital points

11 **Main Driving Spindle and Pinion**
Upset forging S. A. E. steel 1035—heat treated.

12 **Bronze Bushed Load Sheave**

13 **Ball Bearing Driving Spindle**
Where speed is greatest. Not subjected to heavy and shock loads. Eliminates wear on this part.

14 **Steel Suspension Plates**
An extra precaution to care for heavy overloads

15 **Non Fouling Hand Chain Guide**
(Malleable Iron.)

16 **Gear Cover, Extra Heavy**
Pressed from ⅛" plate. Insures permanency

17 **Special Analysis Steel Chain**
Electric welded, heat treated, and proof tested. An elastic limit 3½ times rated capacity, and breaking strength 6½ times rated capacity

18 **Lower Steel Hook—Drop Forged—Proof Tested**
Never opens to drop the load

19 **Detachable Steel Coupling, Drop Forged**
Completely encloses Ball Bearings. Easily detachable to renew chain. Load is not held on connecting bolts but by the forgings

20 **Ball Thrust Bearing on Bottom Swivel Hook**
Permits easy swiveling of load. Insures load chain hanging straight and feeding perfectly straight into load sheave pockets. This insures longer life to chain and wheel, the greatest point of friction and wear

21 **Oil Cups Spring Cover in All Oil Holes**

More economical or efficient material handling equipment was never designed than this, the Wright Improved High Speed Hoisting and Conveying Outfit. Let us send you the proofs.

WRIGHT MANUFACTURING COMPANY
LISBON, OHIO

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An Open Letter to Executives About HANDLING COSTS

MOST executives are wide-awake to the definite saving which can be made by improving handling methods, and to the saving of time and the increase of production that such improvements bring about.

Now it is largely a matter of determining exactly what system of handling is the most practical, the most economical for the particular plant in question. To do this job intelligently and effectively it is not enough for a plant executive to consider stock ready-made systems. He should enlist the aid of trained engineers, of experts on handling matters, who will make a careful study of the special problem in his plant—who will not be bound by precedent or formula—who will be able to design a system for handling his materials that will fit his own needs.

Such a service Alvey-Ferguson engineers are ready to render to any plant in need of an improved handling system.

For 25 years, Alvey-Ferguson engineers have been developing handling systems. Some of the most important installations in the country are theirs. A list of the users of Alvey-Ferguson handling systems would fill several pages like this in small type.

But the important consideration for the plant executive is that Alvey-Ferguson engineers attack a handling problem from an altogether new angle. Although they are backed by many years of experience in solving handling problems, each job is a new one for them, to be studied and worked out from a fresh viewpoint. Whenever necessary, special parts are designed and made.

We invite interested executives to write to us for more information about our unique service. There is no obligation involved. Just mail the coupon.

THE ALVEY-FERGUSON CO.

Incorporated

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CONVEYING A=F MACHINERY

Branch Offices

DETROIT
LOS ANGELES
CLEVELAND
ROCHESTER

THE ALVEY-FERGUSON CO.,
Cincinnati, Ohio.

Gentlemen:

Referring to your Open Letter in August *Industry Illustrated*, please arrange to have a member of your Engineering Service Bureau call to consult with us our handling problem.

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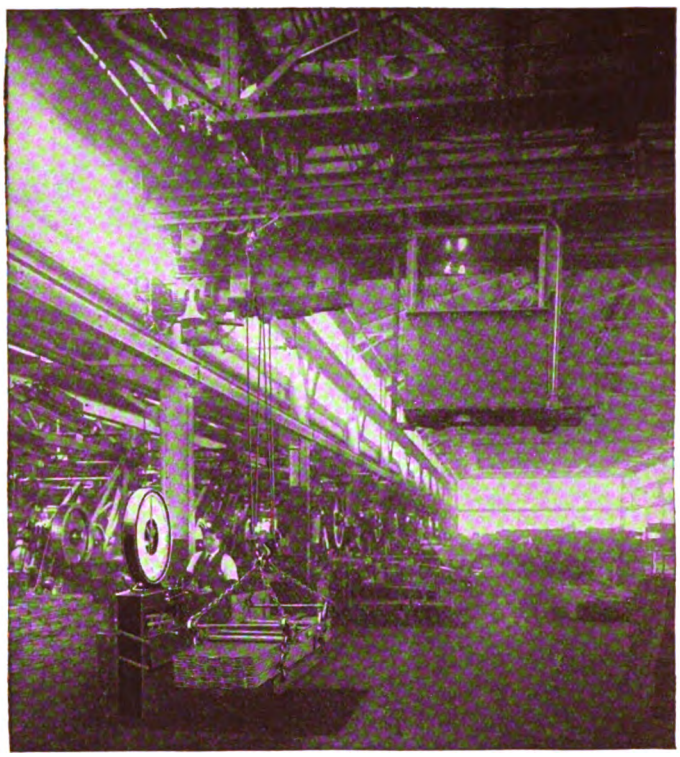
City ..... State .....

Executive .....

Most convenient time to call .....

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Weighing Material on the Move



A load of steel channel on its way to the raw stock department, being lowered by the electric crane on a Toledo Automatic Scale.

The weighman is ready to note the exact weight in plain figures on the great dial the moment the load rests on the platform.

IN the various departments of most industrial plants material usually is weighed or parts counted:

When received.

When issued to production departments.

In transit between departments.

During manufacturing processes.

For cost records or inventory.

To determine the pay for piece work.

To determine freight or express charges or postage.

To determine the amount of invoice for the product itself.

For special purposes.

Time is wasted and mistakes made in these frequent operations, when workmen have to put on and take off loose counterbalance weights, move a poise on a weigh beam, judge when the beam is in balance, read the weight indicated in small figures and markings on a beam from 12 to 24 inches long, and add to this the value of the loose weights.

With Toledos the operator has only to put on the load and read the weight in plain figures on a dial from 5 to 7 feet in circumference. Toledos save thousands of half-minutes and stop thousands of small losses.

A check by a Toledo scale man will show whether losses occur in the weighing or counting operations in your plant. This check will cost you nothing. It may save you much. Write us for particulars. Kindly address Industrial Sales Department, Section 5.

Toledo Scale Company, Toledo, Ohio

Canadian Toledo Scale Co., Limited, Windsor, Ont.

Manufacturers of Automatic Scales for Every Purpose

Offices and Service Stations in 106 Cities in the United States and Canada

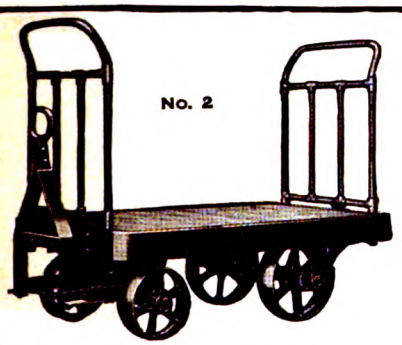
TOLEDO SCALES

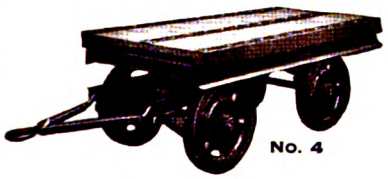
NO SPRINGS HONEST WEIGHT

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Mercury Tractors — *the motive power of the tractor-trailer system* — are offered in four different types and fifteen different models.
Ask for tractor Bulletin 106.

No. 1—The all purpose castor type industrial trailer. *Request Bulletin A-100.*

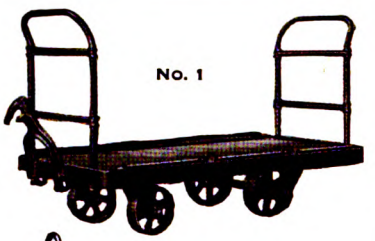
No. 2—This is a 4 ton capacity wagon-type steer. *Bulletin A-125 tells about it.*

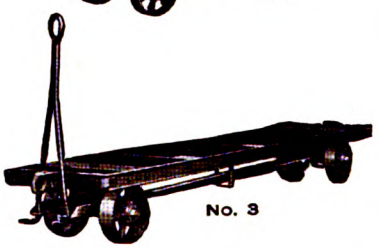
No. 3—A four-wheel steer trailer for long commodities. *Described by Bulletin A-120.*

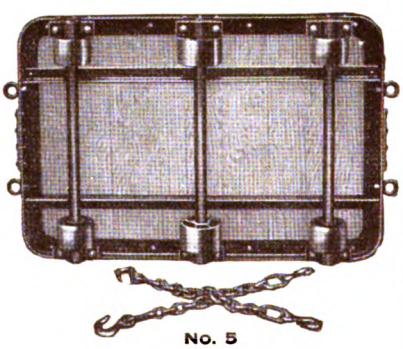
No. 4—Spring suspended — rubber tires — a minature highway trailer. *Complete specifications in Bulletin A-120.*

No. 5—A strong dolley for the hard-to-load shipments. *Ask for Bulletin A-120.*

No. 6—Dump body trailer for bulk material. *For description request Bulletin A-120.*



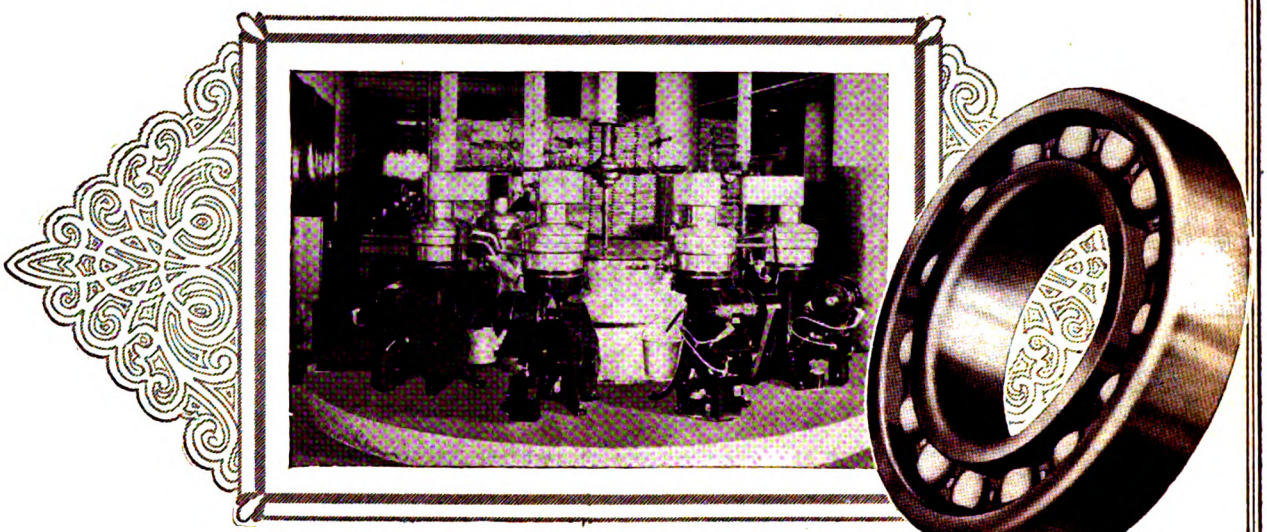




Mercury
Manufacturing Company

4112 So. Halsted St. Chicago

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A battery of oil filters with individual drive by ball bearing motors

Ball Bearing Motors Almost Take Care of Themselves

COMPARED to the service requirements and maintenance expense of sleeve bearings, the simple nine-month lubrication periods and long life of electric motors equipped with New Departure Ball Bearings are a great saving in many ways.

A survey of the performance of a large number of electric motors over a period of years shows that—compared to sleeve bearings—New Departure-equipped motors

Save from half to three-quarters of their motor maintenance expense.

—Reduce the cost of re-winding burned-out motors 70%.

—Cut lubricating and inspecting costs about 82%.

—Save 80% of the cost of new bearings and 88% of the expense of installing them.

"Cutting Costs" is the name of a new booklet now on the press outlining these worth-while economies. A copy will be mailed you upon request.

THE NEW DEPARTURE MANUFACTURING CO.
DETROIT BRISTOL, CONNECTICUT CHICAGO

New Departure Ball Bearings

333

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Something new in Transportation

A PRESSED STEEL* Hand Truck! Wherever strength is essential—strength with minimum weight—pressed steel is today the perfect material.

The American Pulley Company, applying its experience of some thirty years as successful specialists in pressed steel, has perfected a series of all-steel hand trucks scientifically designed for greater ruggedness, safety, economy and ease in handling. These new trucks were created after investigating all known truck uses, comparing the merits and disadvantages of former types, studying and testing every detail of stress, balance and structure.

Not a mere assembly of standard steel bars, but a truck constructed of steel parts, formed to our own design in our own shops. The result:—a truck as light as wood, of great strength, at a reasonable price, which will last indefinately with little or no maintenance or repair. In fine balance, easy running, a pleasure to use.

Every "American" Steel Truck is finished RED for identification as well as for appearance. Order from your dealer, or write us for full information.

*The hand grips only are made of hard wood for handling comfort. Pressed steel wheels are standard on some models, optional on others.

The American Pulley Company

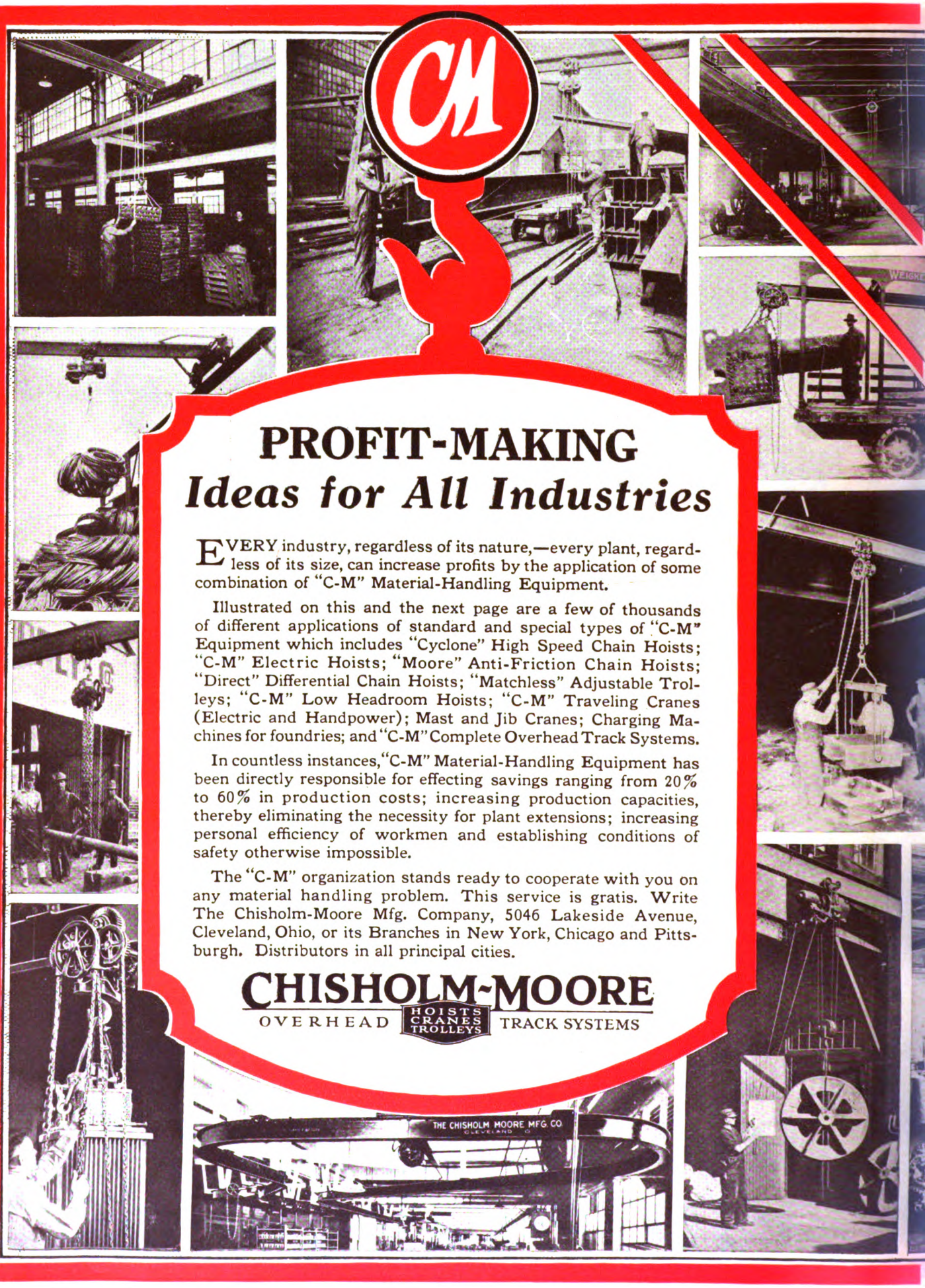
Manufacturers of Steel Split Transmission Pulleys, Pressed Steel Shaft Hangers, Pressed Steel Hand Trucks and Pressed Steel Shapes

4200 Wissahickon Ave. Philadelphia, Pa.

AMERICAN PRESSED STEEL TRUCKS

PATENTS PENDING

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PROFIT-MAKING
Ideas for All Industries

EVERY industry, regardless of its nature,—every plant, regardless of its size, can increase profits by the application of some combination of "C-M" Material-Handling Equipment.

Illustrated on this and the next page are a few of thousands of different applications of standard and special types of "C-M" Equipment which includes "Cyclone" High Speed Chain Hoists; "C-M" Electric Hoists; "Moore" Anti-Friction Chain Hoists; "Direct" Differential Chain Hoists; "Matchless" Adjustable Trolleys; "C-M" Low Headroom Hoists; "C-M" Traveling Cranes (Electric and Handpower); Mast and Jib Cranes; Charging Machines for foundries; and "C-M" Complete Overhead Track Systems.

In countless instances, "C-M" Material-Handling Equipment has been directly responsible for effecting savings ranging from 20% to 60% in production costs; increasing production capacities, thereby eliminating the necessity for plant extensions; increasing personal efficiency of workmen and establishing conditions of safety otherwise impossible.

The "C-M" organization stands ready to cooperate with you on any material handling problem. This service is gratis. Write The Chisholm-Moore Mfg. Company, 5046 Lakeside Avenue, Cleveland, Ohio, or its Branches in New York, Chicago and Pittsburgh. Distributors in all principal cities.

CHISHOLM-MOORE
OVERHEAD HOISTS CRANES TROLLEYS TRACK SYSTEMS

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A Complete Service

Elevators—Conveyors—Power Transmission







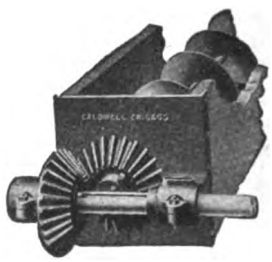
THE reward of skilled engineering, good manufacturing and honest merchandising, is permanent patronage and the confidence of the public.

The Caldwell Creed is to give all that you pay for and more—unquestioned quality, plus an intelligent engineering service.

It should mean a great deal to you that Caldwell customers stay with us year in and year out—thoroughly sold on the fact that Value for their money is certain. And that is real economy in buying.

Whatever your needs may be in the elevating, conveying and power transmission field, there is a Caldwell product adaptable to your use. Write or wire Caldwell or nearest Link-Belt office.





Caldwell Products

Power Transmission Machinery—Bearings, Shafting, Pulleys, Machine Molded Gears, Cut Gears, Chains and Wheels.

Elevating and Conveying Machinery—Helicoid Conveyor and Accessories, Belt Conveyors, Chain Conveyors, Elevator Buckets, Boots and Casings, Car Spotters, etc.

Catalog sent on request.

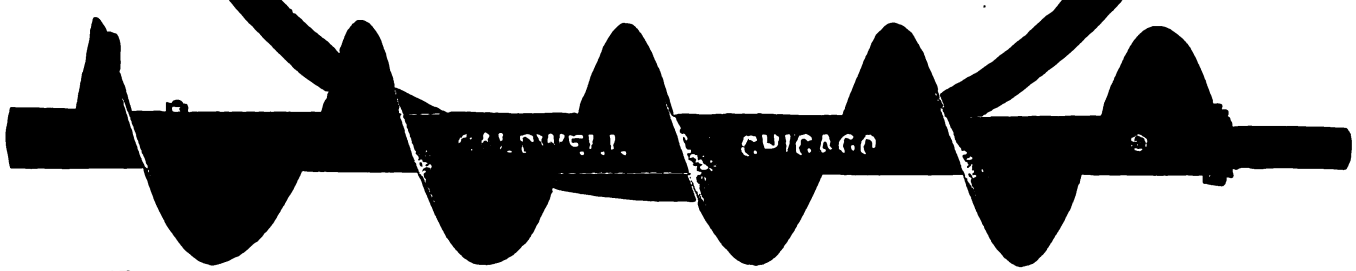
H. W. CALDWELL & SON CO.

LINK-BELT COMPANY, OWNER

CHICAGO: 1700 S. Western Ave.

NEW YORK: 2676 Woolworth Bldg. DALLAS, TEXAS: 810 Main St.

Link-Belt Company Offices in Principal Cities C-46.



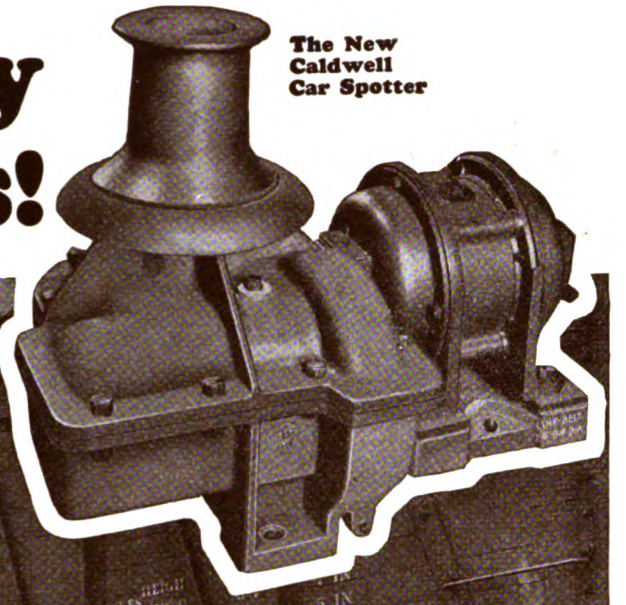
CALDWELL

Conveying and Power Transmission Equipment

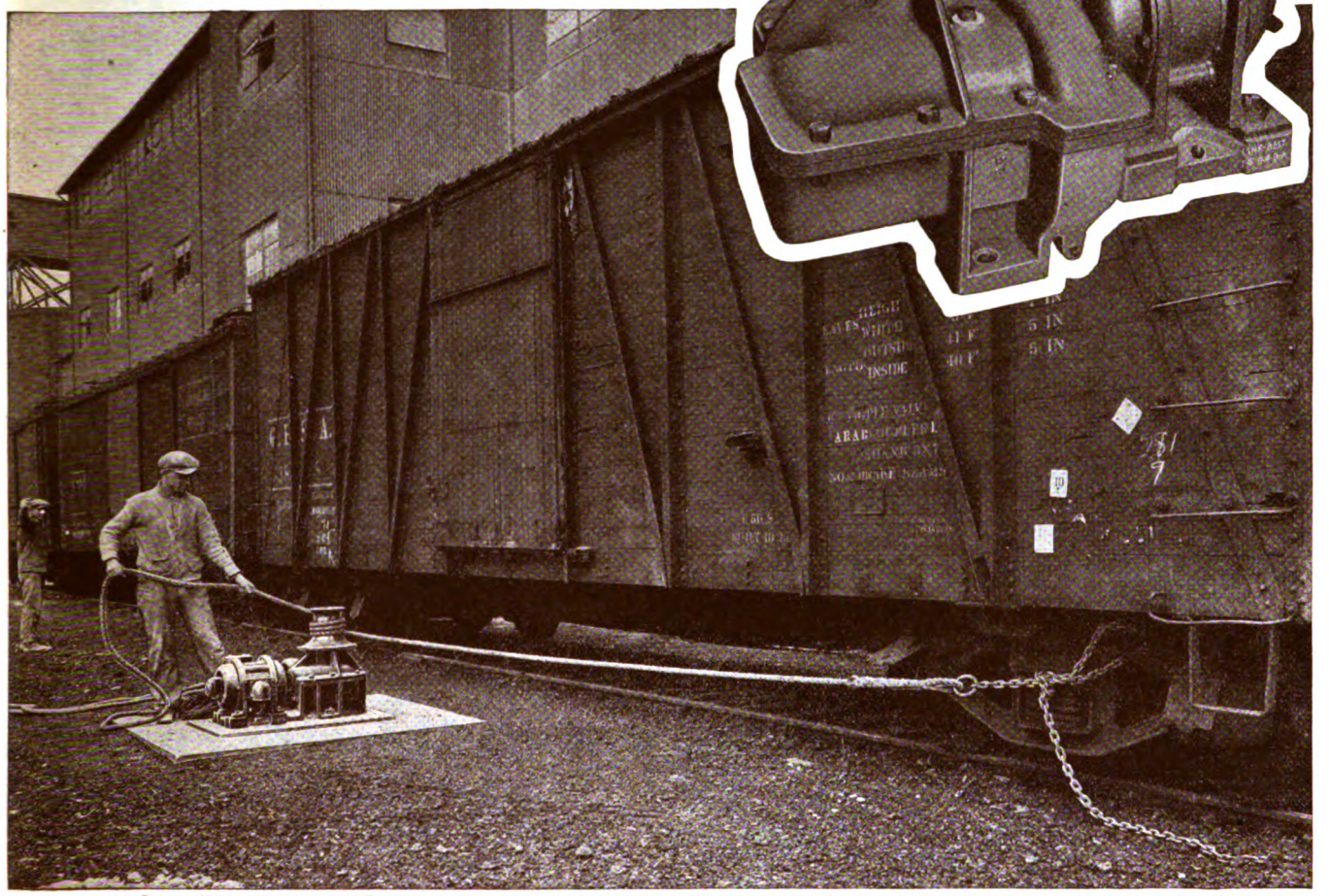
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The Best Way to "Spot" Cars!



The New Caldwell Car Spotter



Caldwell Vertical-Capstan Electric Car Spotter at work at plant of Darling & Company, manufacturers of high grade fertilizer

LET this rugged, self-contained winch spot your cars and do odd "pulling" jobs around the plant. Pulls in any direction.

The Caldwell Vertical-Capstan Electric Car Spotter is always ready—no need to wait for the switch engine! Takes no time at all, to spot a car.

A unique design, with few working parts; therefore, a *low price to you.* It doesn't pay to use pinch bars, or other hand methods. Send for full particulars on the quicker, cheaper way. Return the coupon.

Builders of car pullers for 35 years.

H. W. CALDWELL & SON CO.
LINK-BELT COMPANY, OWNER
New York, 2676 Woolworth Bldg. **Chicago, 1700 S. Western Ave.** Dallas Texas, 810 Main St.

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IND. ILL.

H. W. CALDWELL & SON CO.
1700 S. Western Ave.
CHICAGO, ILL.

Send us (without obligation) price and full particulars about your new car spotter.

Name_____
Firm_____
Address_____
City_____ State_____

CALDWELL CAR SPOTTER

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Give Red Bands your hard jobs



Trade Mark Registered

"Red Bands Stand Up Exceedingly Well in Magnesite Dust and Magnesium Chloride Fumes"

writes Mr. O. Peterson of the National Kellastone Co., Chicago, Ill., "In our stucco, flooring and plaster mill at Waukegan, Illinois, the Howell Motors are operating under very severe conditions. Magnesite dust and magnesium chloride fumes prevail throughout the mill making it absolutely necessary to wash out motors with gasoline every ten days or two weeks in order to assure efficient operation. Under these adverse conditions the Howell Motors are standing up exceedingly well.

At present we have 16 Howell Red Band Electric Motors ranging from 1 to 20 Horse Power in daily operation.

We are the largest producers of oxychloride products in the country and it is necessary that we have motors that are dependable. We have no hesitancy in recommending Howell Motors."

Howell Red Band Motors are made in all types and sizes from ½ H.P. to 100 H. P. Sales and Service blankets the nation. Catalog on request.

Howell Electric Motors Company
Howell, Michigan

62

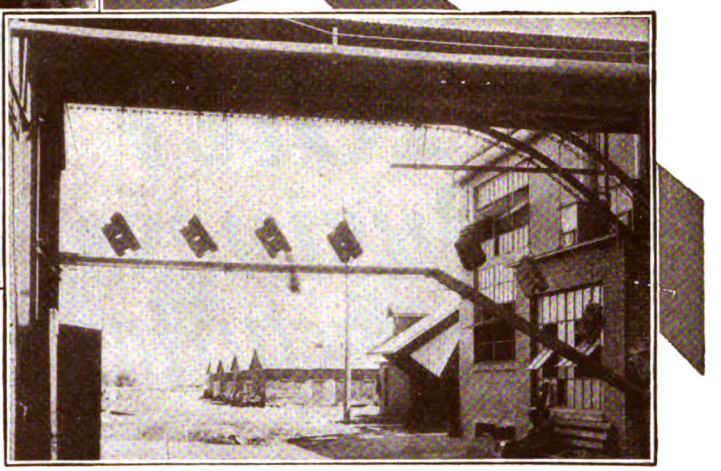
Howell RED BAND ELECTRIC Motors

Make Good On The Hard Jobs

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M H S Monoveyors at The Chevrolet Motor Company



M H-S Monoveyors at Saginaw Products Company

Take a Tip ~ from the Automotive Production Engineer

Mechanical Handling Systems reduce production costs for:

Buick · Cadillac
Chrysler
Chevrolet · Chandler
Cleveland
Durant · Dodge
Essex
Flint · Ford
Hudson
Hupmobile · Jewett
Lincoln
Marmon · Nash
Oldsmobile
Overland · Oakland
Packard
Paige · Pontiac
Reo
Star · Studebaker
Stutz
Whippet · Willys-Knight
Wills-St. Claire

WHEN he tells you that Mechanical Handling Systems will reduce your production costs, he means exactly that —and he can prove it from his own experience.

For instance, at the Saginaw Products Company, where Buick and Chevrolet cylinder blocks and other heavy products for the General Motors Corporation are made, Mechanical Handling Systems Overhead Continuous Monoveyors deliver cylinder blocks through a double sand blast into the cleaning room — 1800 every nine hours, at a cost of $10.48 per day. The old truck and trailer method cost $34.20 per day. A net saving of $6,546.72 per year or an annual return of 72% on the investment.

There are dozens of such examples in which every production manager will be interested.

Ask for Bulletin 420 and for a copy of Nielsen Survey which gives facts and figures.

MECHANICAL HANDLING SYSTEMS INC.

MANUFACTURING ENGINEERS

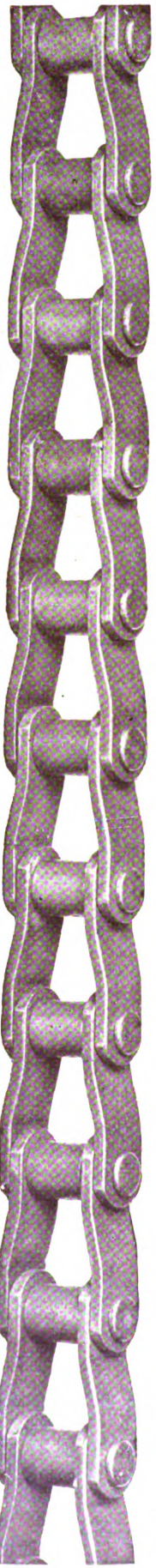
DETROIT MICHIGAN

FORMERLY THE CECIL R. LAMBERT COMPANY

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Your Business & Ours

If Your Business is manufacturing



If your business is manufacturing, we are interested in it.

Our business is conveying and material handling.

You can hardly be in manufacturing without there being some opportunities around your plant for conveying machinery.

Perhaps it doesn't appear so just now, but have you ever gone over the list of industries that have found a place for conveying during the past five years? Automobiles, of course, but do you know that we have built conveyors for fig packers, for fisheries, for bottling plants, for washing machine manufacturers, for stove factories, for foundries, for steamships, for warehouses and a host of others?

The men running these businesses put in these Systems because Rex Conveying reduced costs over other systems of material handling.

Your business needs conveying—our business is to supply it. Why not write about getting together?

REX CONVEYORS

CHAIN BELT COMPANY

711 Park Street Milwaukee, Wis.

What Conveying Accomplishes

Conveying does more than carry.

A system of conveyors is more than a means of material transportation.

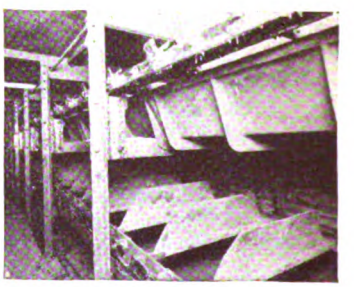
Some of the things that Rex Conveyors have done in manufacturing plants—some of the things that they may do for you are:

Simplify Assembly
Balance Production
Reduce Costs



Rex Progressive Assembly Conveyor Handling Stoves

Improve Quality
Save Floor Space
Increase Capacity
Control Production
Reduce Accidents
Reduce Inventory



Rex Scraper Flight Conveyor for Recovery of Foundry Sand

Break the Bottle Necks
Reduce Days in Process
Simplify Production
Better Deliveries

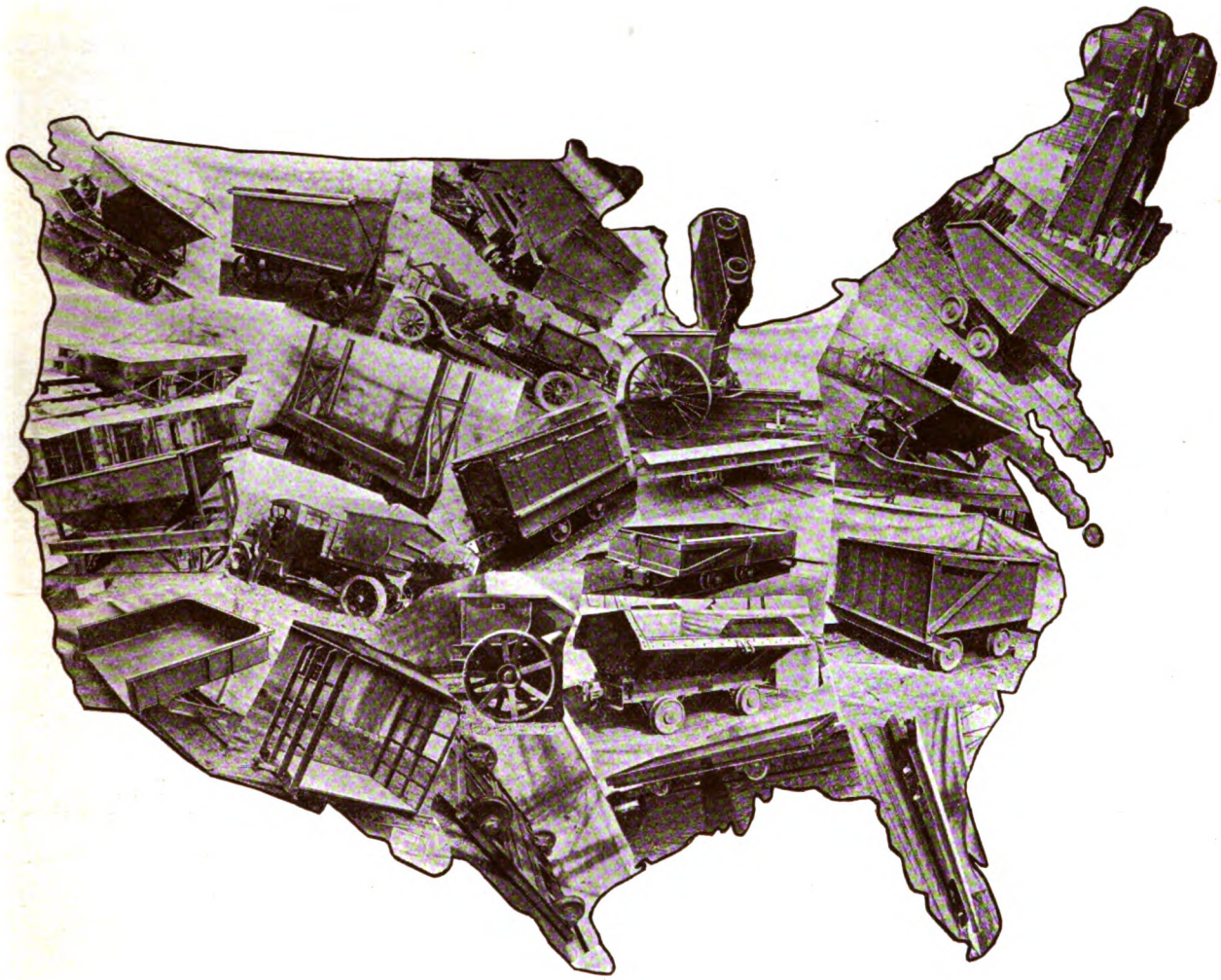
Make Equipment More Productive, Labor More Efficient, Power Factors More Favorable, and Your Business Easier to Run.

If you are interested in any of the above, it is time for your business and ours to get together. Will you start by writing us?

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EASTON



EASTON EQUIPMENT EVERYWHERE

EASTON CAR & CONSTRUCTION CO.

11 Scarritt Arcade, KANSAS CITY, MO. Hilton St., EASTON, PA.

EASTON CARS

FOR EVERY INDUSTRIAL PURPOSE

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A battery *that's tough* when the going *is rough*

An Exide-Ironclad Battery is built so rugged that it hardly ever loses any time out of service for repairs

WHEN you put Exide-Ironclad Batteries in your electric industrial trucks and tractors you may be sure those batteries will not only work like a charm on level surfaces, but will also stand up well under the shocks and jolts of occasional heavy going.

An Exide-Ironclad is so ruggedly built that it is rare indeed for it to lose any time out of service. And no wonder this is true. We have been making storage batteries for thirty-eight years, and our constant aim has been to make them better each year.

Not only does an Exide-Ironclad stay on the job day in and day out, but it always keeps the truck moving along quickly. It is packed with speed and power. Its voltage holds up well right down to the end of the discharge period. It charges quickly, easily and economically. Its first cost is reasonable and its life long.

It will pay you well to get the full facts about this remarkable battery that is cutting handling costs for more and more of the country's manufacturers every day. The names of a few of these companies appear on this page. Why not have our representative call and get his interesting story? No obligation. Or write for our booklet, "Facts for consideration in selecting a Storage Battery." It's full of valuable information.



Your electric industrial trucks may do most of their running on smooth, level surfaces. But what of the times when they must travel over a rough, uneven surface? Exide-Ironclad Batteries are built to stand the jolting and bumping. Read the story on this page.

A few of the many manufacturers that use Exide-Ironclads

E. G. Budd Mfg. Co. Philadelphia, Pa.
Trumbull Steel Co., Warren, O.
Minnesota Steel Co., Duluth, Minn.
Cleveland Automatic Machine Co. Cleveland, O.
Remington Arms Co. Bridgeport, Conn.
National Cash Register Co. Dayton, O.
Buick Motor Co., Flint, Mich.
Dodge Bros., Inc., Detroit, Mich.
American Motor Body Co. Philadelphia, Pa.
J. G. Brill Company Philadelphia, Pa.
Fisher Body Co., Detroit, Mich.
Cadillac Motor Co., Detroit, Mich.
Delco-Light Co., Dayton, Ohio
Crane Company, Chicago, Ill.



The long-life, trouble-free, power-full battery

Exide
IRONCLAD
BATTERIES

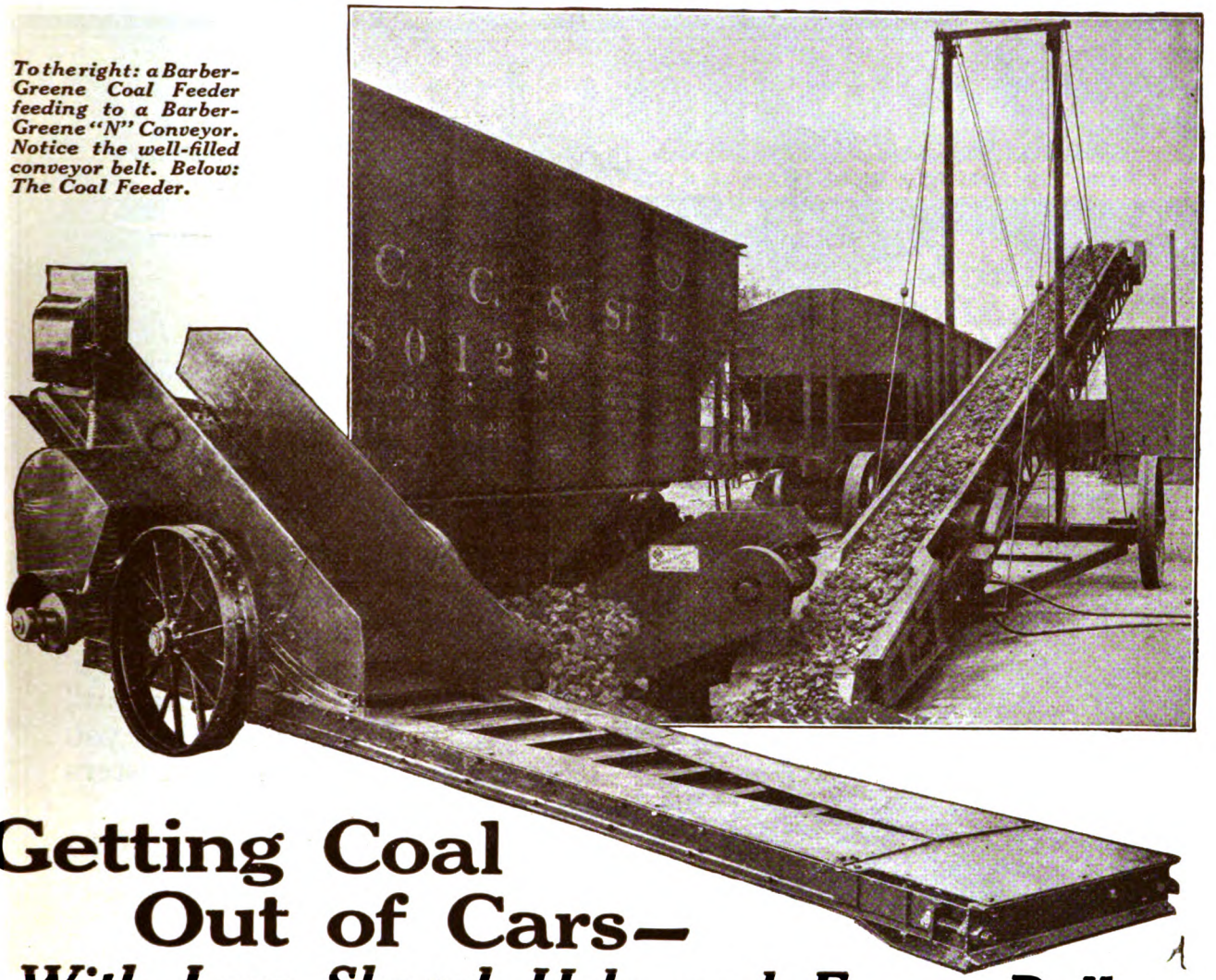
THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

Exide Batteries of Canada, Limited, 153 Dufferin Street, Toronto

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To the right: a Barber-Greene Coal Feeder feeding to a Barber-Greene "N" Conveyor. Notice the well-filled conveyor belt. Below: The Coal Feeder.



Getting Coal Out of Cars—

With Less Shovel Help and Fewer Dollars

This Barber-Greene Coal Feeder cuts the old fashioned shovel gang to a helper or two.

In many cases it speeds up car unloading to such an extent that what is left of the yard gang is free to put in the major portion of its time on other work.

And the Barber-Greene eliminates the need for expensive track pits and expensive unloading machinery.

Its long, low extension slips beneath car hoppers and rests on or beneath rails. All of the coal dropped through the hopper is caught and carried to the storing or loading conveyor.

The only shovel help required is for cleaning the car corners—about the same needed with any ordinary type of unloading equipment. And that shovel help comprises the entire unloading gang. There are no high priced operators—and no foremen.

The Coal Feeder mounted on its two-wheel truck, can be moved to practically any desired spot. Accurate car spotting and constant car moving is often dispensed with entirely.

In company with Barber-Greene Portable Belt Conveyors, the Coal Feeder presents an unusually efficient coal unloading and storing system—for virtually any tonnages.

Operating charges are low—the first cost and investment charges low.

The equipment can be operated for a short period, or a long period—to handle relatively low or high tonnages—at a profit.

And the only shovel help needed is the man or two inside the car. The coupon to the right brings you complete information on the Barber-Greene Coal Feeder — and other B-G Coal Handling equipment.

We have reports in our files of how the Coal Feeder is saving in the neighborhood of $500 per year on tonnages of around 3000 tons.

This coupon will bring you Mr. Barber's famous Scrapbook, which illustrates such jobs with pictures and facts. It's like making a material handling inspection tour through the entire United States. Send for a copy today

For complete information on Barber-Greenes for your tonnages, mail this coupon to The Barber-Greene Company, 500 W. Park Ave., Aurora, Ill.

Name _____

Company _____

Address _____

City _____ **State** _____

Yearly tonnages _____

_____

BARBER-GREENE CO.—*Representatives in* ***fifty cities***—**500 W. Park Ave., Aurora, Ill.**

BARBER GREENE

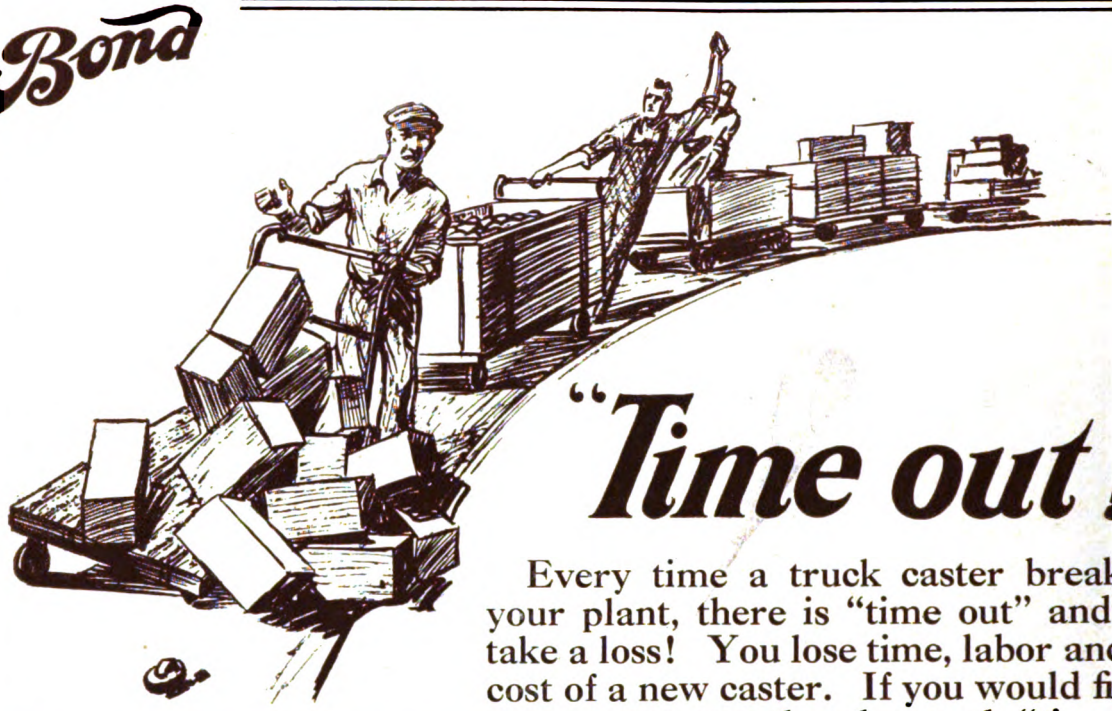
Portable Belt Conveyors Self Feeding Bucket Loaders

Coal Loaders . . Automatic Ditch Diggers . . Coal Feeders

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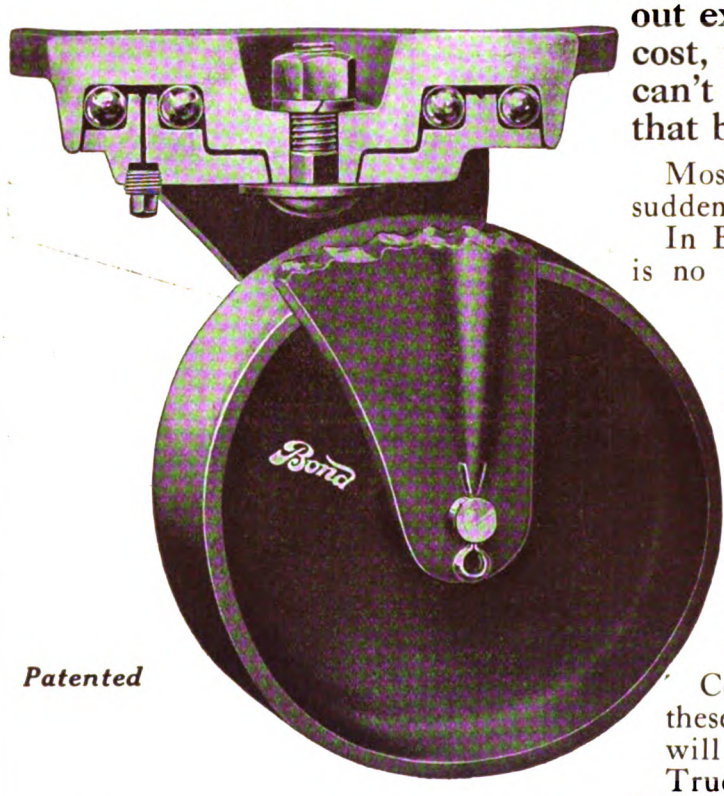
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Bond



"Time out!"

Every time a truck caster breaks in your plant, there is "time out" and you take a loss! You lose time, labor and the cost of a new caster. If you would figure out exactly what each "time out" cost, you would realize that you can't afford to use truck casters that break down in service.



Patented

DOUBLE BALL RACE TYPE

Most truck casters break because of a sudden strain or thrust on the Kingpin.

In Bond Swivel Truck Casters, there is no strain whatever on the Kingpin when swivelling because all stresses and thrusts are taken by the sturdy ball races and hardened carbon steel balls.

This construction means extra strength and easier swivelling under heavy loads. The truck will turn in any direction—quickly and almost without effort. Bond Roller Bearings on the wheels of Bond Truck Casters reduce man-power to a minimum.

Consider the economy of stopping these annoying "time outs." Then you will understand why Bond Swivel Truck Casters are a paying investment. The Bond line of Truck Casters is complete, including a type to meet every requirement of the industrial plant.

We will gladly study your caster requirements and recommend the right type for your use. Send for illustrated catalog.

BOND FOUNDRY AND MACHINE COMPANY

Manheim, Lancaster Co., Penna.

New York Office: 256 Broadway

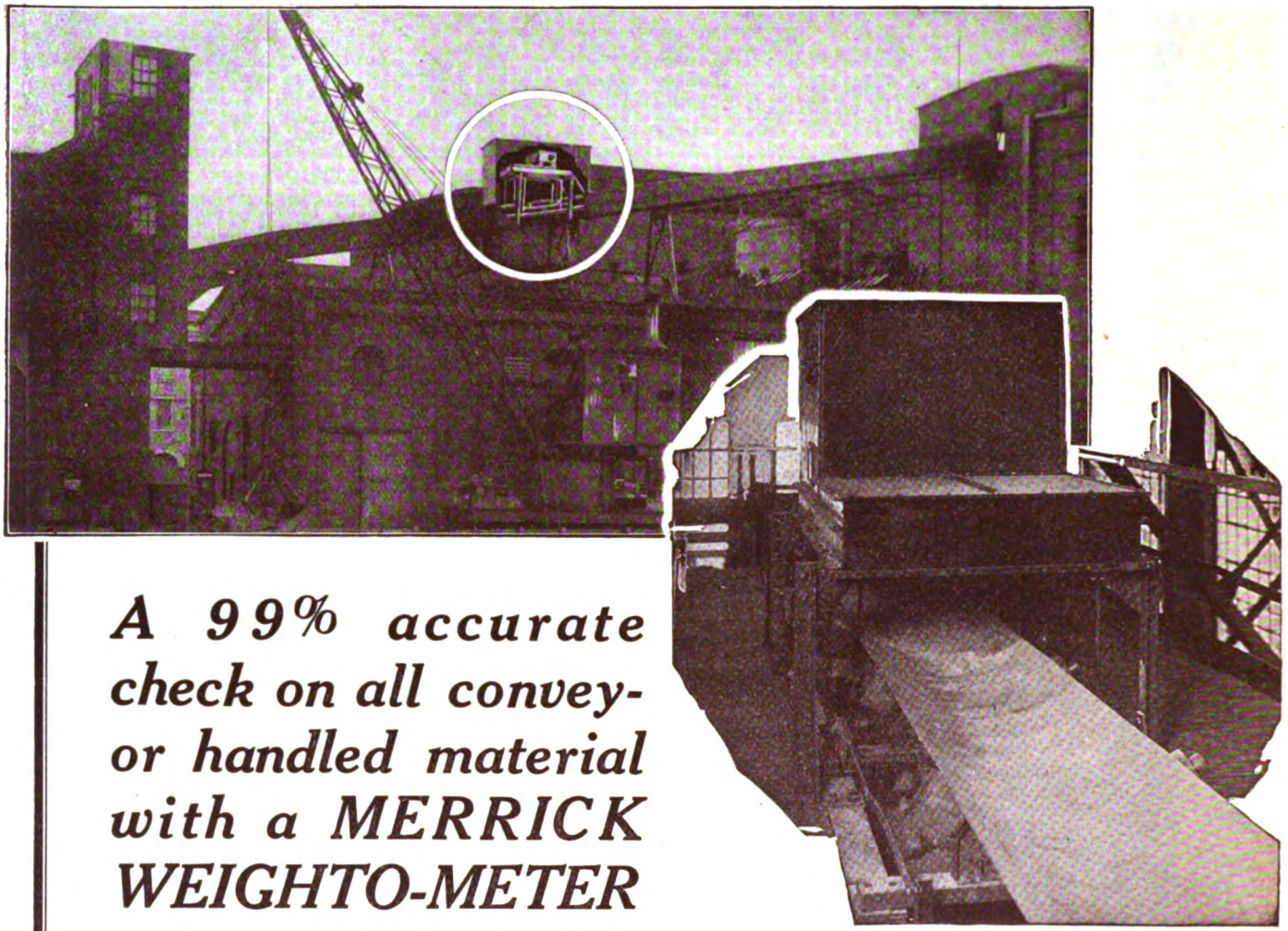
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Photograph Shows Large Disc Fan for Use on Cooling Towers

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A 99% accurate check on all conveyor handled material with a MERRICK WEIGHTO-METER

GUESSING weights is too costly an item with the plant that is constantly receiving quantities of materials. Little inaccuracies daily may mean thousands of dollars lost annually.

It is just as easy to weigh accurately as it is to weigh on the hit or miss plan. The Merrick Weighto-Meter will give you a 99% accurate check on all conveyor handled materials—ore, sand, stone, gravel, coke, finished cement, etc., etc., and without stopping the operation while the material moves along.

The Merrick catalog tells you the complete story—send for it today.

MATERIALS WHOSE WEIGHT ARE ACCURATELY CHECKED WITH A WEIGHTOMETER

- Coal
- Coke
- Fertilizer
- Ore
- Sand
- Gravel
- Finished Cement
- Stone
- etc.

MERRICK SCALE MFG. COMPANY

PASSAIC, NEW JERSEY

MERRICK WEIGHTOMETER

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Three Billion Dollars a Year for Industrial Handling

What Are You Spending?

A TOTAL payroll of American Manufacturing, according to the latest census year, 1923, is given by M. M. Stuart, Director of the Census, as $14,017,107,000.00.

A survey made for a leading trade paper about a year ago, indicates that the cost of material handling is 21.8% of the manufacturing payroll of the country—or the tremendous total of over $3,000,000,000.00.

A startling reminder of the important part that material handling plays in present day production and the need for eliminating waste in handling or moving parts or products.

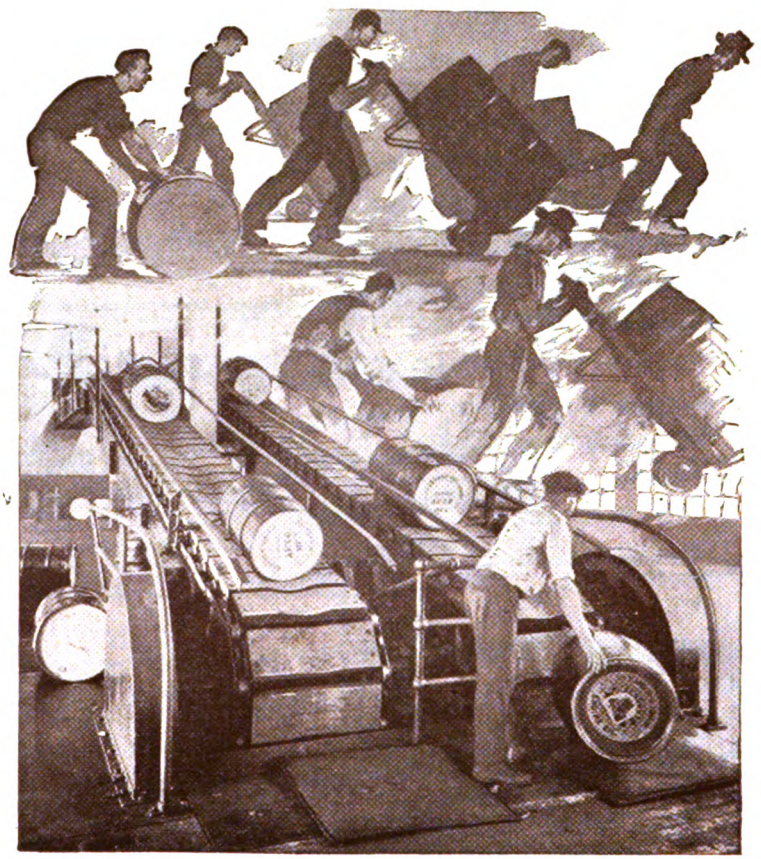
Material Handling may be the "Hidden Cost" that is holding down profits in *your* plant.

Material Handling Methods or Equipment should, however, be selected with care. Put your problem up to Jeffrey Engineers. They have for half a century been planning and analyzing material handling methods for America's leading industrial concerns.

And back of this wide experience stands one of the largest plants of its kind devoted to the building of labor-aiding and production cost-reducing equipment.

Service rendered to industry is responsible for its growth from a one-room workshop in 1877—to a plant today covering 30 acres of floor space.

The twenty Branch Offices mentioned below are ready to serve and aid you.



Receiving end of a Jeffrey Wood Apron Conveyor Handling Barrels in a large Oil Refinery

The Jeffrey Manufacturing Company

946-99 North Fourth St., Columbus, Ohio

New York	Pittsburgh	Cleveland	Milwaukee	Los Angeles
Buffalo	Scranton, Pa.	Charleston, W. Va.	St. Louis	Birmingham
Rochester, N. Y.	Boston	Chicago	Denver	Charlotte, N. C.
Philadelphia	Cincinnati	Detroit	Salt Lake City	Montreal

JEFFREY
MATERIAL HANDLING EQUIPMENT

JEFFREY PRODUCTS

Elevators—Conveyors
Portable Loaders
Coal and Ashes Handling Equipment
Skip Hoists
Chains and Attachments
Sprocket Wheels—Gears
Crushers—Pulverizers
Sand and Gravel Handling, Washing and Screening Equipment
Locomotives
Coal Mine Equipment
Tipple Equipment
Ventilation Fans

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"Moving is 90% of Making"

Whiting Cranes are Moving Many Products in Many Industries — What application are you overlooking?





1 Handling a product in process in a machine shop.

3 Lifting heavy parts of special machinery in a power house.



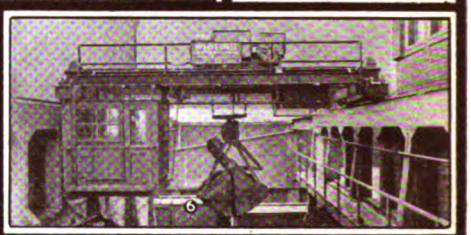


2 Handling ladles, closing flasks, drawing patterns, etc., in a foundry.

4 Handling rolls of paper.

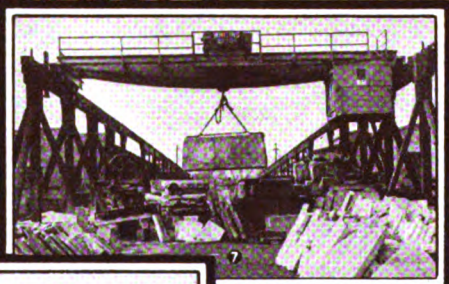


There is a Whiting Crane for every service



5 Piling lumber and loading it again.

7 Handling blocks of stone or marble.





6 Unloading and storing coal.

8 Lifting bars, rods, shapes, scrap, pig, etc., with a magnet.



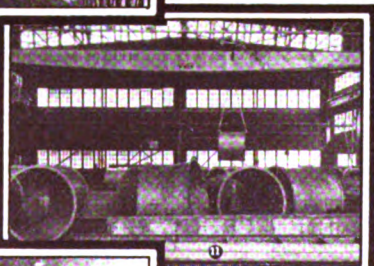
3—250 Tons—all types
Electric or hand power travelers
Gantry, jib, pillar, Bucket handling, etc.



9 Handling loose materials such as cement clinker with a clam shell bucket.

11 Assembling plates and structural members.

13 High piling in an auto body shop.





10 Serving big presses, punches and other tools.

12 Unloading freight cars.

14 Rapid loading and unloading at a warehouse.



Whiting Corporation,
Harvey, Ill.,
(Chicago Suburb)



WHITING

IM8-Gray

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Puts Longer Life *into* Cranes

Smooth, steady, uninterrupted service—you expect it from your traveling cranes. Besides, you want to hold your operating and maintenance costs to a minimum.

This is exactly what you get in the Milwaukee Electric Traveling Crane and Hoist. While the "Milwaukee" is of practical design and of good, sound, sturdy construction—it has in addition one big, outstanding, exclusive advantage—*Positive Oil Lubrication.*

This exclusive Milwaukee feature of positive, semi-automatic oil lubrication assures a long life of service at the lowest possible maintenance cost. All gearing and bearings are fully enclosed—sealed against escape of oil and the entrance of destructive grit and dirt.

Naturally, Milwaukee Cranes stay "active" longer—long after friction-worn, dry-running cranes grow "feeble." Let us tell you what this means in keeping production up to schedule.

If it's an overhead handling problem—Gantry, or standard—consult "Milwaukee" first.

SEND FOR THIS CATALOG



Our new catalog completely describes and vividly pictures Milwaukee Traveling Cranes and Hoists. It gives you detailed information on its exclusive feature—positive oil lubrication. Send for it today.

Milwaukee Electric Crane & Mfg. Corp.

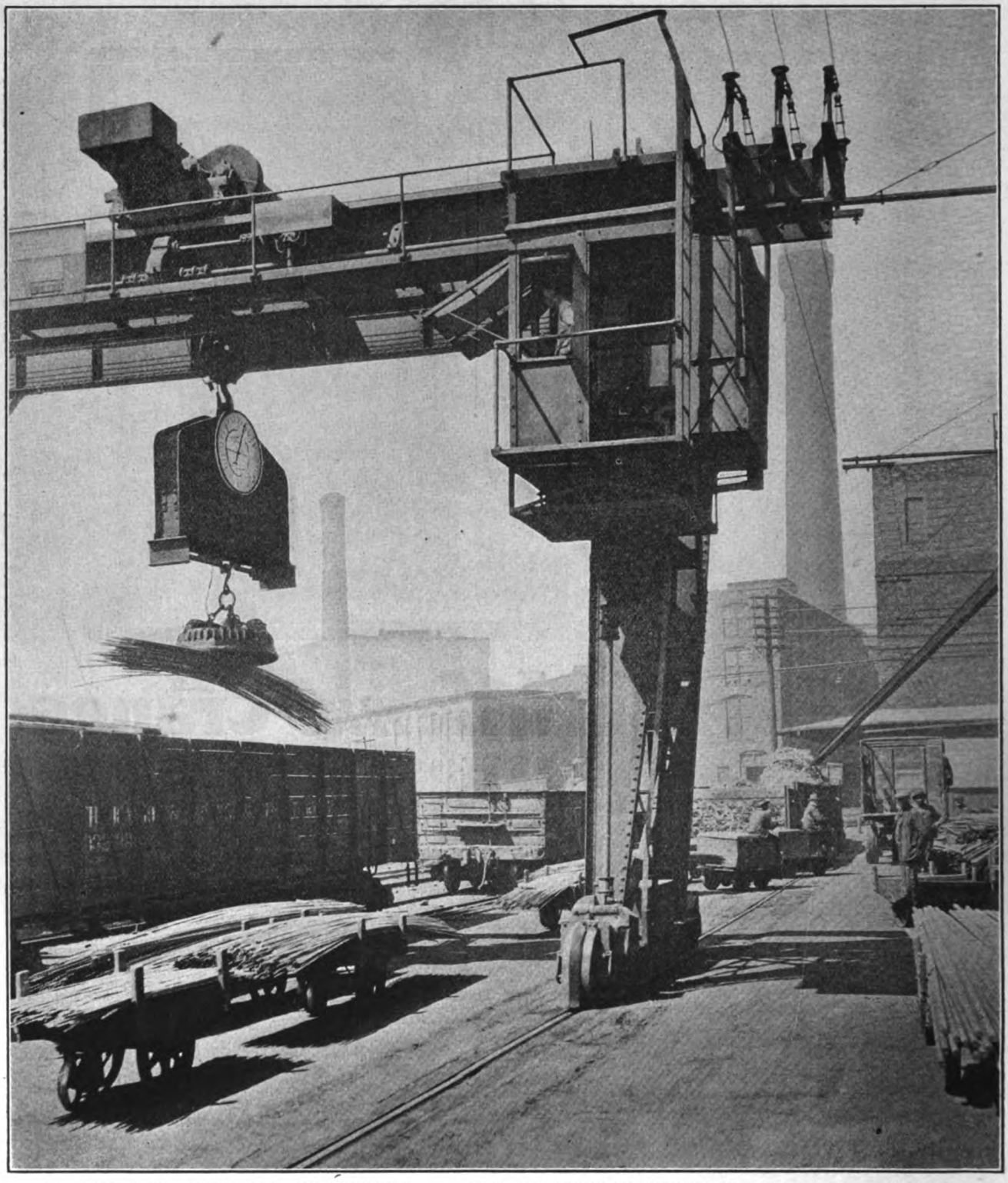
Milwaukee, Wisconsin

MILWAUKEE CRANES

The Traveling Crane with THE MILWAUKEE CRANE *Positive Oil Lubrication*

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A KRON SCALE SOLVES A DIFFICULT WEIGHING PROBLEM

This Kron Crane Scale at the Deering Works of the International Harvester Company, Chicago, makes the weighing of heavy materials a simple matter. No labor is required. The Crane Operator can record the weight while material is on the move.

In addition to standard types such as Dormant Platform—Industrial Railway—Industrial Monorail—Portable Platform—Rolling Mill—Bench or Floor—Traveling Hopper and Counting Scales, we design and build scales to meet special requirements.

Write for the Kron catalog.

AMERICAN KRON SCALE CO.

430 East 53rd Street **New York, N. Y.**

CANADIAN KRON SCALE CO., MONTREAL, CANADA

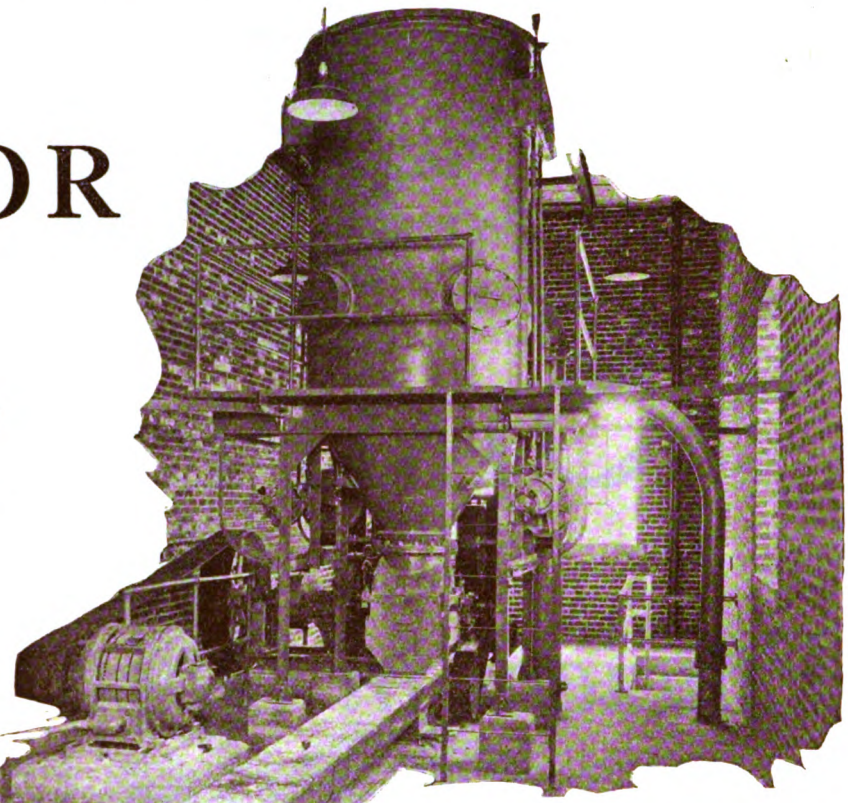
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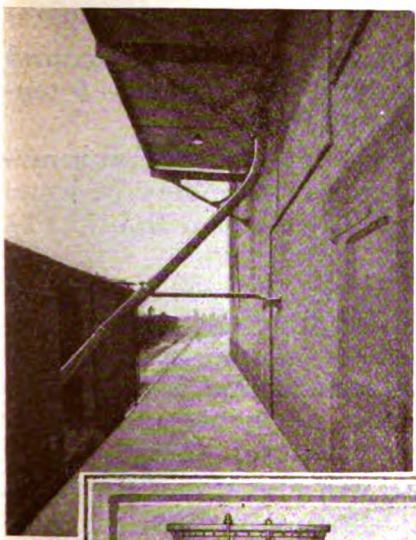
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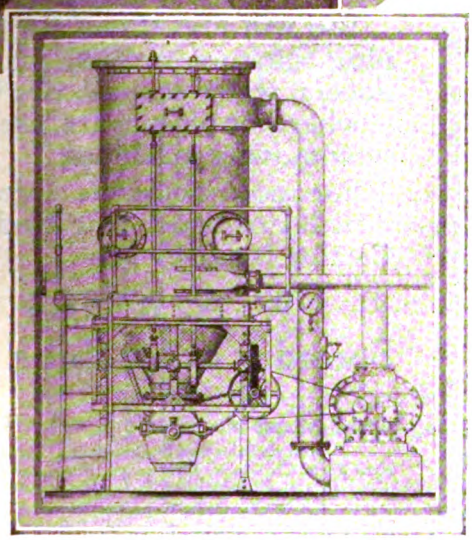
The AIRVEYOR

Conveys

Dusty, Granular and Poisonous Materials







Eliminates

dangers to workers and explosion hazards

OVER Twenty Five Years Experience in the design, construction and installation of all types of conveying and handling equipment is an important advantage, when Guarantee Construction Company Engineers are called in to aid you.

In the field of pneumatic conveying we have many installations successfully handling lime, gypsum, soda ash, clay, flour and other dusty and dangerous materials. With the AIRVEYOR dust hazards are eliminated—costly labor is made unnecessary and every particle is conveyed without loss from car to bin.

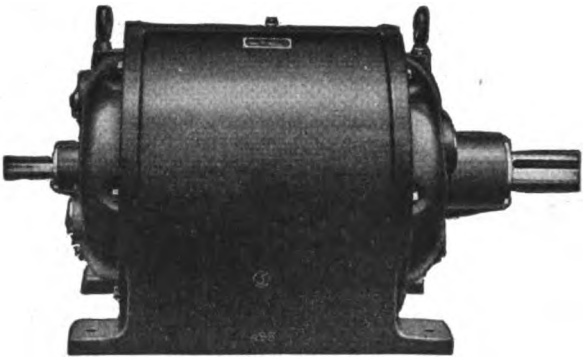
Bulletins on the AIRVEYOR and all other types of Material Conveying and Storage Equipment sent on request.

Guarantee Construction Company

Conveying Equipment and Storage Plants

148 Cedar Street New York

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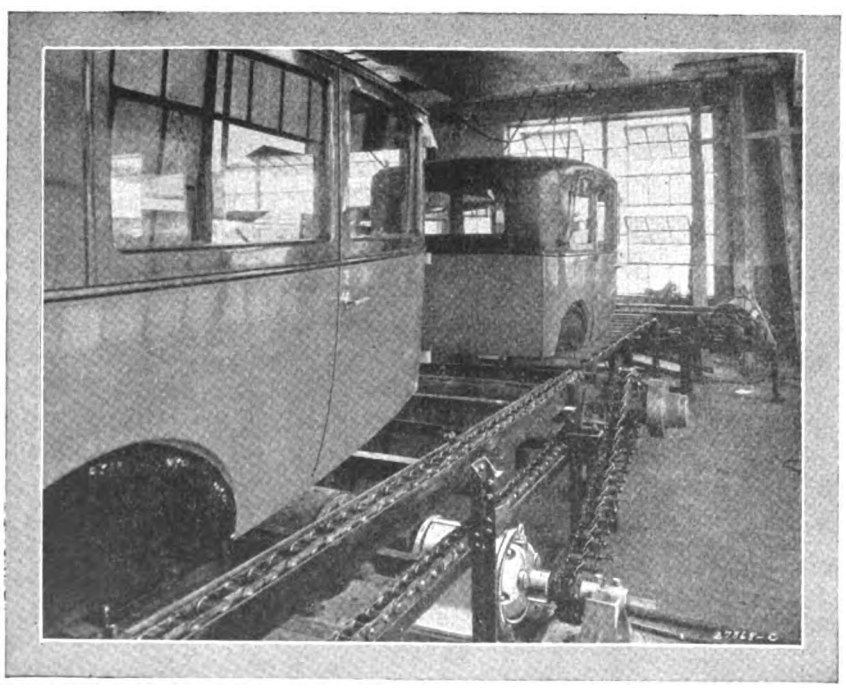


SIMPLE *in Construction* *Efficient in Operation*

A Jones Spur Gear Speed Reducer, driving on a balanced straight line, is as efficient in operation as it is simple in construction. The gears inside the cast-iron housing run in a constant bath of oil.

The bearings in Jones Speed Reducers are liberal. Dirt and grit are barred. Danger of pins and keys getting into the gears is eliminated. Shafts are ground within the limits of plus or minus 5 ten-thousandths of an inch.

The reducer shown driving this automobile body conveyor is a double type Jones Spur Gear Speed Reducer with a 72 to 1 ratio.



Conveyors of many types are driven by Jones Spur Gear Speed Reducers—of simple design, foolproof construction, low installation cost, negligible upkeep and high efficiency.

You will find them, also, running agitators, stokers, gas producers, water screens, dry kilns —wherever motors are used for slow moving machines.

For more complete information let us send you Reducer Catalog Number 26.

W. A. JONES
Foundry & Machine Co.

Main Office and Works:
4412 West Roosevelt Road, Chicago

Branch Sales and Engineering Offices:
New York, Cleveland, Milwaukee, Pittsburgh, Buffalo, Detroit, Birmingham, St. Louis, Cincinnati

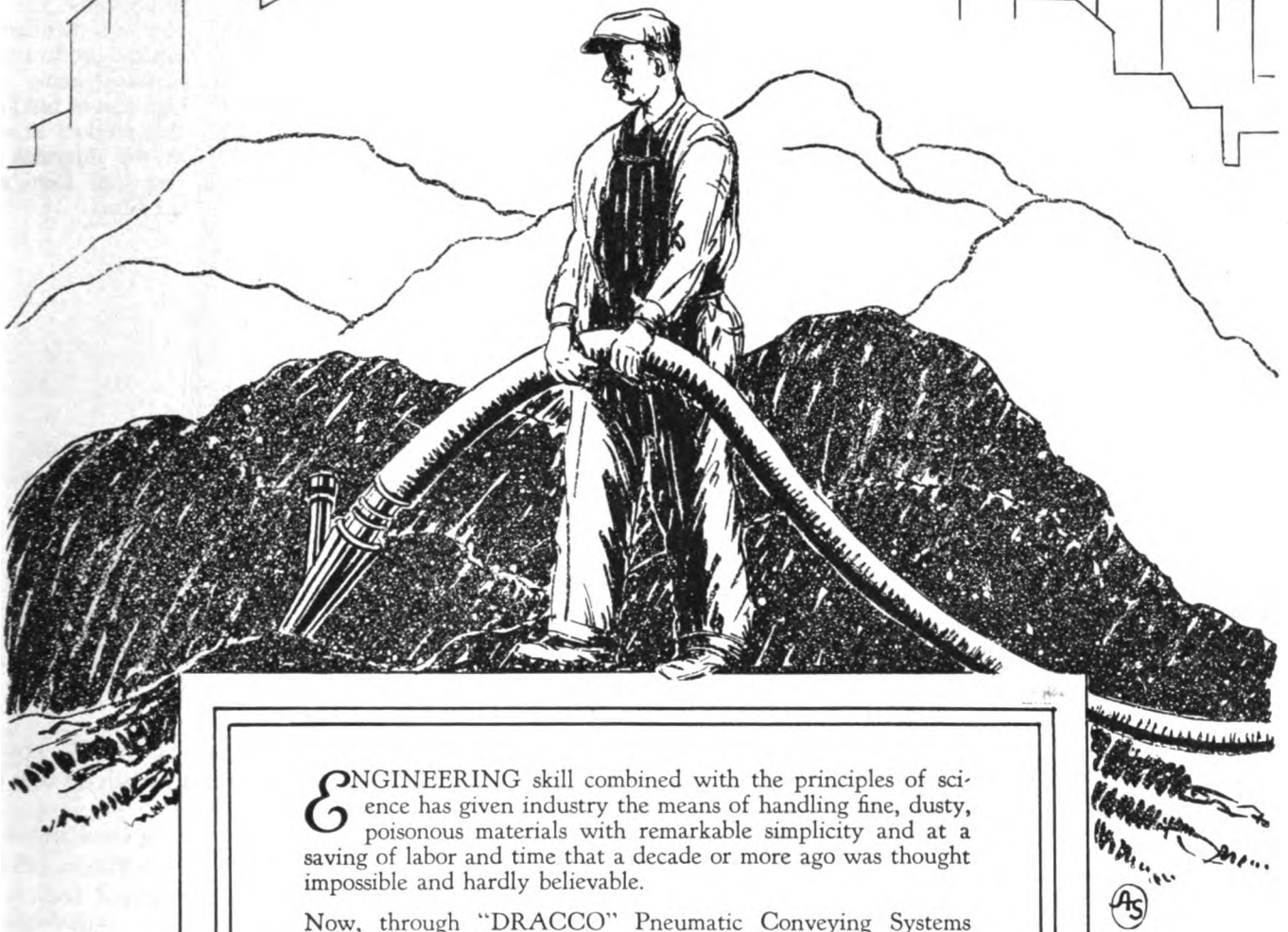
Pacific Coast Representatives:
The King-Knight Co., *San Francisco, Los Angeles, Seattle*

Jones Speed Reducers
and Power Transmitting Machinery

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The Modern Handling System that has Cut the Conveying Time from Days to Minutes



ENGINEERING skill combined with the principles of science has given industry the means of handling fine, dusty, poisonous materials with remarkable simplicity and at a saving of labor and time that a decade or more ago was thought impossible and hardly believable.

Now, through "DRACCO" Pneumatic Conveying Systems Lead, Litharge, Lead Oxide, Lime or Phosphate, Fertilizer, or, in fact, every kind of dusty and powdered material, are conveyed from box cars to bins and storage in the matter of minutes where formerly days and weeks were required, and with the labor of one or two men where a whole gang was necessary.

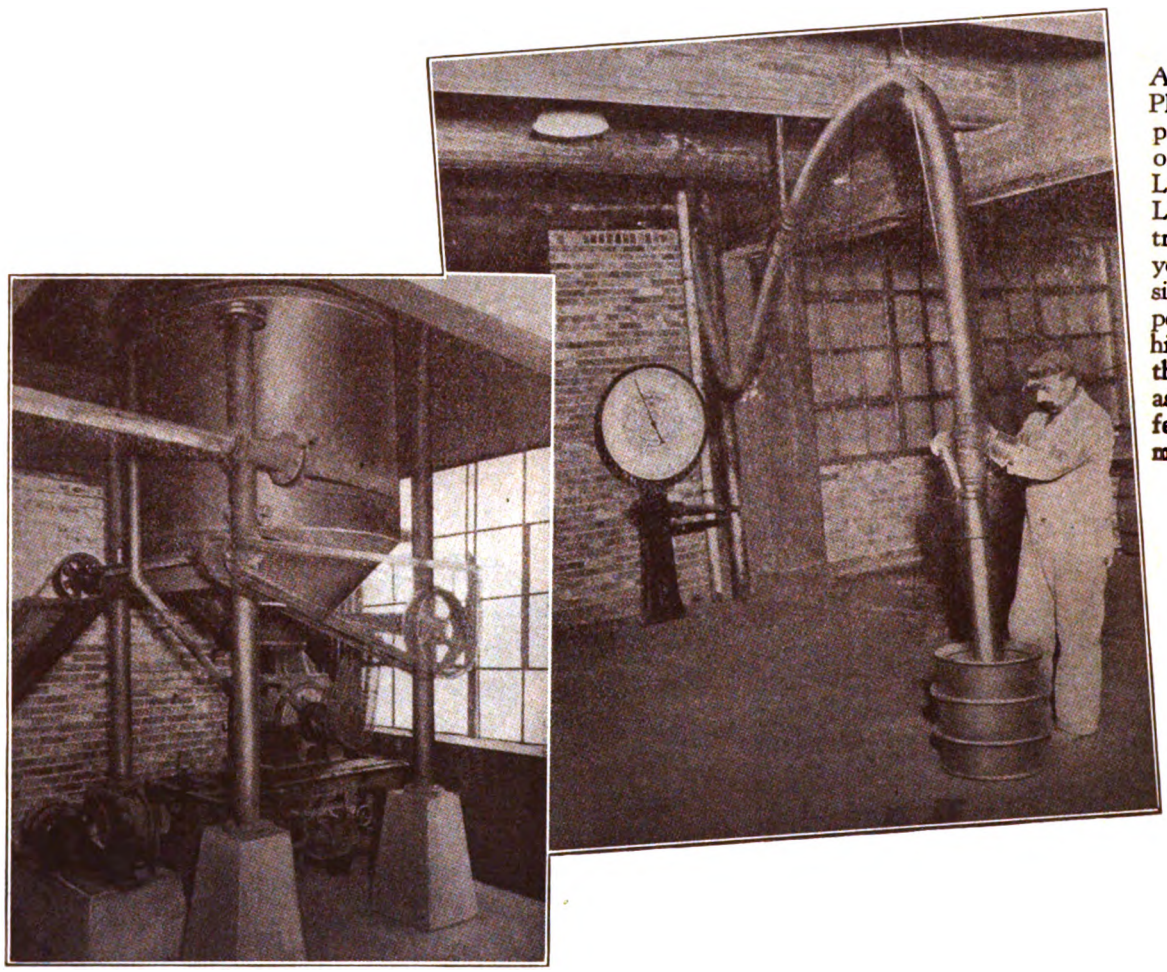
This modern force in the saving of labor costs is described on the following pages.

DRACCO DOES IT

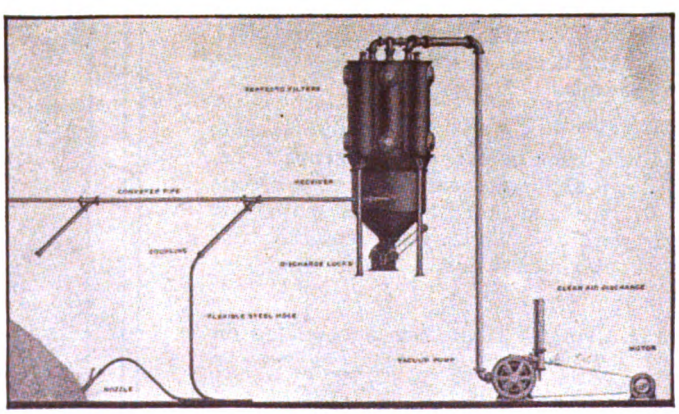
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Many "DRACCO" Installations Prove Here—3000–6000 lbs. of Lead Per Hour



At the Pittsburgh Plate Glass Company, the handling of finely powdered Litharge and White Lead was always a troublesome job. If you ever handled a similar product you perhaps know the high cost of handling this product as well as the injurious effect on men and machines.



Now, *one man* handles it with practically no trouble and not a particle of dust is lost.

The Litharge and White Lead are conveyed to receiver and Perfecto Filters (all in one single unit) and discharged from receiver discharge hoppers into spiral conveyors which deliver the litharge and white lead to their individual storage hoppers.

"DRACCO" Pneumatic Conveying is the dustless, effortless, automatic, economical way to handle such material.

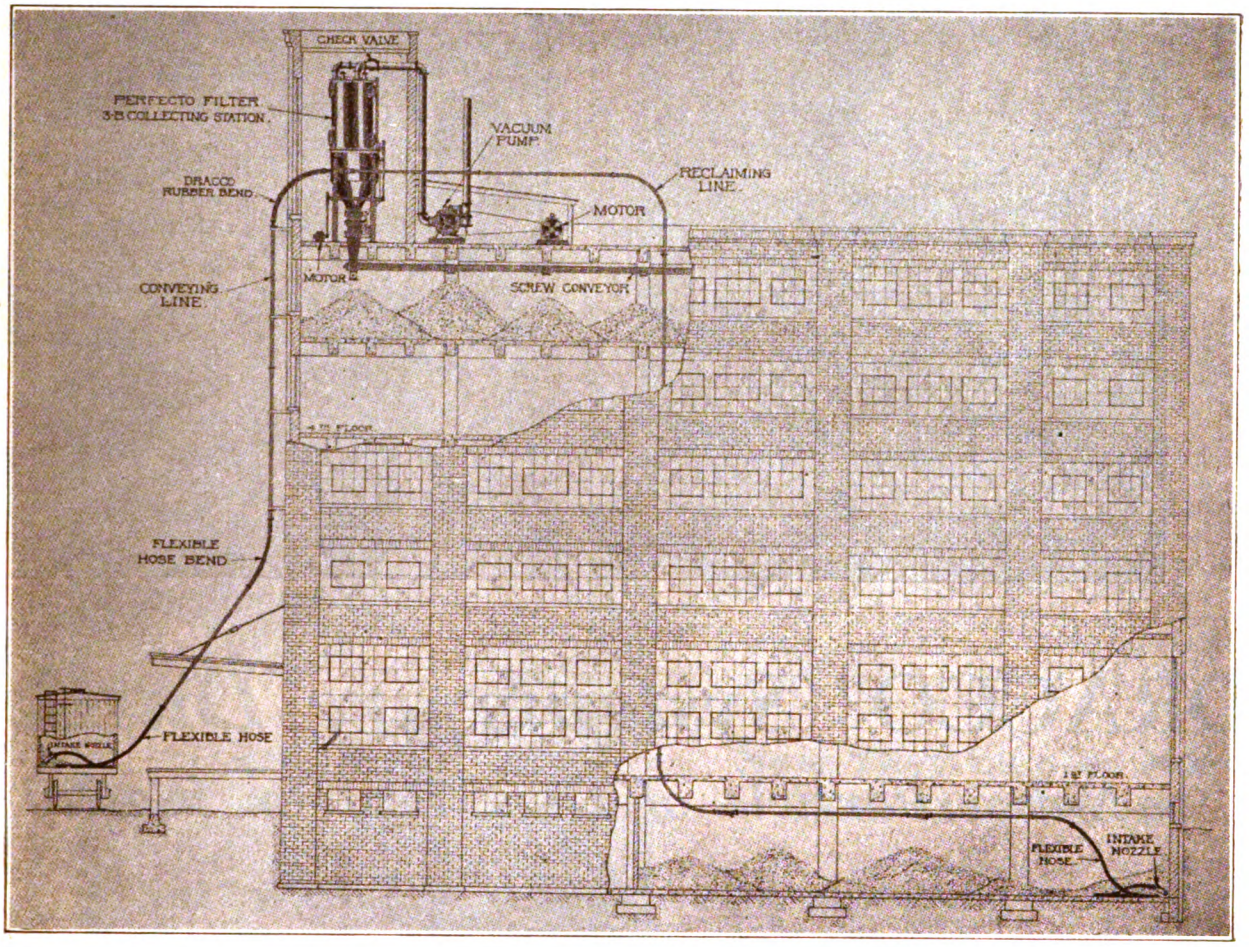
THE DUST RECOVER
Engineers and Manufac

DRACCO DOES IT

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the Simplicity of Pneumatic Conveying There—10 Tons of Soda Ash Per Hour



In a large and well known Company manufacturing soap and toilet articles, soda ash is conveyed through a 3" pipe line, and every particle is conveyed, by "DRACCO" Pneumatic Conveying.

One man handles the whole job and here again a product that presented many handling difficulties is now conveyed with remarkable simplicity and under absolutely clean conditions.

Here the same "DRACCO" System also handles sand. The flexibility of the Pneumatic Conveying System can handle the both products with care.

Your product may be handled in the same way. Our engineers, with many installations to show you, can tell you just what a "DRACCO" Pneumatic System Can Do.

G & CONVEYING CO.
CLEVELAND, OHIO

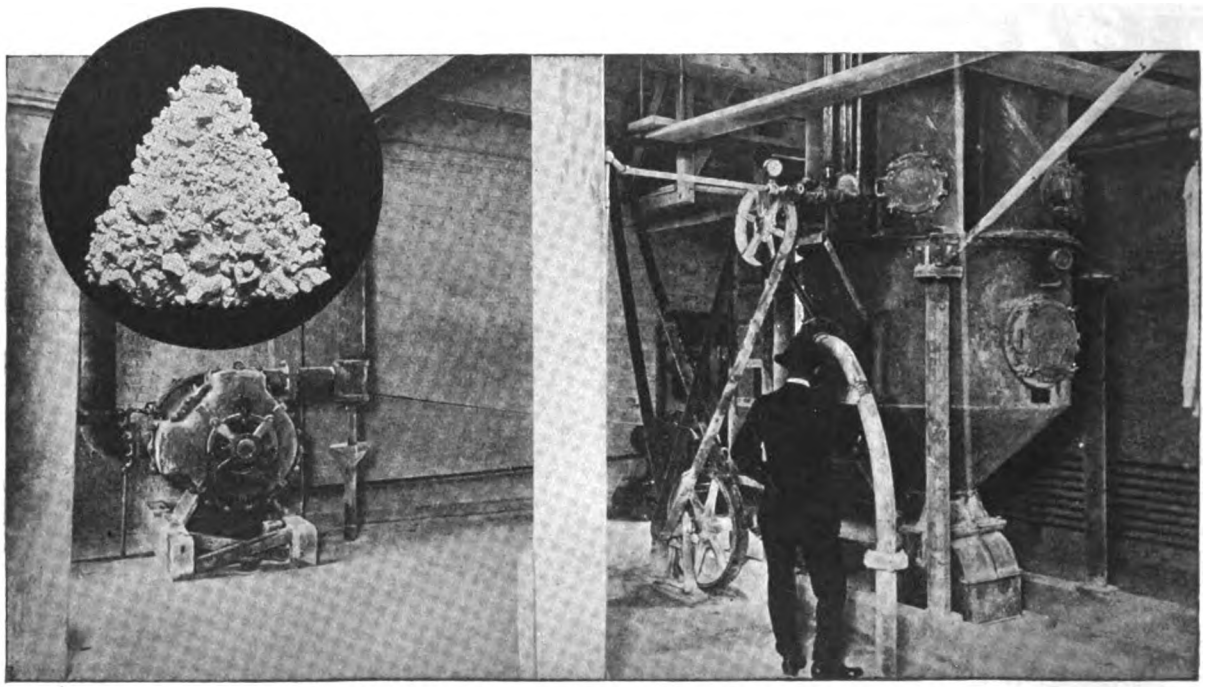
One man Instead of a whole gang



DRACCO DOES IT

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and in addition to saving Labor and Time



"DRACCO" *Systems are Dustless—*

Not a Particle of Dust Lost or Wasted

Before the installation of "DRACCO" Pneumatic Systems the fine particles of dust settling everywhere in the plant presented a difficult labor problem. The health of workers was impaired constantly. In many plants the labor turnover was tremendous.

"DRACCO" Systems always solve the problem because Pneumatic Conveying gives these advantages: Spill and dust being entirely eliminated, clean healthy conditions result and labor turnover is lessened considerably.

Our engineering staff is ready to tell you about the Materials Conveying applications that have been installed. We have only told a very small part of the complete story of "DRACCO." There is no obligation in letting them give you all the facts.

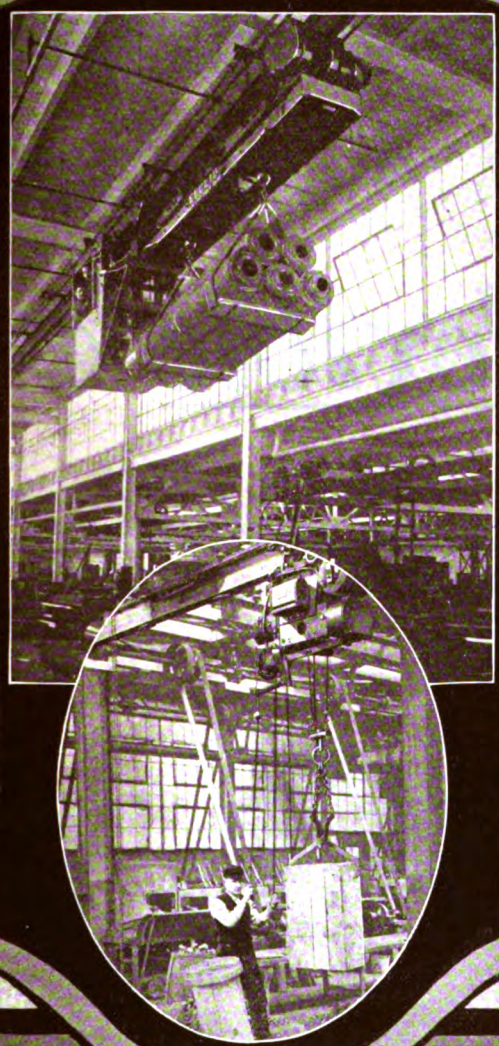
THE DUST RECOVERING & CONVEYING CO.
***Engineers and Manufacturers*, CLEVELAND, OHIO**

DRACCO DOES IT

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They Always Win!



EUCLID
CRANES HOISTS
RAISE PROFITS

"Be sure you're right, then go ahead," is the policy of one of the largest automobile companies in the world; and to be sure they *were* right in their selection of cranes and hoists they thoroughly tested practically every electric hoist on the market before placing their order. One of the tests consisted of operating the hoist continuously until failure. On this and other tests Euclid hoists proved superior.

Now They Employ More Than 100 EUCLIDS

Not only in this plant but in plants of every size and description all over the country Euclid Cranes and Hoists are daily justifying the confidence initially placed in them; and proving beyond the shadow of a doubt the wisdom of their selection.

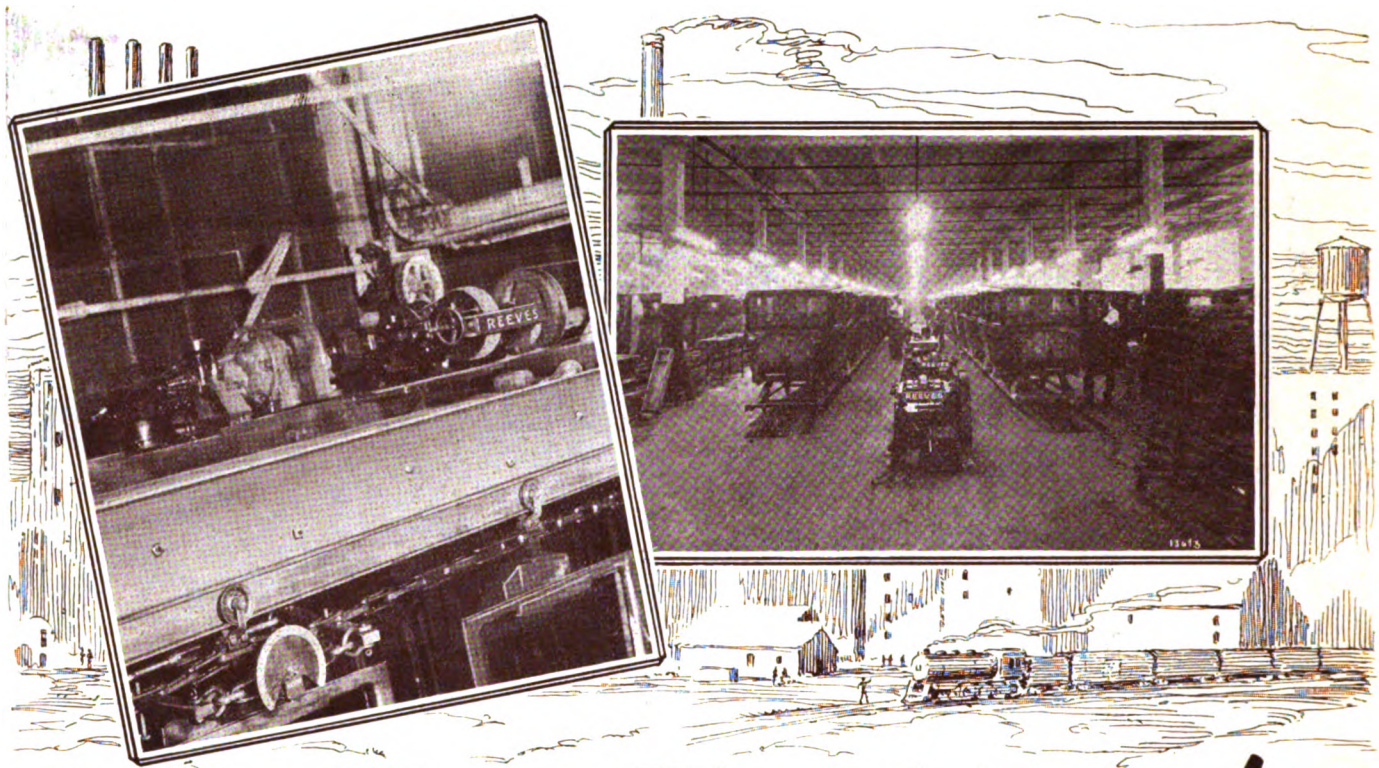
Surely, no more convincing proof of Euclid economy and efficiency could be desired.

Write today for catalog and further information.

THE EUCLID CRANE & HOIST COMPANY
102 CHARDON ROAD
EUCLID, OHIO

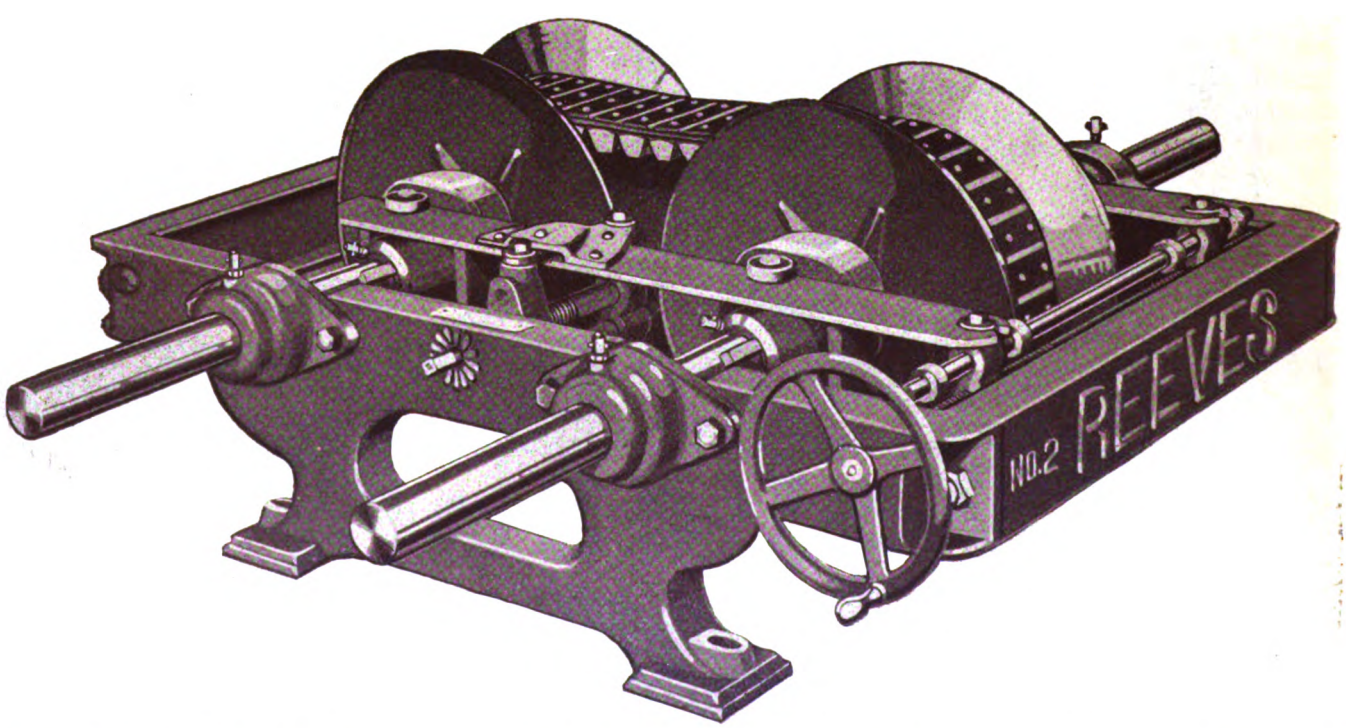
Cranes **EUCLID** *Hoists*

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How Flexible Are

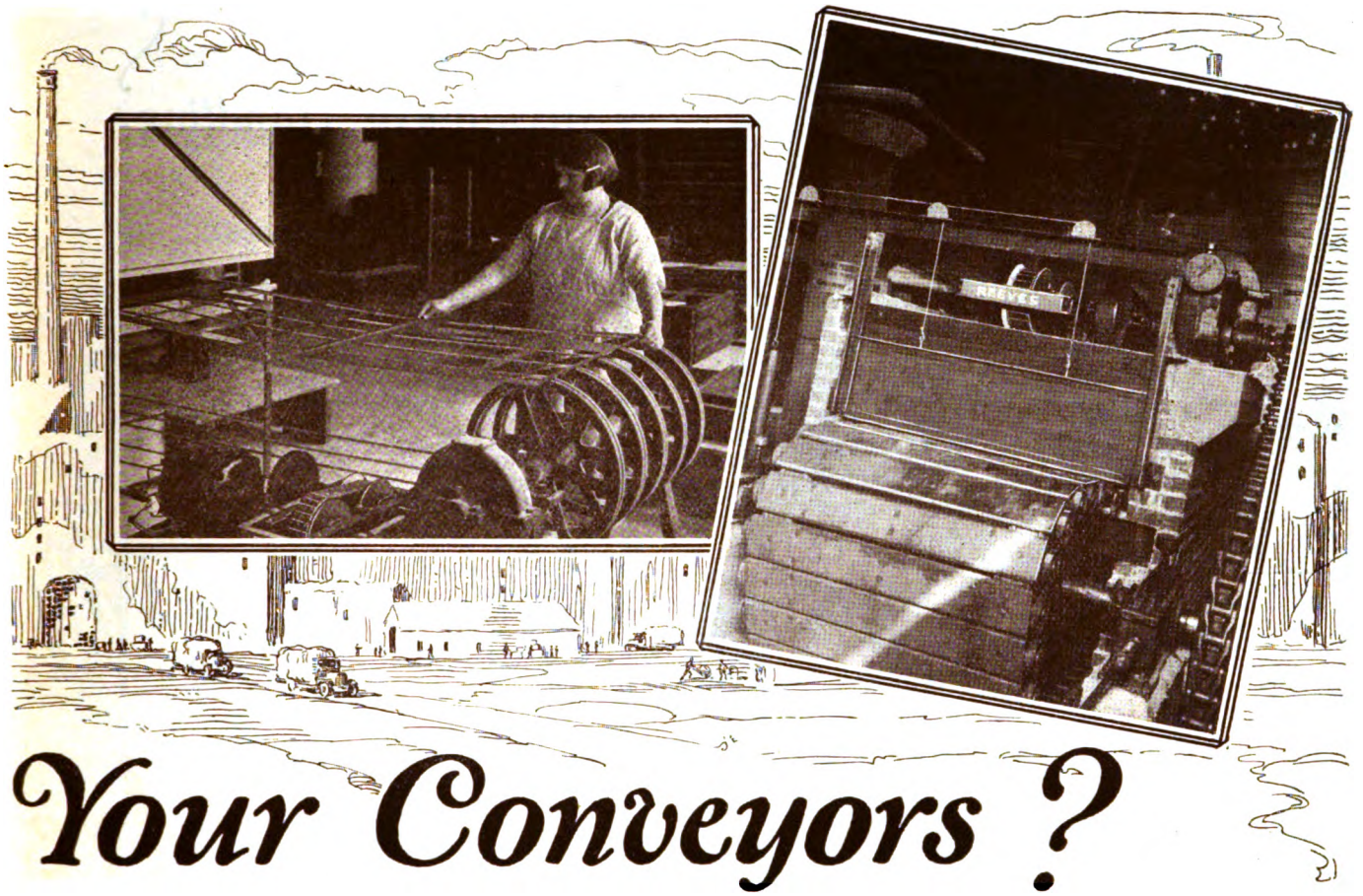
THE REEVES Transmission is a simple, compact mechanical device which receives power at a constant speed and delivers it at any speed desired to any machine or group. It will maintain one set speed indefinitely, or may be changed instantly to meet any different operating condition. Easy to install. Simple to operate. Pays for itself in a short time. Lasts for years. Accurate and dependable, always.



INDUSTRY COMES TO REEVES

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Your Conveyors ?

Here is a simple, inexpensive device that enables you to run your conveyors at *any* speed you desire!

HOW do you control your material handling equipment? Do you run at only *one* set speed—do you get just a *few steps* in speed—or can you get *any* speed you desire? For maximum efficiency your conveyors should be absolutely *flexible*—able to run at any speed between fastest and slowest—and the REEVES Transmission offers you the only truly accurate and *dependable* means of securing this vital flexibility.

Speed flexibility on material handling conveyors IS vital. With the REEVES Transmission you can adjust the speed of a conveyor *instantly* to meet any different operating condition. You can schedule your production more closely. You can run your conveyors at their most efficient operating speeds every hour in the day.

Progressive manufacturers everywhere are using the REEVES Transmission. In many of the most modern plants in your industry, REEVES Transmissions have proved themselves thoroughly. We will be glad to give you detailed information about the successes of the REEVES in the plants of your own fellow manufacturers—how it is cutting their material handling costs and increasing the efficiency of their conveyor systems. Send for our catalog L-66. It will answer many of your speed control questions.

REEVES PULLEY COMPANY

Established 1887

COLUMBUS, INDIANA

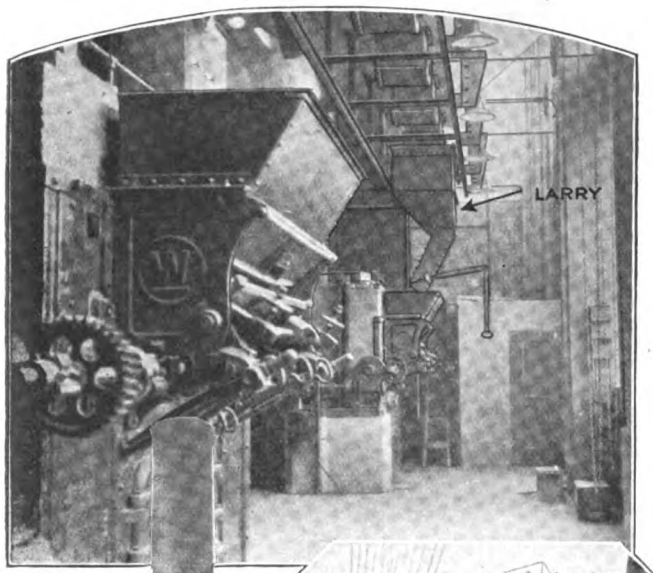
REEVES

Variable Speed Transmission

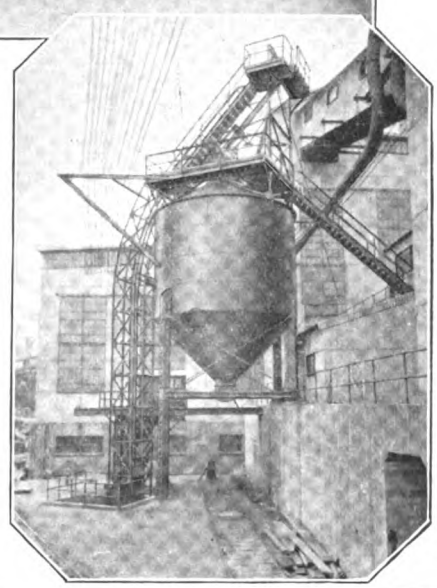
FOR ACCURATE SPEED CONTROL

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Travelling Larry receives coal from bunkers and distributes to stokers.



One of the modern power houses completely equipped with Webster coal and ash mechanical handling equipment.

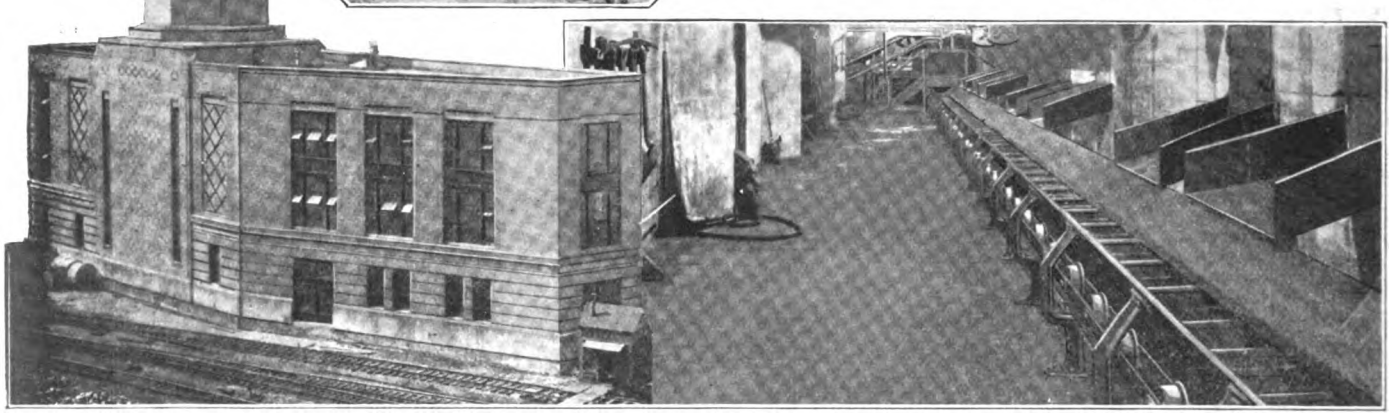
Webster Mechanical Handling Equipment

- Apron Conveyors
- Barrel and Package Conveyors
- Belt Conveyors
- Flight Conveyors
- Gravity Discharge Elevators
- Lehr Conveyors
- Retarding Conveyors
- Sawmill Conveyors
- Screw Conveyors
- Ash Skip Hoists
- Belt Loading Hoppers
- Bin Gates
- Bucket Elevators
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- Car Pullers
- Car Retarders
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- Coal Crushers
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- Elevator Boots
- Elevator Buckets
- Gears
- Hand Winches
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- Malleable Iron Chain
- Marine Legs
- Perkins Pivoted Bucket Carriers
- Picking Tables
- Pulleys
- Shaker Screens
- Slate Dumps
- Sprocket Wheels
- Steel Chain
- Stoker Spouts
- Stone, Sand and Gravel Screens
- Track Hoppers and Feeders
- Trippers
- Weigh Larries

WEBSTER

The Webster Ash Skip Hoist — a simple and highly economical means for handling quantities of ashes, or similar products.

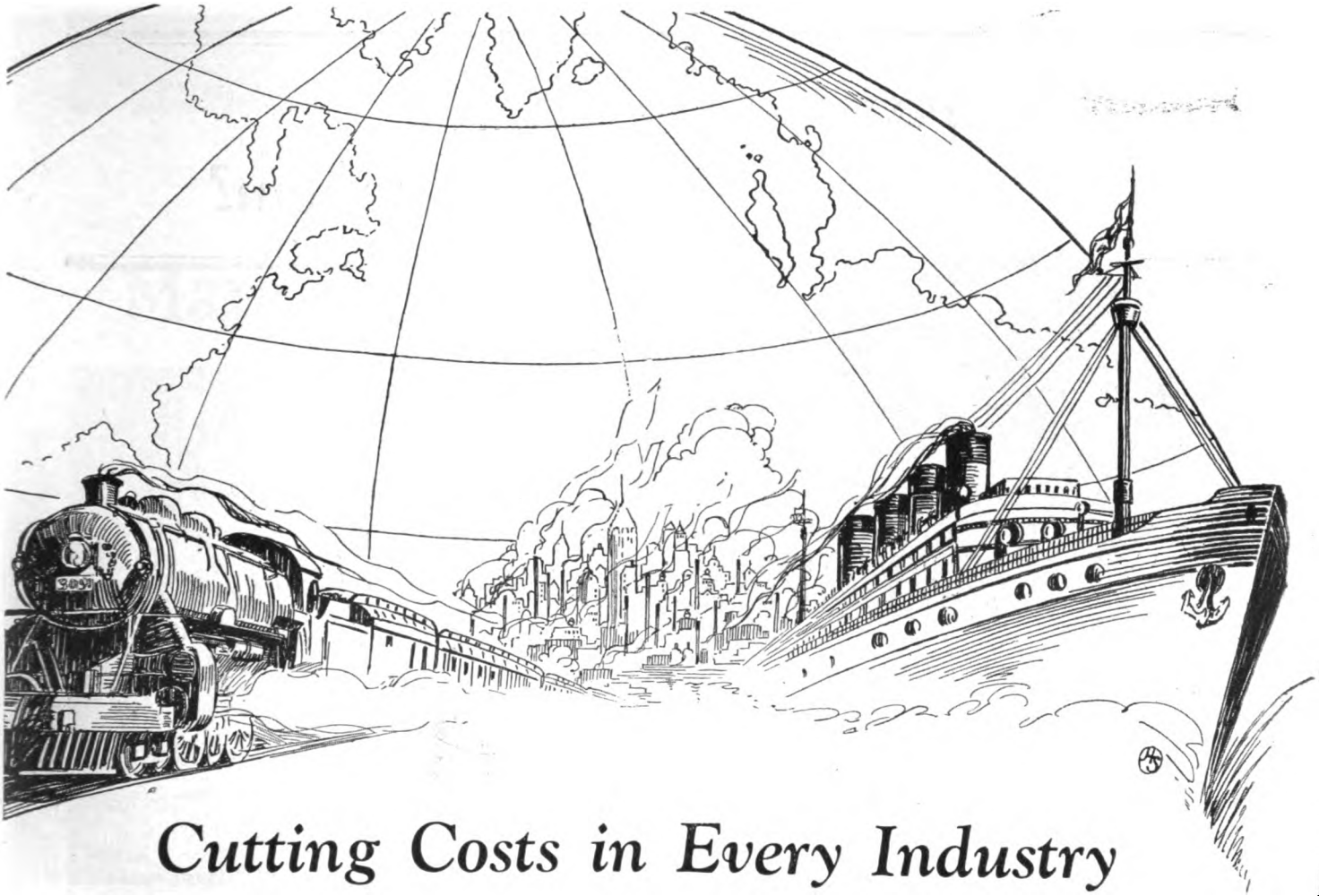
Lower run of Perkins Carrier showing ash doors and chutes.



Webster

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Cutting Costs in Every Industry

The only satisfactory answer to promises is performance, and in the application of Webster Engineering and Equipment to the Material Handling needs of widely diversified industries, the performance record has been far beyond the ordinary.

To substitute mechanical handling for manual always makes obvious savings. But Webster service reaches far beyond the obvious. It penetrates those costs which are concealed under "Overhead" and "Productive Labor" but which are really "Handling," and in many cases eliminates them entirely—in all instances they are minimized.

This is the result of a fundamental policy—"to do the job thoroughly or not at all." In every single instance "thoroughly engineered" mechanical handling systems have shown a generous return on the investment. They have shown that a greatly reduced force with much lower operating expenses can increase production.

If you are still doing the bulk of your handling by man power, it will be time well spent if you will let us make a survey of your plant, and show you where you can save money by cutting your Handling, Overhead, and Productive Labor Costs.

Write us today so that we may put your name on our mailing list to receive a copy of our publication, the "Webster Method" regularly.

THE WEBSTER MFG. CO.

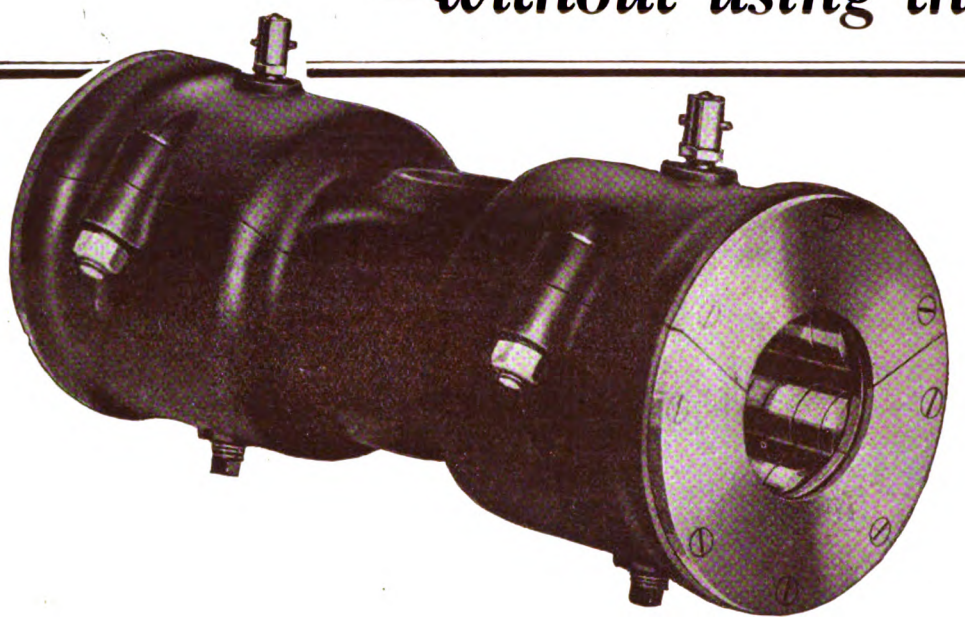
4401-4500 Cortland St., Chicago, Ill.

Mechanical Handling EQUIPMENT

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Why pay for HYATTS —without using them?



Every bit of power wasted by the steady drag of plain bearing friction grinds away a certain portion of your profits.

One year of this friction tax is usually sufficient to buy you a complete Hyatt installation—and permanent freedom from bearing troubles.

For Hyatts are practically frictionless, and wear-proof. They are rugged, durable and resilient. They need little attention—only three or four lubrications a year.

Manufacturers of various products report that Hyatt Roller Bearings are cutting their power bills 10% to 25%—an average reduction of about 15%.

Figuring the savings at $50 per horsepower per year, their investment brings an annual return of 50% to 125%. Thousands of Hyatt Line Shaft Bearings have been bringing this return for 20 and even 30 years.

And most of these original Hyatt Bearings are still rolling out dividends.

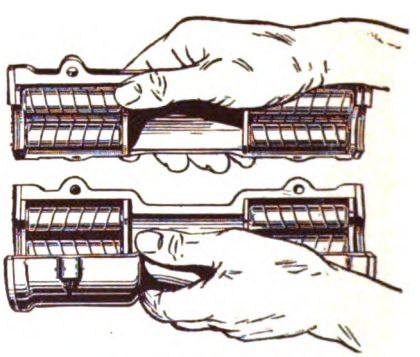
Hyatt Line Shaft Bearings, and their boxes, are split for easy installation. They can be installed in a few minutes without stripping the shaft.

Why not profit by Hyatt efficiency now?

HYATT ROLLER BEARING COMPANY

NEWARK DETROIT CHICAGO SAN FRANCISCO
WORCESTER PHILADELPHIA CHARLOTTE
PITTSBURGH CLEVELAND

HYATT
ROLLER BEARINGS



Completely Split for Easy Installation

These companies have used Hyatt Line Shaft Roller Bearings, in quantities of 200 to 30,000, for twenty years and more:

Colburn Mach. Tool Co. Franklin, Pa.	20 years
Ford Motor Car Co., Detroit	20 years
Harley-Davidson Mf'g Co. Milwaukee	20 years
United Shoe Mach. Co. Beverly, Mass.	20 years
Wallace Barnes Co. Bristol, Conn.	20 years
Whitin Machine Co. New London, Conn.	24 years
Davis Sewing Machine Co. Dayton, Ohio	25 years
Roanoke Mills Roanoke Rapids, N. C.	30 years
Greenfield Tap & Die Corp. Greenfield, Mass.	33 years

Nearly two million Hyatt Line Shaft Roller Bearings are now in use

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TRADE **YALE** MARK

Material Handling Equipment



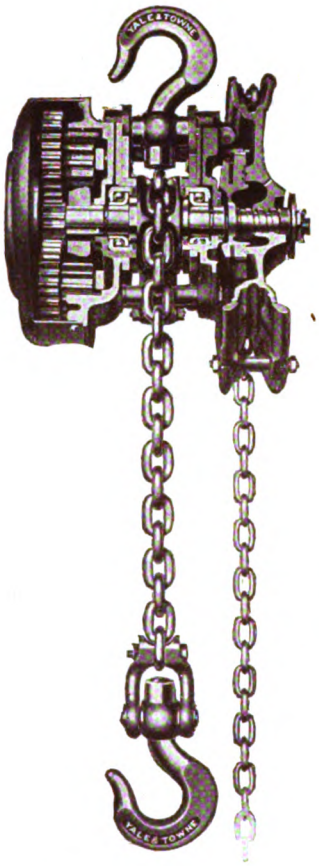
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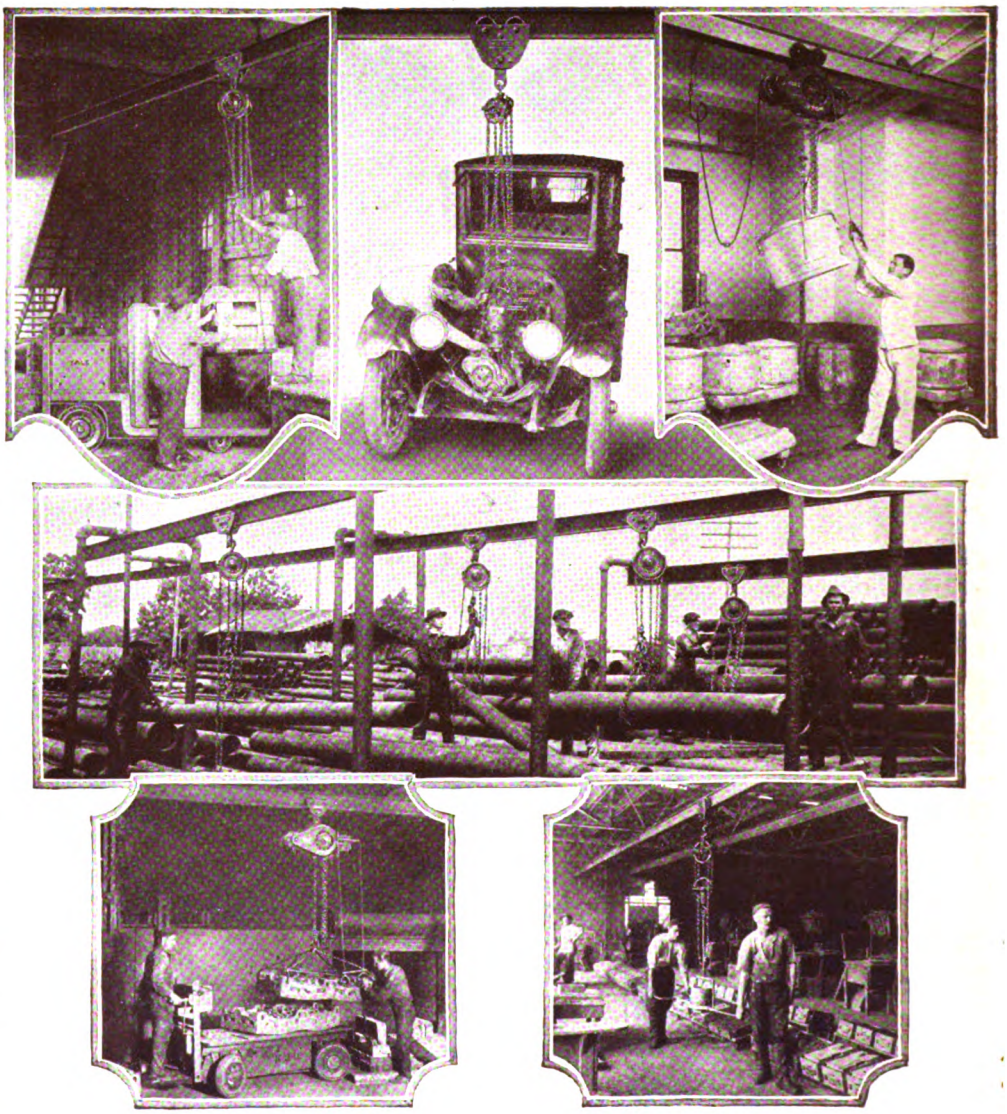
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TRADE **YALE** MARK

A Unit for expeditious and

YALE Chain Blocks~Electric Chain





Yale Ball Bearing Chain Blocks range in capacity from ¼ to 40 tons. They possess the highest mechanical efficiency heretofore obtained in any chain block hoisting equipment. They wear longer, lift more easily and quickly and are safer than any other block made.

Yale Ball Bearings, on which the steel load sheave rotates, reduce friction where friction is greatest.

A thorough lubrication system is provided. Oil ducts pass through the solid frames, conducting oil direct to the ball bearings, and then on to the driving pinion shaft bearings.

The Yale & Towne Manufacturing Co.

Makers of Yale Products: Locks, Door Closers, and Material-Handling Equipment

Stamford, Conn., U. S. A.

YALE MARKED

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every requirement of safe, economical handling of equipment

Hoists~Trolleys~Crane Ends

From the beginning, half a century ago, the name YALE has stood for the highest quality in hoisting and conveying equipment, and YALE products have been important factors in reducing the tremendous overhead which industry carried before material-handling methods and machinery were introduced.

Today, every piece of YALE Equipment — chain block, electric chain hoist, trolley, crane ends and electric industrial truck and tractor — is the product of skillful engineering and years of experience.

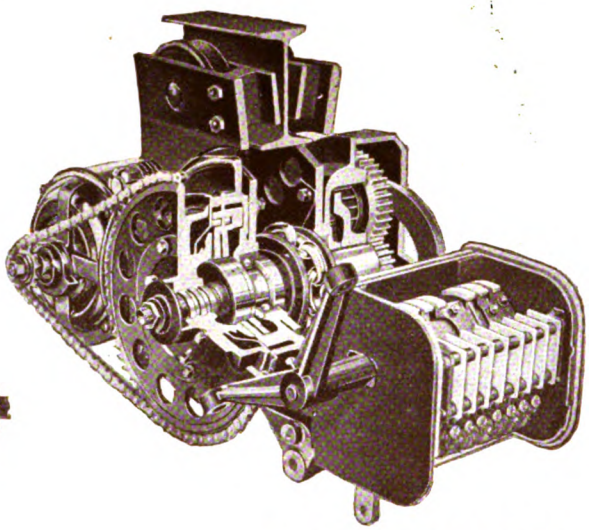
Yale Standards

These YALE standards are evident in the finished product. Accuracy in design, ample factors of safety, precision in manufacture, frequent inspections, exhaustive tests at every step in the manufacture from raw to finished products.

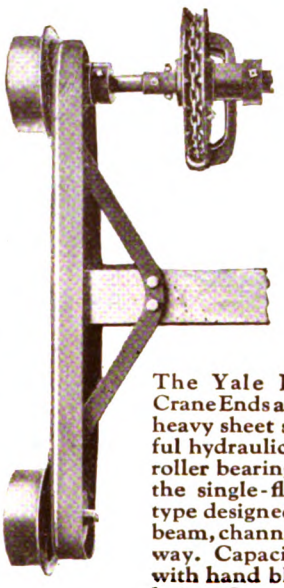
Every chain block, electric hoist and truck is given an overload test greater than its rated capacity, which assures maximum carrying ability.

Roller and ball bearings have been introduced to reduce friction losses to the minimum, and superior reduction gearing helps to maintain the reputation for highest efficiency on all YALE Material-Handling Equipment.

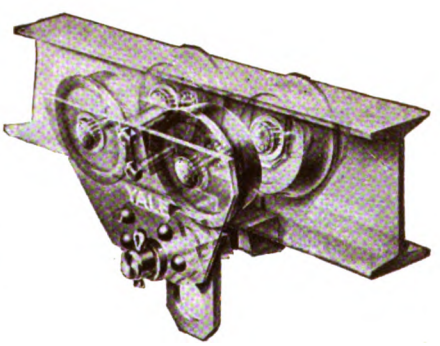
The standards of safety, design and efficiency are the result of years of study and practical experience by YALE engineers. Continuous development is still being carried on.



Yale Model 20B Ball-Bearing Electric Chain Hoists range from ¼ to 2-ton capacity. The latest design embodies such features as ball bearing load sheave, close headroom, long lift, higher speed, automatic top and bottom limit stops, and greater over-all strength. These hoists have very unusual factors of safety in the strength of the load supporting members and are designed to withstand shock loads so common to this class of equipment. All suspension members of the Yale Electric Chain Hoist are made **of the highest quality steel.**



The Yale Pressed Steel Crane Ends are formed from heavy sheet steel by powerful hydraulic pressing. The roller bearing wheels are of the single-flange universal type designed for use on I-beam, channel or T-rail runway. Capacities ¼ to 1 ton with hand block or electric **hoist. Spans up to 21 feet, inclusive. Travel chain pull in pounds, 10 to 30.**



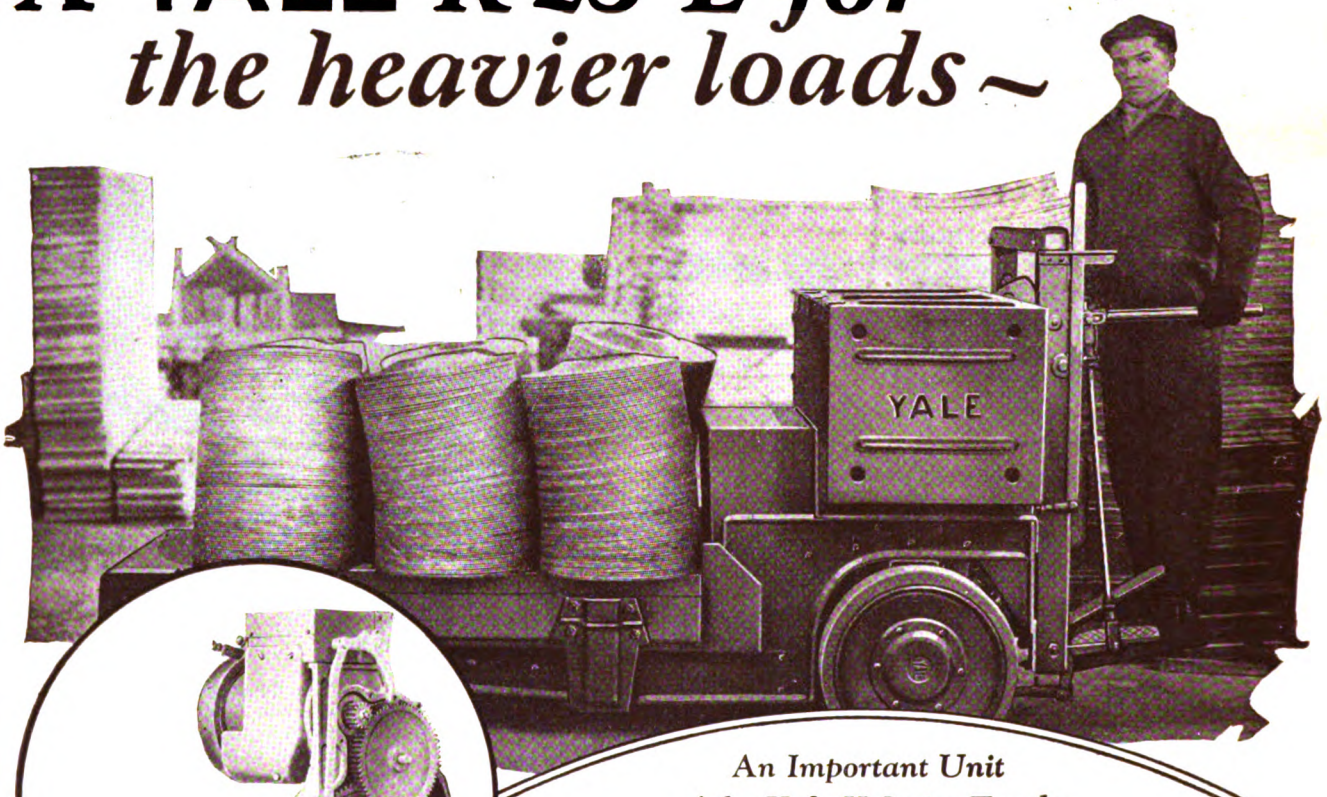
Yale Steel-Plate Roller-Bearing Trolleys range in capacity from ¼ to 20 tons. Their outstanding characteristics are strength, flexibility, roller bearings, hardened and ground axles, chilled tread wheels and heavy cold-rolled steel equalizing pins.

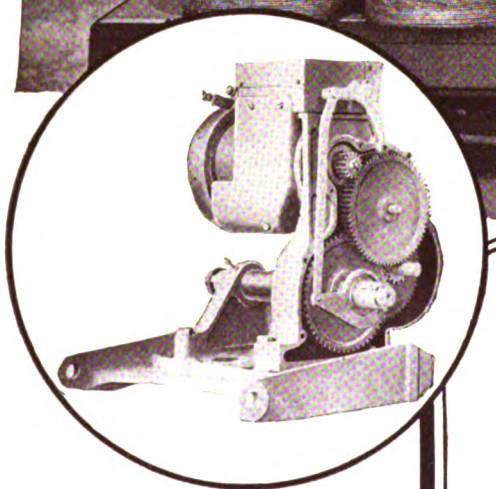
IS YALE MADE

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TRADE **YALE** MARK

A YALE *K-23-E for the heavier loads~*





Elevating Mechanism used in Yale K-23-E Truck.

An Important Unit of the Yale K Series Trucks and Tractors

Like all other YALE Material-Handling Equipment, the new YALE K-23-E has the usual overload reserve. Rated at 6000 pounds capacity, this truck, with the self-loading elevating platform, is able to handle greater tonnage at real savings in time, money and labor.

The YALE K-23-E will do more work during a day's run because it is easy to steer, easy to handle and lifts with remarkable speed and facility.

The YALE standards of safety, efficiency and design have been maintained in this new industrial transportation unit and conform with the YALE policy of ever developing new methods of efficient material handling.

In the K-23-E, the elevating platform is raised by means of two large eccentrics, mounted on the hoist unit shaft, which draw the platform forward and upward. Simple and safe operation is assured by mechanical upper and lower limit stops. Details on all YALE Equipment will be mailed on request. Engineering advice is a part of our service to Industry.

Yale Material-Handling Equipment includes a full line of Electric Industrial Trucks, Tractors and Trailers for every industrial purpose. They are in use in every part of the United States and in a great many foreign countries, supplementing the lowest priced common labor.

The Yale & Towne Manufacturing Co.

Makers of Yale Products: Locks, Door Closers, and Material-Handling Equipment

Stamford, Conn., U. S. A.

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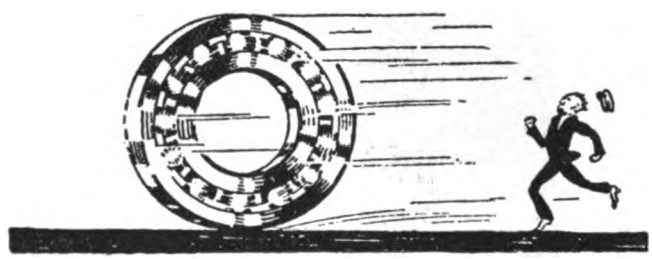
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Gliding Friction and Material Handling Equipment

THE snail must battle with gliding friction all his life. He cannot get rid of it. But modern manufacturers can release friction's drag, speed up production and cut excessive repair bills by specifying SKF-marked Ball Bearings for their material handling equipment.

Throughout the world there are thousands of industrial trucks, tractors, conveyors, hoists, cranes, elevators and other material handling equipment which run more smoothly and efficiently because of SKF-marked Ball Bearings which show hardly a trace of wear year in and year out and—require no adjustments to compensate for wear!



SKF-marked Ball Bearings have the stamina and endurance which guarantee long-life service no matter how hard the going may be. And, a large part of the maintenance expense can be written off too, for the only attention these bearings need is replenishing of lubricant about three or four times a year. Summing it up, SKF-marked Ball Bearings keep material handling equipment going twenty-four hours a day without bearing failures — the greatest value per dollar invested.

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Dependable Accuracy Based On FAIRBANKS *Superior Construction*

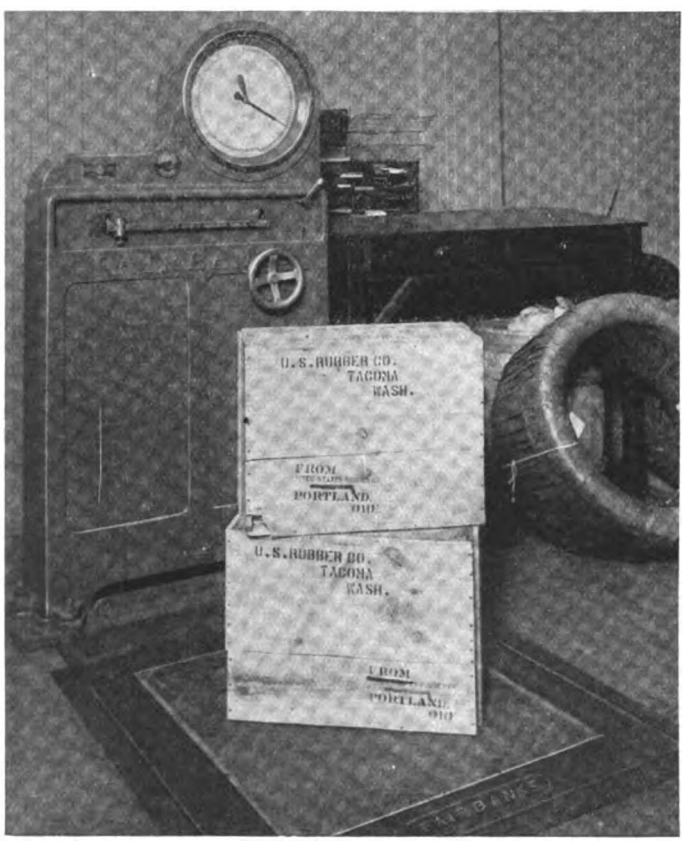
ALL scales are accurate and most of them stay accurate for some time,—but Fairbanks scale accuracy can be absolutely depended upon,—it is a built-in quality that justifies year after year of confidence in them.

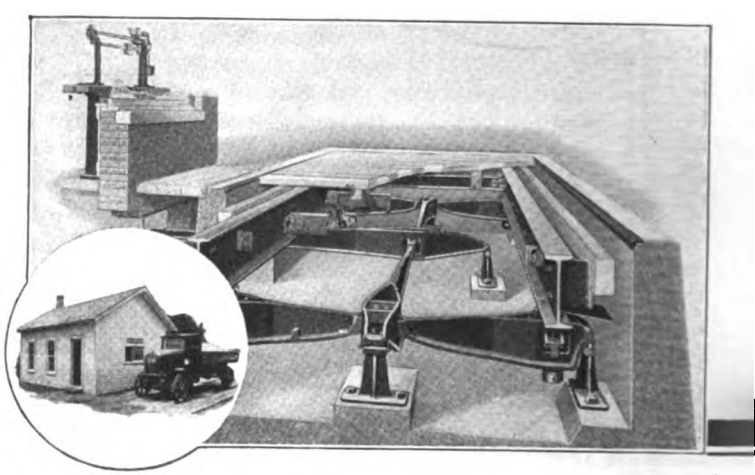
That is the important point to consider when choosing scales, be they of the railroad or auto-truck platform variety, or portable scales for factory and shipping uses.

Severe usage has no effect on Fairbanks Scales because their material, design, and construction, based on a hundred years of scale building, are of such character that inaccuracies are virtually impossible.

If your inventory systems are to be depended upon, and your checking systems 100% accurate, you should select Fairbanks Scales for every weighing operation.

Fairbanks Engineers are always ready to consult with you on any special problem involving accurate weighing with speed.





Fairbanks Scales

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Sold Everywhere

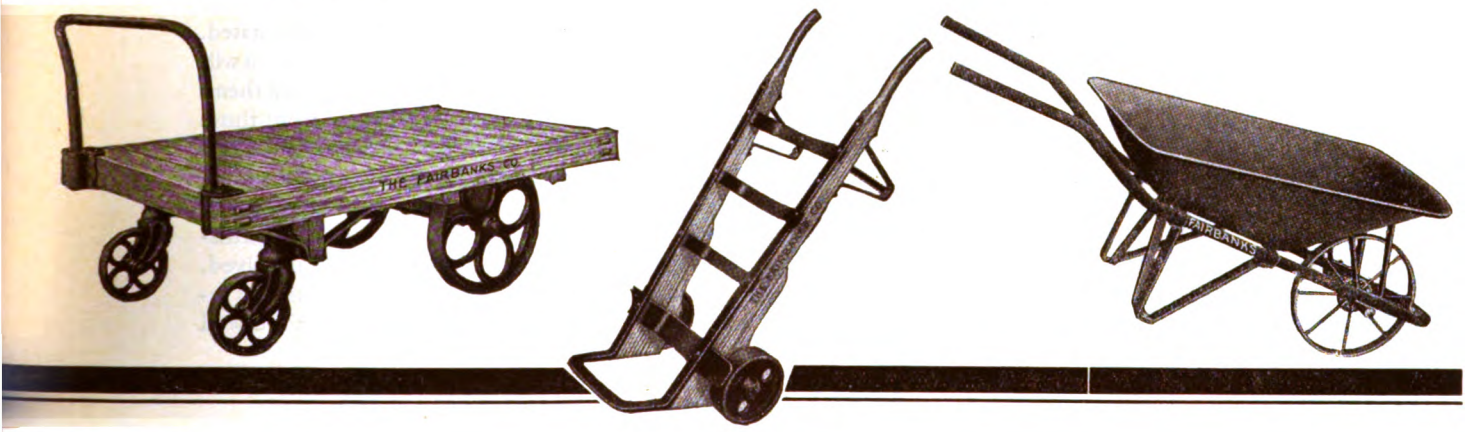
A COUNTRY wide service through hundreds of distributors is constantly maintained to take care of industry's truck requirements.

Here also, Fairbanks century old experience is evident in the rugged construction of their product. Fairbanks Trucks are made of wood for flexibility and handling ease, and are steel-bound wherever wooden surfaces must be protected.

They are light, sturdy, perfectly balanced handling units that are indispensable to most departments of your plant.

Your nearest jobber can supply you at a moment's notice with any model Fairbanks Truck. Order them by number from our illustrated catalog.

The
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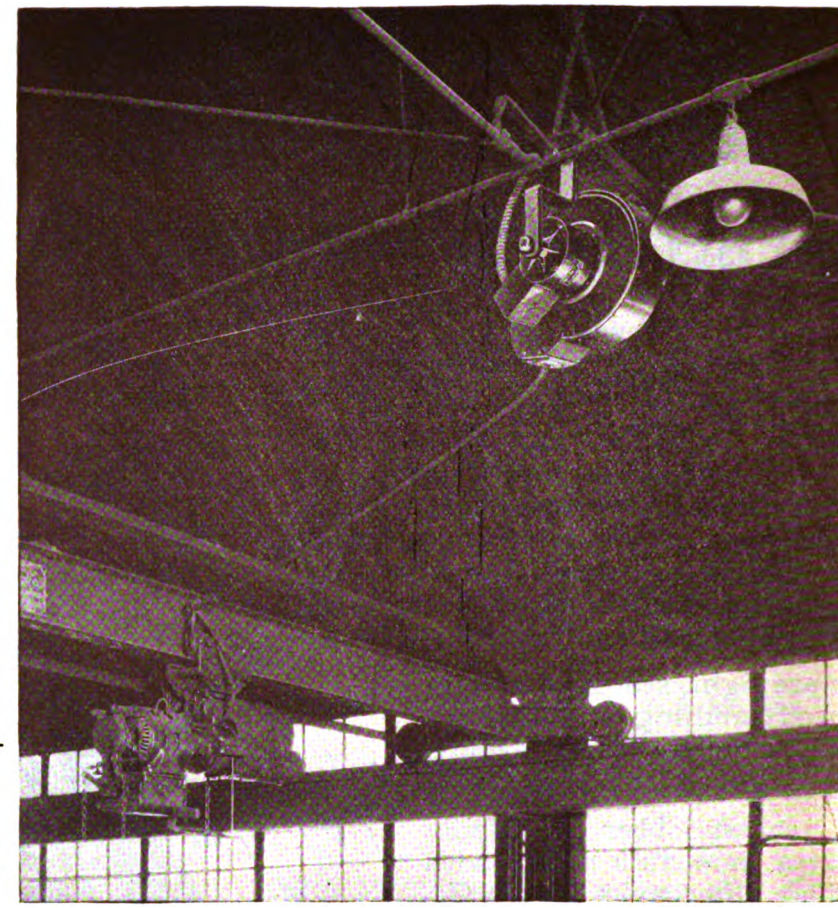


Reelite

REG. U. S. PAT. OFF.

The handy light on a reel

For use in the garage or machine shop where it is desired to bring the light directly to the work being done, without having the cord trailing about in the grease and dirt. Equipped with twenty-five feet of cord, and can be furnished with connector in place of light so that it will furnish current for small machinery, and portable drills, etc.



Mogul Type Reelite with ball-bearing cable outlet installed at plant of Federal Drop Forge Company, Lansing, Mich.

Whenever power must be supplied to a traveling crane—Reelite!

Reelites furnish the elastic, unbreakable connection between generator and motor in those plants where careful attention is paid to maintenance leaks.

For Reelites save cable-renewals at such a rate that they pay for themselves in a year or two, sometimes in a few months.

No costly layoffs of machinery while new cable is installed. Reelites *preserve* the cable, handle it with care, run it over ball-bearings, wind it up when not in use. They're mechanical caretakers.

The convenience, economy and safety of such an installation as that shown above can scarcely be overstated.

Once you have tried Reelites you will begin *looking* for places to install them.

They come in all sizes, from those types for use with a drop-cord light, to the giant Mogul types that supply high-tension current to lifting magnets.

Drop us a line for further information. There's no obligation involved. But we feel sure that *you'll* find an investigation of Reelite was time well spent. Write today.

APPLETON ELECTRIC COMPANY

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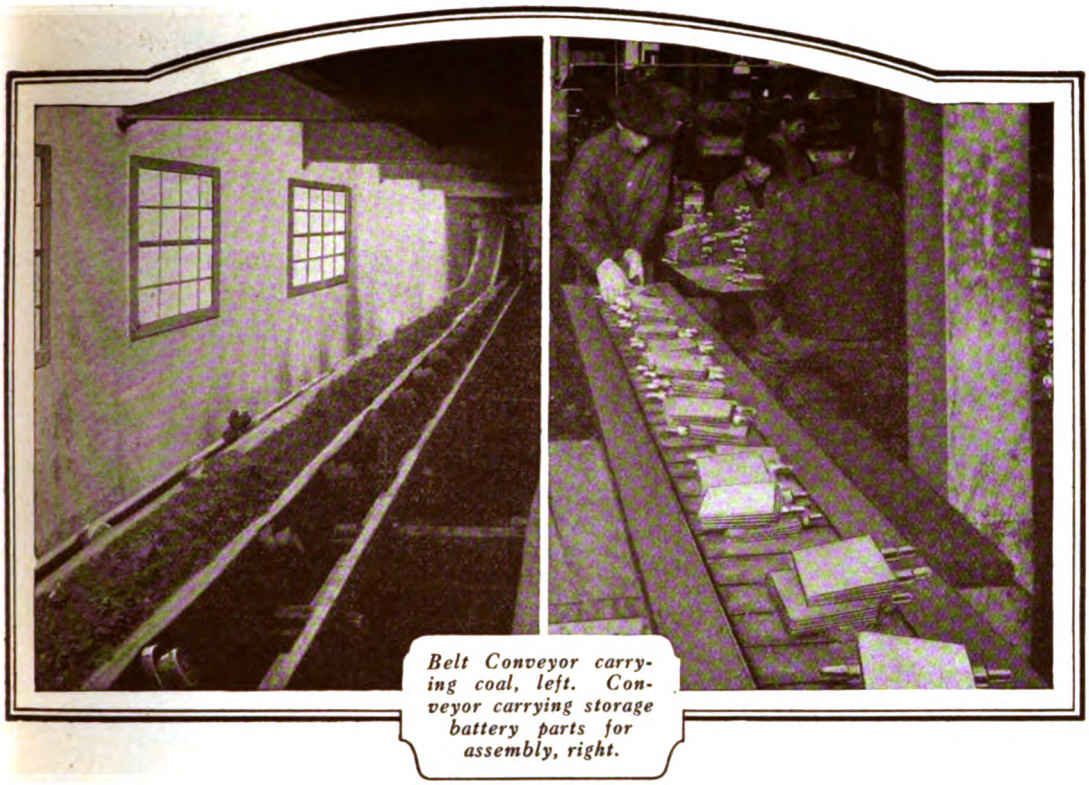
Reelite

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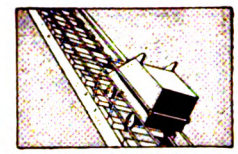
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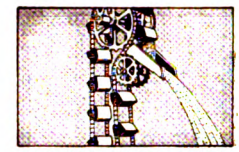
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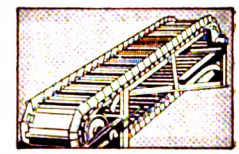
Belt Conveyor carrying coal, left. Conveyor carrying storage battery parts for assembly, right.



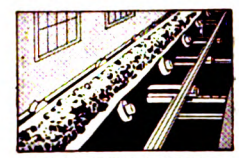
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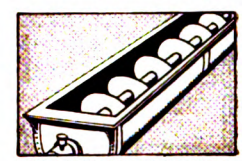
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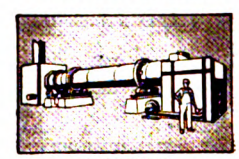
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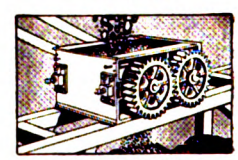
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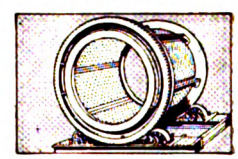
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DRYERS



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SCREENS

Save In Your Own Plant

Here's an easy way to take advantage of the savings effected by material handling machinery. Call in a Bartlett & Snow Engineer. Ask him to look over your plant and tell you where Bartlett & Snow equipment will cut your costs. This service will be gladly given without obligation.

For forty years we have built nearly every type of elevating and conveying machinery. Our suggestions based on this experience are at your disposal.

General Catalog No. 50, is a 624 page book describing all types of equipment which we manufacture. It is rich in engineering data and has hundreds of illustrations of actual installations. A copy will be mailed free to responsible executives.

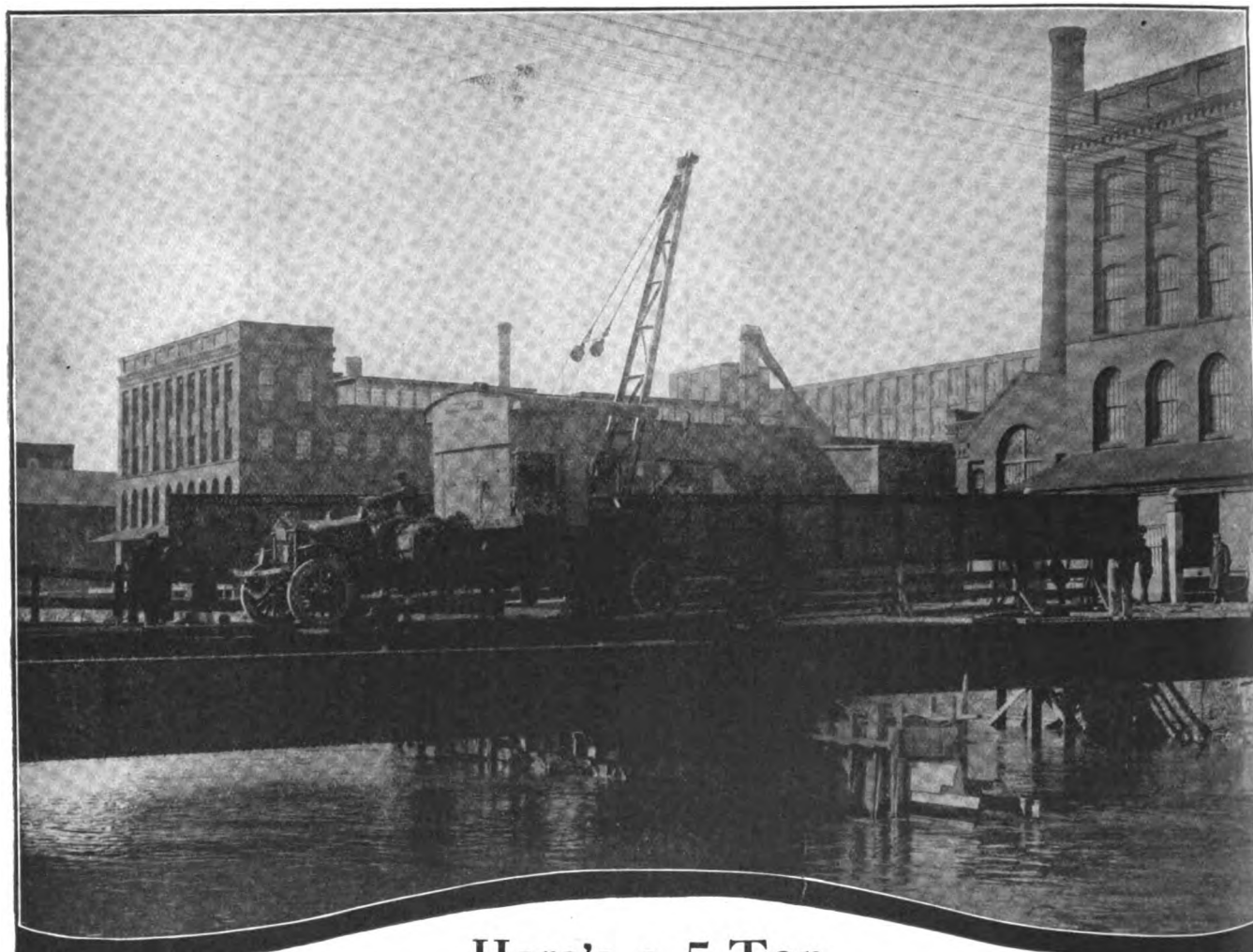
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MACHINERY FOR HANDLING MATERIALS

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UNIVERSAL CRANE

Equipped with

WILLIAMSPORT

Telfax Tape marked—Factory certified

WIRE ROPE

handling a 7 ton girder 52 ft. long 48″ deep as easy as a man picking up a piece of firewood.

The significant thing about this is the power of the crane and ease in handling —but if the manufacturer used cheap rope of uncertain tensile strength on the job, the whole apparatus might as well be cheap.

Manufacturers of good reliable machinery are fast getting away from considering ropes of uncertain tensile strength. They are turning to "Williamsport" the only wire rope made that proves its grade by plain English evidence woven into every inch of their wire rope.

They prefer to pay a little more and be *sure;* than to use unmarked ropes and *guess* on the grade.

The good name of any manufacturer is not a guarantee against mistakes.

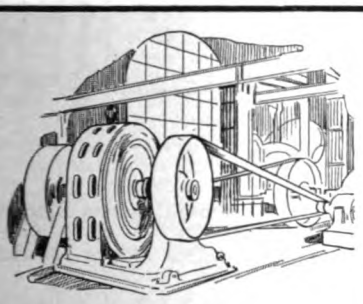
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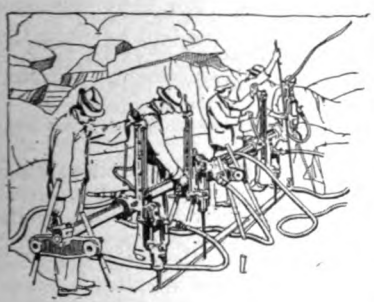
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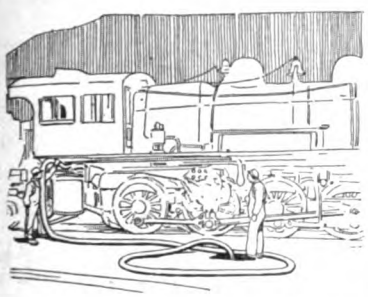
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Good rubber—an industrial necessity









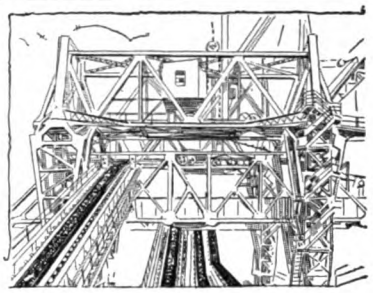
The steel which, rolled into rails and fabricated into hulls, transports our manufacturers; the stone and brick which house our industries; the cast iron and brass of our machinery—these have fired men's minds by the sheer bulk of their creations.

Rubber is less spectacular, but it is as indispensable to our industrial life as any of these materials.

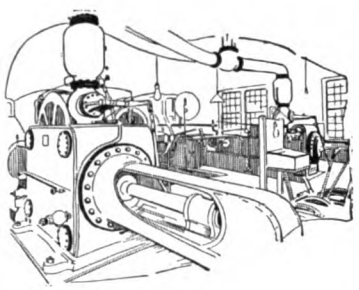
Rubber air hose, driving rivets by the million, gives form overnight to either factory or ship. Rubber packings and rubber insulated wire make possible our modern steam and electric power plants. Rubber hose carries to the drills of our mines, quarries and oil wells the pressure to operate and the lubricant to cool them. Rubber belting conveys the raw material at points of transfer, and drives machines which turn out finished products.

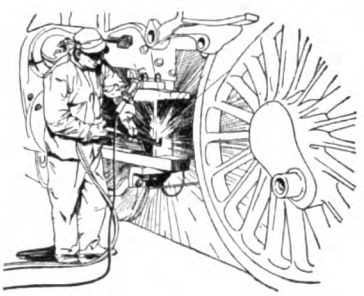
Such tasks deserve good rubber, and the United States Rubber Company has played a leading part in making good rubber a recognized industrial necessity. It has made important contributions to the development of almost all the rubber products used by industry. It has acquired extensive plantations to assure a permanent supply of high grade crude rubber. Looking always to the future good of the rubber industry and of industry as a whole, it has earned a name for high quality and well tested values.

Mechanical rubber goods can have no better guarantee than the "U. S." trade mark.











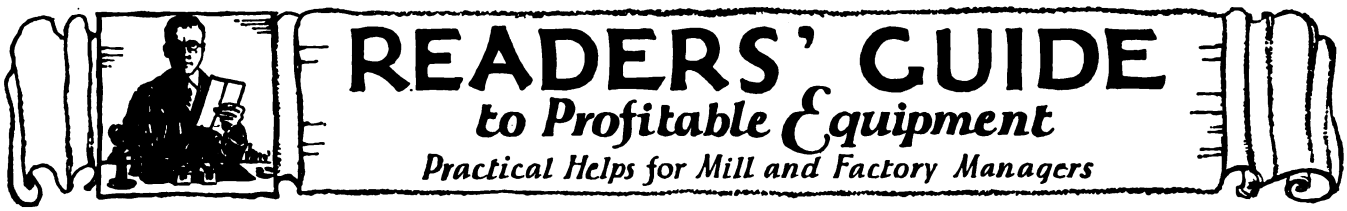
United States Rubber Company

1790 Broadway New York City

Branches in every industrial center

Trade Mark

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MATERIALS HANDLING EQUIPMENT

Bulletins on the AIRVEYOR and other materials handling, conveying and storage equipment are offered by Guarantee Construction Company. See page 139.

A New Tier-Lift, small, compact and made especially for narrow aisles and congested places. For full particulars and literature. See page 106. Wright-Hibbard Industrial Electric Truck Co.

Illustrated Catalog on Swivel Truck Casters can be obtained from the Bond Foundry and Machine Company. See page 132.

Information on Portable Electric Lighting that aids in better work. See page 158. Appleton Electric Company.

Bulletin No. 420 describes a new type of overhead conveying system in use in many of the largest automotive manufacturing plants. Mechanical Handling Systems, Inc. See page 127.

Information on Equipment that lowers handling costs in the yard or plant is contained in the booklet, "Mr. Barber's Scrapbook." See page 131, Barber-Greene Co.

A Nation Wide Service that guarantees quick delivery on all sizes and types of pulleys. See page 4. The Rockwood Manufacturing Company.

Advice and Service by Tramrail and Materials Handling Specialists are offered by the Cleveland Crane and Engineering Co. See page 107.

Free Trial on a Ball Bearing I-Beam Trolley is offered by the Richards-Wilcox Mfg. Co. See page 31.

A New Catalog Describing Cranes and Hoists with a positive oil Lubrication feature. See page 137. Milwaukee Electric Crane & Mfg. Corp.

"Webster Method" is the title of a publication that helps industrial executives in solving handling problems. For a copy see pages 148-149. It is issued by the Webster Mfg. Co.

A Handy Tool for Moving the Heaviest of Railroad Cars. For information see page 78. The Advance Car Mover Company.

Information on a New Pressed Steel Pulley can be obtained from the American Pulley Company. See pages 121-165.

A Booklet is Offered describing a Lift Truck that cradles the load perfectly. See The Plimpton Lift Truck Corporation advertisement, page 85.

Industrial Railway Cars for Every Purpose also portable track, switches and turntables. Easton Car and Construction Co. See page 129.

Information on the New Rigid Connected Type Electric Hoist can be obtained from the Roeper Crane & Hoist Works, Inc. See page 110.

Any Type of Truck or Caster can be equipped with the new Floor Saving Wood Wheels made by the Metzgar Company, Inc. See page 79. Booklet offered.

Bulletins No. 26 and 35 describe a Clutch particularly adapted to portable loaders, conveying equipment and other types of machinery. See page 86. The Conway Clutch.

Information on a High Speed Hoisting and Conveying Outfit that has 21 points of superiority, can be obtained from the Wright Manufacturing Company. See page 116.

A Scrap Handling Dump Bucket that can be applied to any industrial lift-truck. See page 2. The Roura Iron Works.

Catalogue L-66 gives Useful Information on an inexpensive device that enables you to run your conveyors at any speed you desire. See pages 146-147. Reeves Pulley Company.

A Complete Service on Elevators, Conveyors, Power Transmission Equipment is offered by the H. W. Caldwell & Son Co. A division of Link-Belt Company. See pages 124-125-168.

An Engineering Service Bureau with twenty-five years' experience in developing improved handling systems. The Alvey-Ferguson Co. See page 117.

Full Particulars and Prices on a Vertical-Capstan Electric Car Spotter can be obtained from the H. W. Caldwell & Son Co., Link-Belt Company, owner. Pages 124-125-168.

The Latest General Catalogue describes a complete line of rubber, fibre and cast iron wheels and also single and double casters for factory trucks. For copy see page 78. Lansing-Company.

Information on Canvas Cushion Wheels for every type of factory truck, that eliminates tire replacement. See page 114. Divine Brothers Company.

Factory Certified Wire Rope for use as crane cable. See page 160. Williamsport Wire Rope Co.

Electric and Pneumatic Hoists and Cranes as well as Electric Locomotive Turntables and other types of materials handling equipment are illustrated and described on page 113, by the Detroit Hoist & Machine Co.

General Catalog No. 50, is a 624 Page Book describing all types of equipment that conveys and handles products of every description. This book contains hundreds of illustrations of actual installations. For a copy look at page 159. The C. O. Bartlett & Snow Company.

Catalog describing Cranes & Hoists that have proved superior by tests and through service. See page 145. The Euclid Crane & Hoist Company.

Catalog No. 26 Describes Spur Gear Speed Reducers, very efficient for conveyors and also for other equipment where slow speeds are required. See page 140. W. A. Jones Foundry & Machine Co.

A Booklet "Facts for Consideration in Selecting a Storage Battery" is offered by the Electric Storage Battery Co. See page 130.

Equipment that Minimizes the Handling of Products. The Powell Pressed Steel Co. Page 91.

A Catalog describing Weighing Scales that show the weights of materials while on the move is offered by the American Kron Scale Co. Page 138.

Information on Conveying and Handling Systems that are now in successful use in many industries. See page 128. Chain Belt Co.

Industrial Tractors, Trucks and Cranes that save enough on handling costs to charge off the purchase price in six months. See page 104. The Baker-Raulang Co.

Information on Overhead Materials Handling Equipment is offered by The Chisholm-Moore Mfg. Company, on pages 122-123.

Handling Methods that Cut Production Costs are shown on pages 124-125-168 by the Link-Belt Company.

A sixty-eight page "Book of Illustrated Economies," giving figures and actual photographic illustrations and a sixty page, "Floor Operated Hoist Catalog" are offered by the Shepard Electric Crane & Hoist Co., Back Cover.

A Tier-Lift Truck with more than a hundred uses is described by the Lakewood Engineering Co. See page 90.

A New Track Unloader that fits right on to the coal car is described on page 87 by the Chicago Automatic Conveyor Company.

A Thirty Day Trial Offer on a Portable Crane that is known as the handiest tool in the shop. For information see page 78. Canton Foundry and Machine Co.

A New Ball Bearing Trolley Wheel for Materials Handling Systems is announced by The Louden Machinery Company on page 111.

"Bearing the Burden of Industry" is a title of a new book on modern conveying system. For a copy see page 115. Mathews Conveyor Company.

Fourteen Applications of Whiting Corp. Cranes are illustrated on page 136.

Four Different Types and Fifteen Different Models of Tractors are described in Bulletin 106. Other bulletins are

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offered: A100 showing all purpose Industrial Trailers, A125 and A120 also give complete description of their line of trailers for every industrial requirement. See page 119. Mercury Manufacturing Company.

A Handling Unit for Every Requirement is pictured and described on pages 151-152-153-154, by the Yale & Towne Manufacturing Co.

Three Billion Dollars—Industry's Cost of Handling Materials. These are the facts brought out by The Jeffrey Manufacturing Company on page 135.

Crane Gears That Give Four Times the Service. See page 112. R. D. Nuttall Company.

Important Developments in Materials Handling Monorail Systems are described by The American MonoRail Co., on page 109.

Fifty Years of Conveyor Service, the record of the Logan Company. Details on page 1.

A Few of the Many Electric Trucks, Tractors and Cranes manufactured by The Elwell-Parker Company are shown on page 108.

A Modern System of Handling that has cut conveying time from days to minutes is shown by The Dust Recovering & Conveying Company on pages 141-142-143-144.

Booklet and Circulars on the Guaranteed Line of Trucks and Casters are offered by The Colson Company on page 163.

An Illustrated Catalog on Hand Trucks that are steel-bound wherever wooden surfaces must be protected can be obtained from The Fairbanks Company. See pages 156-157.

Industrial Trucks and Trailers built for every specific requirement. See page 85. The Warren Manufacturing Co.

TRANSMISSION EQUIPMENT Including Belting

Literature that Explains the Advantages of Pulleys and Pressed Steel Hangers is offered by the American Pulley Co. See pages 121-165.

Free Sample of a Self-Aligning Belt Fastener can be obtained from The Bourne-Fuller Company. See page 84.

Bulletin No. CE719 Describes a Steel Belt Lacing that is quickly joined. See page 67. The Bristol Co.

A Non-Metallic Gear that operates noiselessly at high pitch-line velocities. See page 89. General Electric Company.

Catalogue Describing a Drive Which saves belting, floor space and increases capacity 25%. Offered by F. L. Smidth & Co., Inc. See page 80.

Booklet on Pulleys, Gears and Sheaves is being offered by the Pyott Foundry Company, makers of Pyott Red Face Pulleys. Look on page 95.

A 60-Day Trial on a Belt Preservative. See page 91. Cling-Surface Company.

A Book that Answers Questions on belt care and operation can be obtained from Chas. A. Schieren Co. Pages 81-88.

A Short Center Belt Adjuster that automatically Equalizes Belt Tension. Also Information on "Everything in Line Shafting Equipment." See page 85. The Medart Company.

A Catalog on Flexible Shafting for tool room, machine shop, pattern shop and foundry. See page 88. N. A. Strand & Co.

Belt Lacers that result in greater transmission efficiency. See pages 82-83. Clipper Belt Lacer Co.

Literature Describing Cast Iron Power Transmission Appliances. See page 167. T. B. Wood Sons Co.

MISCELLANEOUS

Information on Stopping the Losses Resulting from Human and Mechanical Errors in the measurement of material is offered by The Toledo Scale Co. See page 118.

Catalog No. 26 describes an improved oven for cores. See page 8. Young Brothers Company.

A New Catalog describing the Baby Conoidal Motor Driven Fan. Made by the Buffalo Forge Company. See page 98.

Literature Describing a Power Baler that saves waste storage space and is fire-proof is offered by Davenport Mfg. Co. See page 92.

A Booklet Describing Counters for rate setting and production work. See page 79. The Veeder Mfg. Co.

A Bulletin on a Complete Line of Shop Furniture is offered by the New Britain Machine Company. See page 41.

New Book on Air Moving is offered by the New York Blower Co. See page 104.

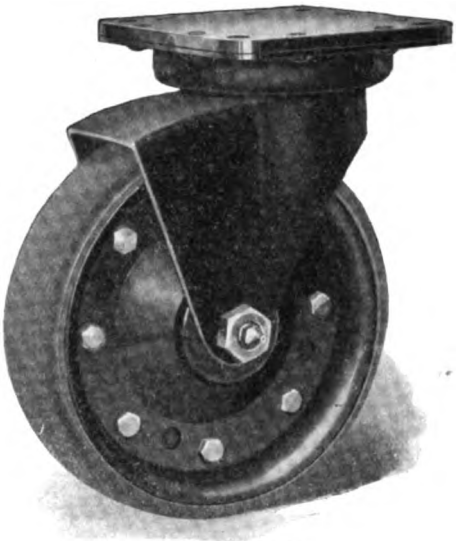
A New Catalog M-28 gives complete information and data on Blue Printing. C. F. Pease Co. See page 47.

Illustrated Folders on the Hallowell Pressed Steel Bench Legs and Workbenches should interest every industrial

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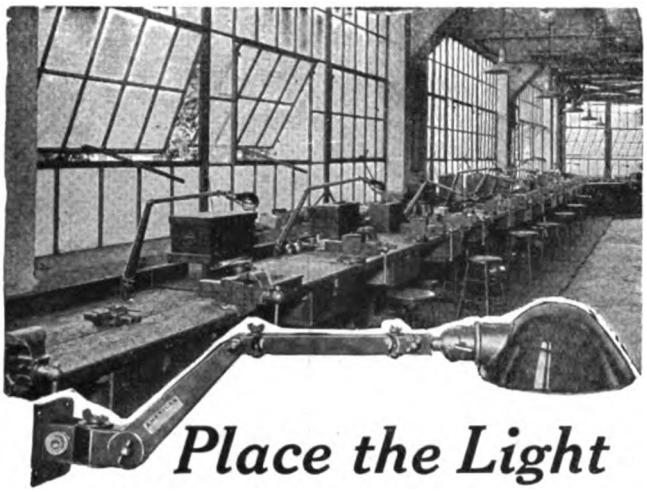
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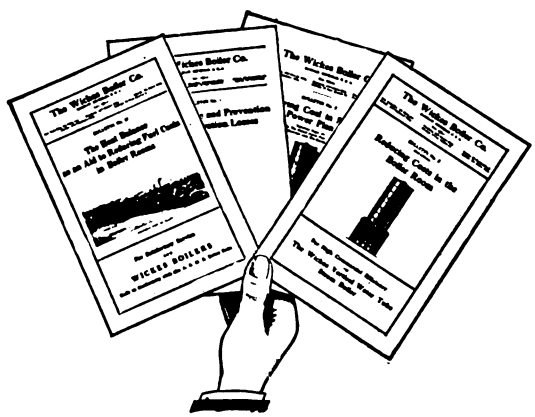
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executive. See page 7. Standard Pressed Steel Company.

A Catalog No. 21, Showing some Valuable Suggestions for Steel Lockers, Bins, Racks and Shelving. See page 91. Durand Steel Locker Co.

The "Merrick Catalog" shows how bulk materials can be weighed while conveyor handled. The Merrick-Scale Co. See page 134.

Catalog No. 10 on an Industrial Thermometer that can be read at any distance is offered by the Moto Meter Company. See page 42.

The Latest System in Watchclocks. Literature describing this is offered on page 102 by the Detex Watchclock Corp.

A New Catalog on sanitary ice cooled drinking fountains. See page 99. Century Brass Works.

Fabricated Sheet Metal Parts. An engineering service offered by The Breese Bros. Co. See page 67.

Illustrated Folder Describing Desk and Sectional Cabinets for home and office is offered by the Globe-Wernicke Co. On page 53.

Enclosed and Open Agitator Drives for use between line shaft and tanks. For complete specification portfolio see page 77. New England Tank & Tower Co.

Descriptive Circulars Illustrating Steel Fabricated Buildings for every industrial requirement can be obtained from the Martin Steel Products Co. See page 90.

Catalog Describing 275 Styles and sizes of oilers for all types of machinery. Gits Bros. Mfg. Co., page 90.

Blowers for Heating, Ventillating and Mechanical Draft. For information see page 133. American Blower Company.

Booklets Describing Temperature Control are offered by Taylor Instrument Companies. See page 101.

An Economical Means of Cleaning Parts is shown on page 167. Oakley Chemical Co.

Mechanical Rubber Goods of tested and proven quality are illustrated on page 161, by the United States Rubber Company.

Scales for Every Weighing Operation required in industry. See pages 156-157. The Fairbanks Company.

POWER PLANT EQUIPMENT AND AUXILIARIES

Very Interesting Bulletins on Boiler Room Economies are offered by the Wickes Boiler Co. See page 164.

Catalog and Price Lists on Steam Unions that prevent loss of steam, can be obtained from the E. M. Dart Mfg. Company. See page 77.

A Steam Trap on a 90 Day Trial also catalog. Offered by the Armstrong Machine Wks. See page 100.

Booklet R-127 Explains Radiator Trap for Vacuum and Steam Pressures up to 20 lbs. See page 81. Sarco Co., Inc.

Catalog on a Gas-Fuel Boiler Governor can be obtained from the Chaplin-Fulton Mfg. Co. See page 95.

Catalog A-12 shows the correct way to choose a Steam Trap. See page 98. Davis Eng. Corpn.

Bulletins on Jennings Heating Pumps, containing valuable information on heating system installations. Nash Engineering Co. on Page 14.

BEARINGS. Transmission and Line Shaft

An Average Power Saving of 15 per cent. is shown on page 150 by Hyatt Roller Bearing Co.

A Factor in Preventing Shut Downs, Depreciations, and Power Losses in Machinery. See page 5. Timken Roller Bearing Co.

Ball Bearings that have eliminated bearing failures. See page 155. SKF Industries, Incorporated.

An Oilless Bearing is described on page 76 by the Arguto Oilless Bearing Co.

Anti-Friction Bearings, that permit higher speed at the lowest friction loss. See page 120. The New Departure Mfg. Co.

TOOLS. Shop Tools, Saws, Files, Chucks, etc.

A New Catalog No. 26 illustrates and describes a line of standard, heavy duty, shell, small machine and cylinder reamers. See page 10. Wetmore Reamer Company.

Catalog No. 30 on Small Tools can be obtained from Brown & Sharpe Mfg. Co. See page 96.

Vises that are noted for their strength and ability to stand up under hard work. Prentiss Vise Co. See page 102.

Chucks that are used as Standard Equipment on nearly every

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portable tool made in the United States. See page 94. The Jacobs Manufacturing Co.

Special Analysis Steel can be obtained from Ludlum Steel Co. Page 104.

A copy of "Hacksawology" gives many valuable hints on the selection of Hack Saw Blades. This is offered by the Simonds Saw & Steel Co. Page 99.

High Speed Drills for high speed production. See page 13. The Cleveland Twist Drill Co.

A Free Trial Offer on an exceptionally efficient Portable Saw for various purposes. For complete information see page 67. D. W. Onan & Sons.

Chrome Vanadium Wrench Kits for Millwrights, Loom-fixers and other Shop Mechanics. See Inside Front Cover. Bonney Forge and Tool Works.

Screw Drivers Forged in One Piece from handle to tip and unconditionally guaranteed. See page 92. American Saw & Manufacturing Company.

The Cap Screw with the perfect hexagon head. See page 87. Ferry Cap & Set Screw Co.

Sample Blades are Offered by Victor Saw Works. See page 90.

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Information on Scientifically Prepared Coatings for all industrial purposes can be obtained from The Goheen Corporation. See Inside Back Cover.

The Proper Handling and Storage of Lubricating Oils. See page 48. S. F. Bowser & Co., Inc.

Long Wearing Brushes for every industrial purpose are described on page 6. The Osborn Mfg. Co.

Descriptive Bulletins on Metal Coating that can be applied right over wet, rusty, oily and hot surfaces. For information see page 77. The Nitrose Company.

An Oily Waste Can that outwears 3 to 5 of the ordinary kind is described on page 103 by The Witt Cornice Company.

Literature and Suggestions on Steel Window and Mechanical Operator Installations that have brought more day-light into plants, can be had from the Truscon Steel Company. Page 3.

Metal Case Brooms for every industrial purpose. For illustrated booklet and price list see Joseph Lay Co. advertisement on page 88.

Catalog No. 23 contains information on valve reseating machines, useful in any power plant and factory. The Leavitt Machine Co., page 103.

An Illustrated Booklet, "More Light" on the use of factory paint is offered by the U. S. Gutta Percha Paint Co. See page 9.

Coatings that Cut Down Upkeep on Roofs, Floors and Walls. Choice of samples offered by L. Sonneborn Sons, Inc. See page 59.

An Interesting Booklet on a Waterproof, Acid, Alkali, and Brine resisting paint. American Asphalt Paint Co. See page 75.

A Painting Method that makes the painting of industrial plants an economical and low cost labor saving method. See page 97. The Vortex Manufacturing Co.

ELECTRICAL EQUIPMENT. (Motors, Generators, Buffers, Polishers, Grinders, etc.)

Information on Lighting Fixtures, adjustable for any operation, is given in the catalog offered by the American Fixture Co. See page 164.

Catalog "E" very interestingly describes an adjustable speed grinder that saves its cost in one year. See page 68. The U. S. Electrical Tool Co.

Tap Drill Chart Cards useful for designers and builders of machinery are being issued by Wisconsin Electric Co. See page 11.

"Industry's Electrical Progress" is a story of savings through modern motor control of machinery and equipment, and can be obtained from The Cutler-Hammer Mfg. Co. See page 12.

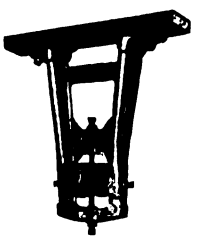
Bulletin on Direct Current Motors that are used in industrial operations. See page 95. Diehl Mfg. Co.

Complete Details can be obtained on a Motor that gives long service. See page 99. Master Electric Company.

A Nation Wide Electric Motor Service. For the nearest address see Howell Electric Motors Company, on page 126.

Motors Built for Specific Production Requirements. See page 93. The Domestic Electric Company.





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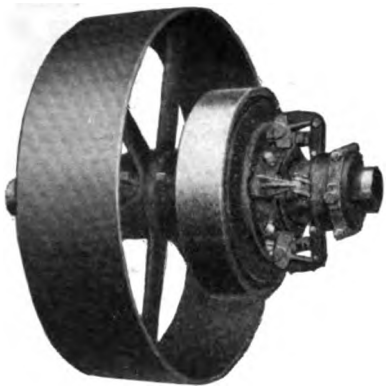
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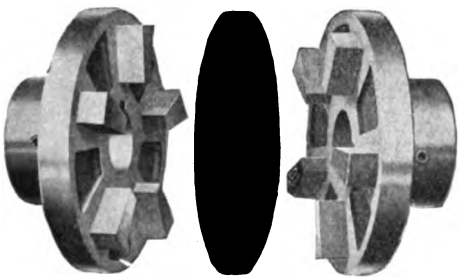
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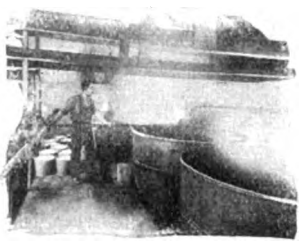


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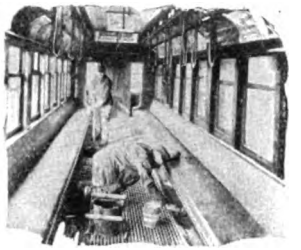
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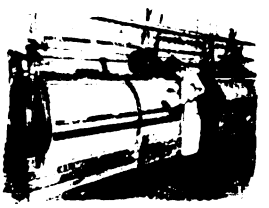
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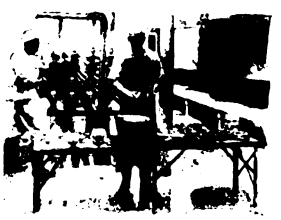
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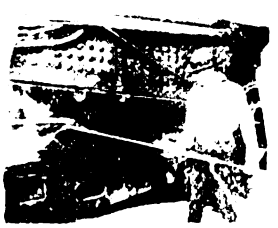
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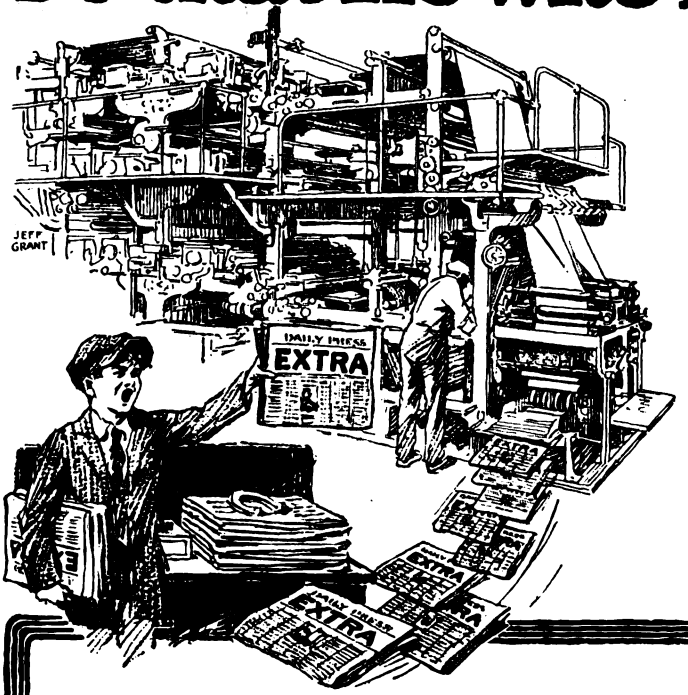
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40A THAMES ST., NEW YORK, N.Y.

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So that He who runs may Read



A THRONE is vacated—a famous couple are blessed by the stork—a Flyer crashes an open switch—a boat sinks—or a distinguished foreign visitor gives his impressions of America after a two day stay on our shores—

And the "story" is flashed to the millions within a few hundred minutes of its happening.

Perhaps you have never thought of the modern newspaper as an outstanding proof of the savings and speed resulting from standardized manufacture.

Here is *mass production* again—

That man-planned and machine-effected taking in of materials at one end and the delivering of finished products at the other.

You might be surprised, too, at the newspaper's efficient use of the principle of waste-less conveying of materials.

No matter what the line of production, real volume cannot be efficiently gained and labor costs reduced until materials are elevated or conveyed without costly cumbersomeness.

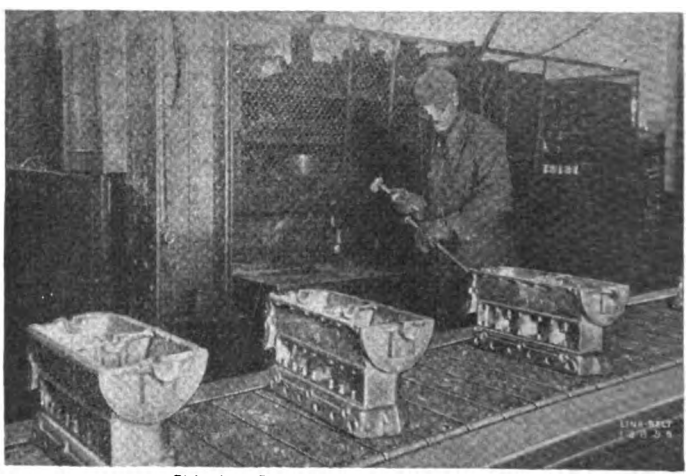
LET MEN produce—while conveyors carry the load.

There's a principle worth considering. The Ford Motor Company put it into practice. Of the many thousands employed at the Ford River Rouge plant, few do any lifting, carrying, or hauling. Such work is done more quickly and economically with mechanical handling equipment.

Manufacturers of automobiles, stoves, batteries, and many other products, let the work in process move to and from the workmen on conveyors.

Let Link-Belt experienced engineers help you increase your output and lower production costs. Address nearest office.

Elevators and Conveyors for all materials.
Assembly conveyors for Automobiles, Food Products, everything made in quantity in the factory.
Foundry Sand Handling and Mould Conveyors.
Bucket Elevators for all materials.
Coal and Ashes Handling Equipment.
Crawler Cranes, Crawler Loaders, Portable Conveyors.
Chains—wheels—elevator buckets and all elevator and conveyor accessories.



Chipping Conveyor, River Rouge Plant, Ford Motor Co., Detroit, Mich.

LINK-BELT COMPANY

CHICAGO, 300 W. Pershing Road — INDIANAPOLIS, 200 S. Belmont Ave. — PHILADELPHIA, 2045 Hunting Park Ave.

Atlanta, 610 Citizens & Southern Bank Bldg. Birmingham, Ala. - 720 Brown-Marx Bldg. Boston - - - - - - - 49 Federal St. Buffalo - - - - - - 554 Ellicott Square Cleveland - - - - - 531 Rockefeller Bldg. Denver - - - - - - - 520 Boston Bldg. Detroit - - - - - - - 5938 Linsdale Ave Huntington, W. Va. - Robson-Prichard Bldg. Kansas City, Mo., R.436, 1002 Baltimore Ave. Louisville, Ky. - - - - - 321 Starks Bldg. New Orleans - 504 New Orleans Bank Bldg. New York - - - - 2676 Woolworth Bldg. Pittsburgh - - - - - - 335 Fifth Ave. St. Louis - - - - - - - 3638 Olive St. Toronto 2, and Montreal, Link-Belt Limited Wilkes-Barre - 526 Second Nat'l Bank Bldg.

H. W. CALDWELL & SON CO.:—Chicago, 1700 S. Western Ave.; Dallas, Texas, 810 Main St.; New York, 2676 Woolworth Bldg.

LINK-BELT MEESE & GOTTFRIED CO.:—Fresno, Calif., 215 Briz Bldg.; Los Angeles, 400 E. Third St.; Oakland, Calif., 526 Third St.; Portland, Ore., 67 Front St.; San Francisco, 19th and Harrison Sts.; Seattle, 620 First Ave., S.

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LINK-BELT

Elevating and Conveying Machinery

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GOHEEN

PAINT ENGINEERS

Offer Scientifically Prepared Coatings for Concrete and Wood

GOHEENS
WOOD FLOOR PRESERVATIVE

Accomplishes perfectly the three major requirements of a wood floor protective coating.

1. **Toughens the surface to prevent or stop splintering.**
2. **Waterproofs the floor.**
3. **Penetrates to kill rot producing fungi.**

It adds years to the life of wood floors. Makes floors sanitary and does not change color of wood.

Purchase cost is low and it can be applied by unskilled labor. Covers about 400 square feet per gallon.

Can be used in any building, from factory to residence, interior or exterior.

CONCREWALTUM PAINT
(TRADE MARK)
FOR WALLS

For interior or exterior use on any type of brick or cement surface or masonry walls, Concrewaltum Wall Paint is the highest grade concrete coating made. Used by Public Utilities and largest Industrials for years. Waterproofs and damp-proofs. Will not crack, peel or flake off. Combats weathering and disintegration for many years. Concrewaltum is unaffected by alkalinity of concrete or plaster. Can be scrubbed and cleaned. Made in many colors or special shades. Covers about 300 square feet per gallon. Made in Flat, Eggshell and Gloss.

ROCKOTE
For Hardening Concrete Floors

Rockote is a scientifically prepared and tested liquid product which **overnight** gives a permanently hard, flintlike surface to soft dusting granular concrete floors. Purchase cost is low and its ease of application with unskilled labor makes the labor cost insignificant. Any janitor or laborer can apply Rockote. Only two applications necessary. Concentrated to permit dilution with water. No interruption of plant operation, dries overnight. Covering capacity remarkably high.

CONCREWALTUM
TRADE MARK
FLOOR ENAMEL

Produces a hard elastic, durble and beautiful enamel finish on Concrete Floors. Prevents absorption of oils, greases, etc. Makes concrete floors easy to clean and keep sanitary. Most economical, covering 300 square feet per gallon. Gives years of service. Made in many colors or special shades.

CONCREWALTUM
TRADE MARK
COLORLESS—INVISIBLE

Concrewaltum Colorless is a preparation that can be applied on any brick or concrete surface that is already up. The modern use of brick and concrete buildings creates the need for a COLORLESS CONCREWALTUM for waterproofing and to prevent dampness from penetrating. COLORLESS CONCREWALTUM is a transparent coating that does not change the color or the texture of the surface to which it is applied. It can be easily brushed into the surface and will absolutely prevent dampness from penetrating.

It will not change the color of the surface in any manner. It is easily applied by either brush or spray and has excellent covering capacity.

GOHEEN CORPORATION of N. J.

Paint Engineers since 1888

NEWARK, N. J.

A Standard Goheen Paint for Every Type of Surface and Use

Galvanum — TRADE MARK

CARBONIZING COATING FOR IRON and STEEL — TRADE MARK

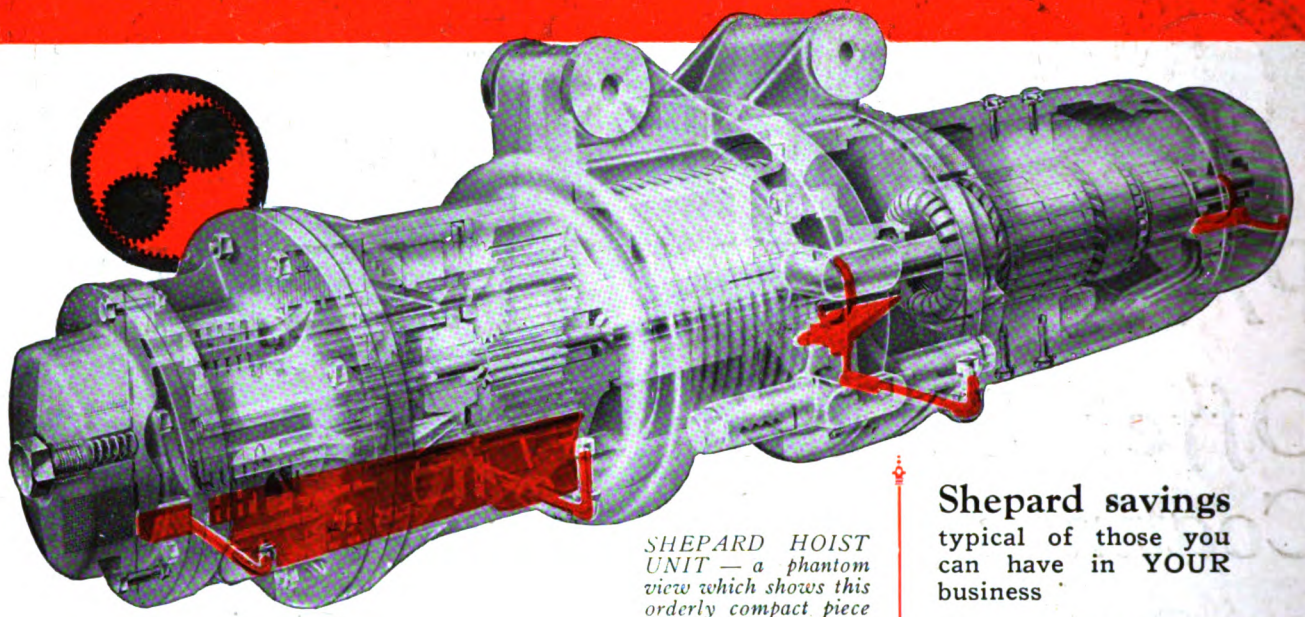
Chemically Combined HIGHWAY RED — TRADE MARK — Red Lead Paint

THERMOKOTE — A GOHEEN PRODUCT — A PAINT FOR ALL HOT SURFACES AND STACKS

GOHEEN'S Mill White — TRADE MARK

EILERT PRINTING COMPANY, INC.
518-526 W. 39TH ST., NEW YORK

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SHEPARD HOIST UNIT — a phantom view which shows this orderly compact piece of machinery, built like a machine tool, and amply lubricated.

Shepard predominates

and the reasons why are easily understood

The most widely used electric hoist in America! Because Shepard design has stood the test of time and service.

Not over a few years, but ever since the earliest days of electric hoist manufacture—a quarter century ago—Shepard has demonstrated its superiority of design and workmanship. Today there are in constant daily service, Shepard Electric Hoists installed 18, 20 years ago and longer.

Industry has learned to expect, in Shepard, a superior design, for the Shepard Electric Crane & Hoist Co. is a pioneer organization of electric hoist and crane builders whose entire endeavor is the making of electric hoisting and allied equipment—not a side line, not a small part of a business, but the whole business.

Shepard gives industry a proven design; the widest range of hoist capacities, and types to meet every condition in every plant; big economies in time and labor; these, plus the endorsement of thousands of satisfied users including America's biggest industrial enterprises.

Consult Shepard Engineers—their advice pays in determining your material handling needs.

SHEPARD ELECTRIC CRANE & HOIST CO.
366 Schuyler Ave., Montour Falls, N. Y.
Branches in Principal Cities
Largest Manufacturer of Electric Hoists in America

SHEPARD
ELECTRIC CRANES & HOISTS

Shepard savings

typical of those you can have in YOUR business

"$8,000 a year saved in labor." S. L. Allen Co., Inc., Philadelphia, Pa. (Mfgr. of Flexible Flyers)

"75% speedier than other hoists." Mississippi Valley Structural Steel Co., St. Louis, Mo.

"$9750 a year saved in labor." Neo-Gravure Printing Co., New York, N. Y.

"Handling time cut 87½%." Consumers Power Co., Pontiac, Mich.

"Shepard and 1 man unloads 8 tons conduit in 5 minutes; hand labor method would take 4 men 1 hour." Graybar Electric Co., New York, N. Y.

"One Shepard releases 12 men for other work." Mid West Piping and Supply Co., St. Louis, Mo.

"Plant efficiency increased 500%." Tool Steel Gear & Pinion Co., Cincinnati, O.

"$270 a week saved; hand labor reduced 90%." Joseph P. Cattie & Bros., Philadelphia, Pa.

"One man instead of five on cupola charging platform." Central Foundry Co., Newark, N. J.

The foregoing are a few instances of Shepard economies selected, at random, from the thousands of Shepard installations.

WRITE FOR

68 page "Book of Illustrated Economies," giving figures and actual photographic illustrations of Shepard Savings in numerous lines of business.
and
60 page "Floor Operated Hoist Catalog" which gives dimensions, prices and complete data about 33 standard types of Shepard Electric Hoists.

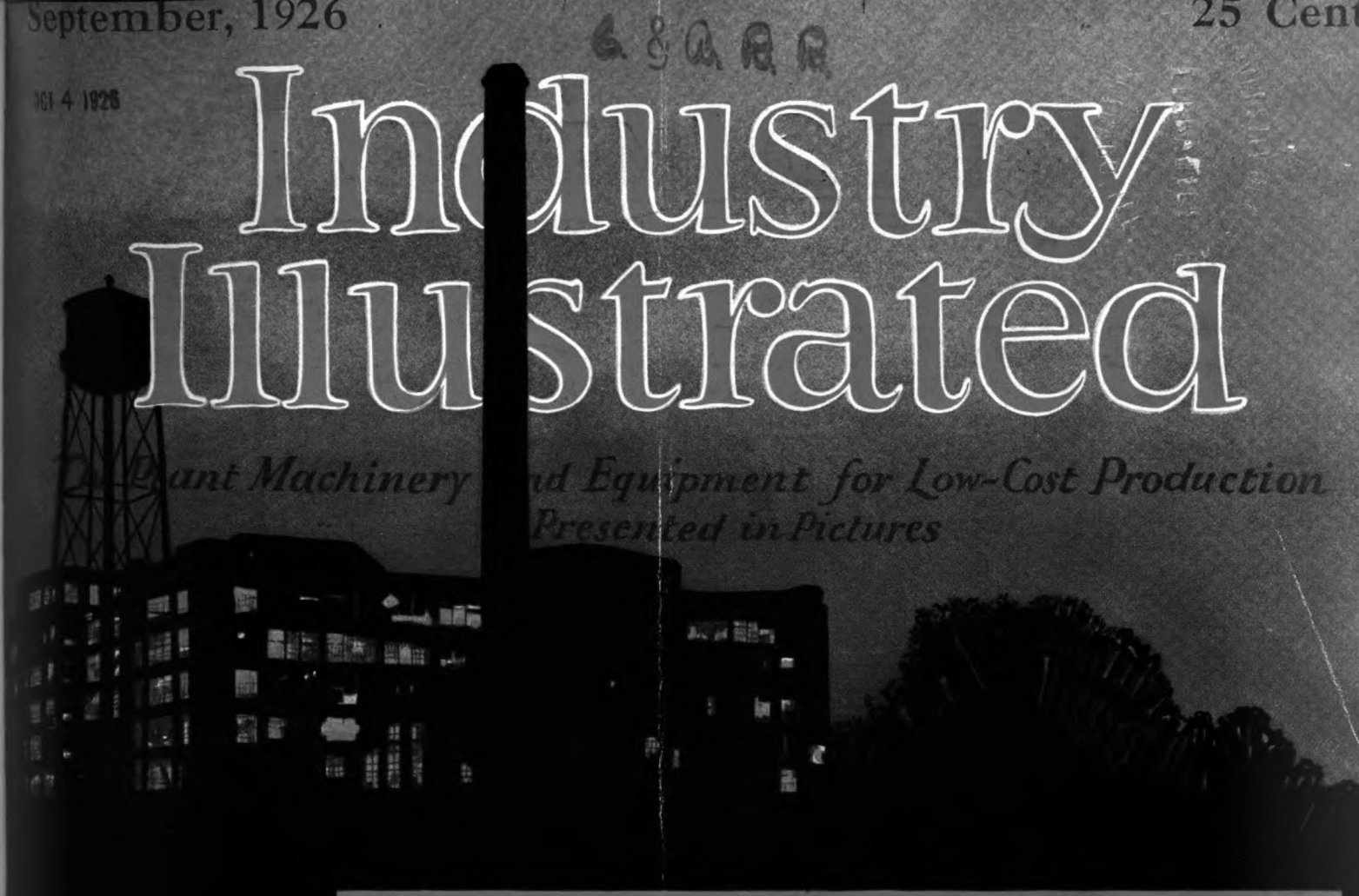
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September, 1926 25 Cen

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Industry Illustrated

...ant Machinery ...d Equipment for Low-Cost Production
Presented in Pictures



Getting Ready for Fall Production

The vacation season is over. All indications point to splendid prospects for the coming months. Is your shop ready for this business?

Now is the time to answer this question, and this issue of Industry Illustrated is intended to help you do so. You will find a wealth of practical, usable information in both editorial and advertising pages.

Complete Table of Contents, page 17

Publishing Offices
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A GOOD MECHANIC

IS KNOWN BY THE WRENCHES IN HIS KIT—

Master Mechanics everywhere are using Bonney *C. V. Chrome Vanadium Wrenches

*C. V. is a Bonney trademark registered in the U. S. Patent Office





Set No. 25
Contains six *"CV" Engineer's type 15 degree angle wrenches with 12 different openings from 3/8" to 1". Price, east of Mississippi $6.85 without Leatherette Roll. $7.85 with Roll. Canadian and Western prices slightly higher.

Bonney *C. V. Chrome Vanadium Wrenches are twice as strong as ordinary carbon steel wrenches and are easily identified by the dull nickel finish of the handle and the highly polished heads. Look for orange Bonney trademark in handle and the words "Chrome Vanadium" on the handle.

You can secure from your jobber. Write for detailed information.

Bonney Forge & Tool Works
Dept. B. Allentown, Pa.

Makers of Special Service Wrenches of Chrome Vanadium, Carbon Steel Drop Forged Wrenches, Stillson Wrenches, Vises and Drop Forgings and the Bonney Rim Tool.

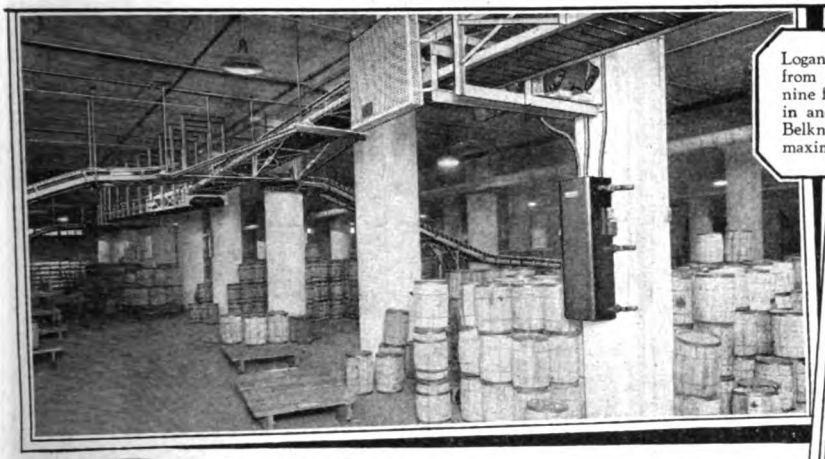
BONNEY Chrome-"CV"-Vanadium WRENCHES

(Patents Pending)

Chrome Vanadium, registered Aug. 11, 1925

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50 YEARS OF SERVICE ~ OUR GOLDEN ANNIVERSARY



Logan Power Slat Conveyors, suspended from ceiling, constitute a sort of "mezzanine floor" for the movement of materials in and out of this warehouse room of Belknap Hardware & Mfg. Co., leaving maximum floor space for storage.



Logan Inclined Slat Elevator and Gravity Rollers enable Continental Motors to handle almost twice as much material as before on the same platform and at practically no cost.

3 More room in the same Space

"ANNOUNCING a New Addition to Our Plant!" Sounds well but costs money—*and frequently it's unnecessary.* For many a plant addition has been forestalled by a more productive use of *the original floor space.*

In scores of factories and warehouses Logan Conveyors have eliminated space-consuming congestions, reduced the size and frequency of aisles and reclaimed enough waste space to accommodate normal plant expansions for years to come.

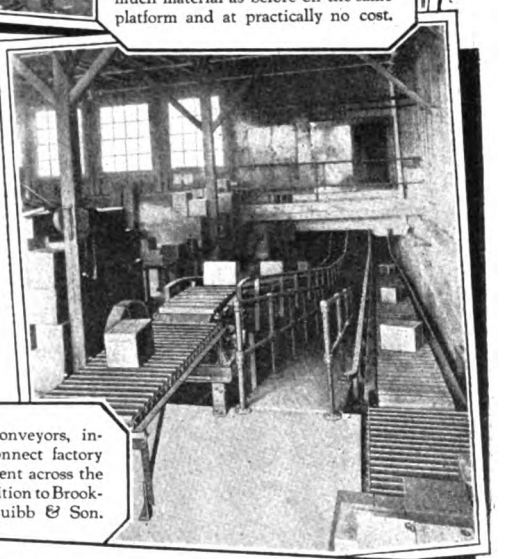
Even where Logan Conveyors are installed on the floor itself, they permit a larger volume of traffic through smaller aisles, prevent costly slow-downs in production and insure maximum plant capacity in minimum space. *The coupon will bring you further details.*

THIS *is the* THIRD of a series of announcements featuring seven distinct savings made possible by Logan Conveyors, any one of which may pay for an installation in your plant.

No. 1 featured Savings in Labor.

No. 2 featured Savings in Time.

The remaining four will follow in consecutive issues.



Logan Power Slat Conveyors, installed in a tunnel, connect factory with shipping department across the street, saving costly addition to Brooklyn plant of E. R. Squibb & Son.

LOGAN CO.
Louisville, Ky.

Date .....

We are interested in conveyors. Send catalog ☐ Without obligating us, have your representative call ☐

Name .....

Address .....

Logan Co.
INCORPORATED 1881

LOUISVILLE, KY. *Offices in Principal Cities*

Logan Conveyors
LOUISVILLE

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TRUCKS
BARRELS
BOXES
and TRAYS

For transporting and storage of packages, parts, raw material, trimmings, etc. Durable, easy to handle and cheaper in the long run. Write for catalog of the

Leatheroid Line

ROGERS FIBRE CO.

121 BEACH STREET, BOSTON
NEW YORK 78 Fifth Ave. PHILADELPHIA 1024 Filbert St. CHARLOTTE, N. C. 326 S. Church St.

The Publisher's Column

Good Business Weather Ahead

THIS month ushers in the beginning of the fall season when business usually begins to put on increased speed after the usual summer slow-down.

This year differs from most other years in that there has been very little of a summer let-up in industrial activity. It has hardly been noticeable this season.

Indications are, therefore, that activity this fall will be on even higher levels than were established last year.

This is a pleasing outlook for industry and business, but it brings added responsibility to industrial executives who must be prepared to meet additional demands efficiently and economically without disastrous increases in price levels.

The editorial and advertising pages of INDUSTRY ILLUSTRATED are devoted to helping industrial executives to solve the problem of increasing production and at the same time diminishing costs. Careful study of the ways and means of accomplishing these ends is especially appropriate now.

Industry Illustrated

Published Monthly by

THE ENGINEERING MAGAZINE CO.

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TRUSCON Boxes and Platforms Save Time, Space and Money

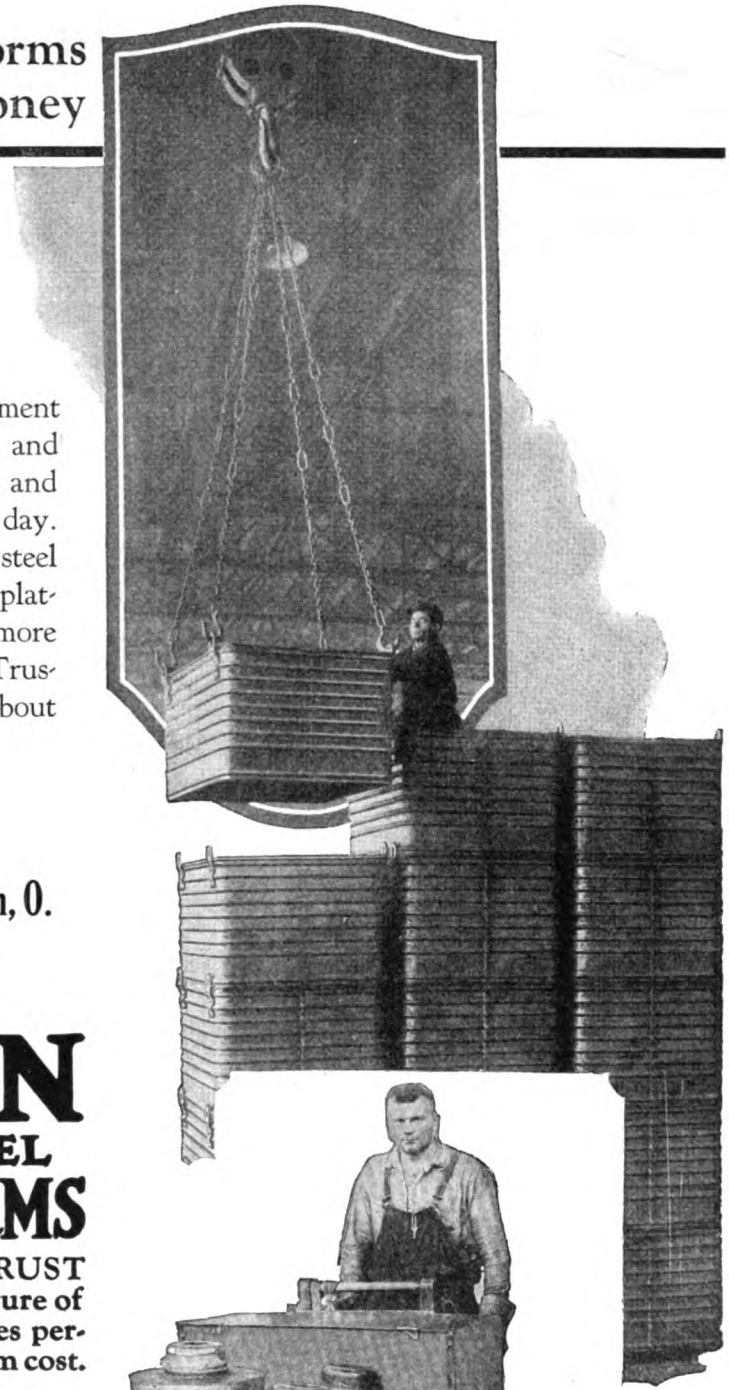
They Stand Up Under Hard Usage

Get the facts about Truscon handling equipment now. Truscon Steel Boxes have durability and rugged strength. They are built to use, to last and to stand the gaff of rough work day after day. Truscon one-piece, integrally reinforced all steel Platforms are the strongest, most practical platforms in the world. Yet they cost you no more than steel bound platforms. In the long run Truscon Platforms are far cheaper. Inquire today about this handling equipment.

The coupon will bring free catalog and information.

TRUSCON STEEL COMPANY, Youngstown, O.

Special Box and Platform Representatives in New York, Philadelphia, Chicago, Pittsburgh, Cleveland, Buffalo, Detroit, Boston, St. Louis and Cincinnati.



TRUSCON
★ALLOY STEEL
BOXES AND PLATFORMS

★COPPER ALLOY STEEL RESISTS RUST
An enduring better steel for the manufacture of Boxes and Platforms. Copper Steel assures permanent value and performance at minimum cost.



Truscon Alloy Steel Boxes and Platforms meet all needs. Boxes adaptable to crane and other conveyor systems and to high stacking. Platforms specially designed for lift truck handling. Boxes and Platforms separate or as a combined unit.

TRUSCON STEEL COMPANY
Youngstown, Ohio

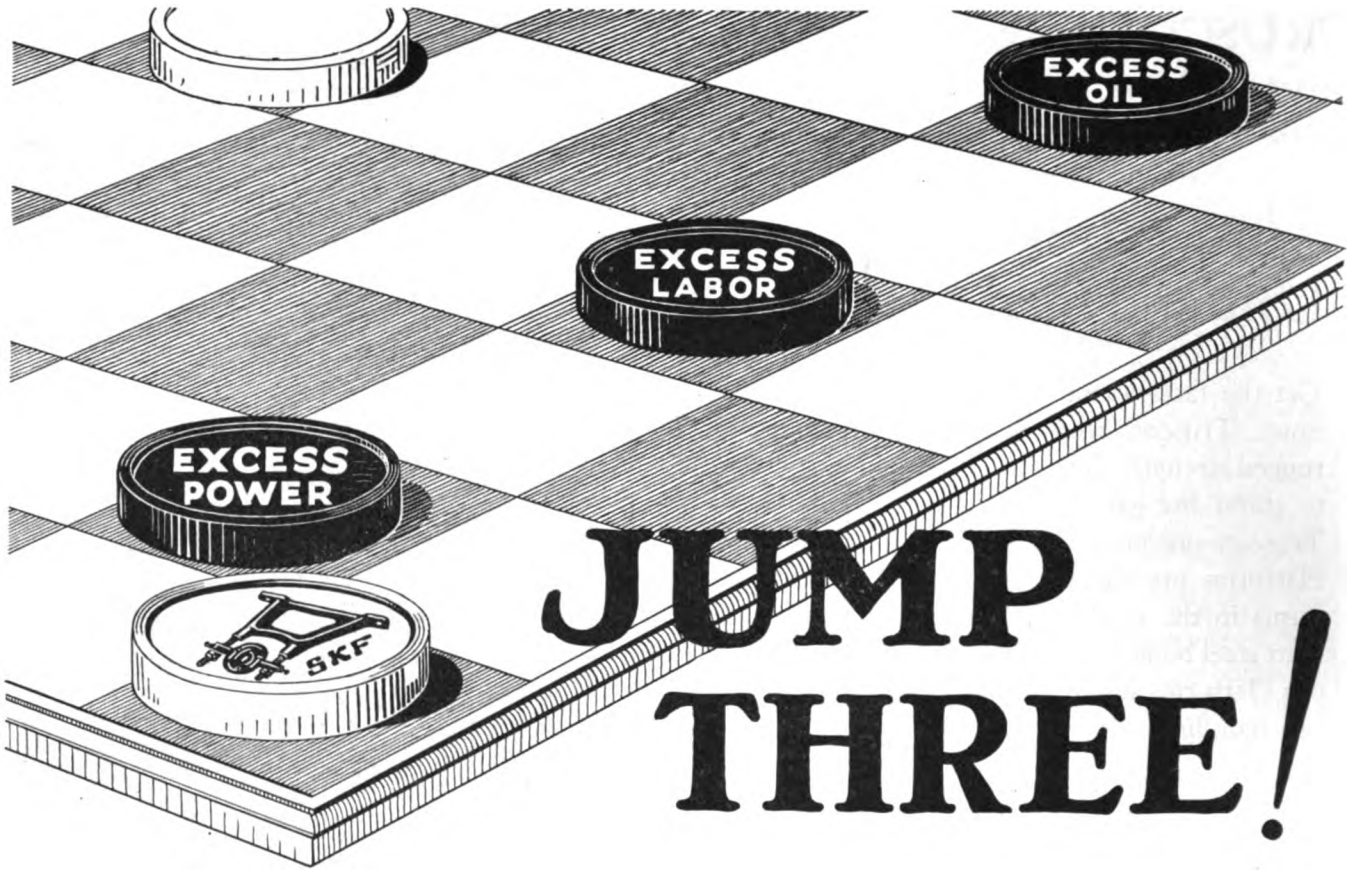
Send me catalog and full information on Truscon Alloy Steel Platforms and Boxes.

Name.....

Address.....

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THERE they are—three big obstacles that stand in the way of efficient management in every plant that operates on plain bearing line shaft equipment—Excess Power, Labor and Oil.

And yet, you can surmount all three obstacles at the same time, by installing Skayef Self-Aligning Ball Bearing Hangers. Skayef equipment SAVES through friction reduction. It fights Friction at the source, rather than with excess Power, Labor or Oil. It pays for itself in two years' time.



If you would like to secure facts gathered by an unbiased group of research engineers covering a typical Skayef Installation in your industry or in one closely related to it, write.

It's Your Move!

SKF INDUSTRIES, INCORPORATED, 165 Broadway, New York City

SKF

MARKED

Self-Aligning **HANGERS** *Ball-Bearing*

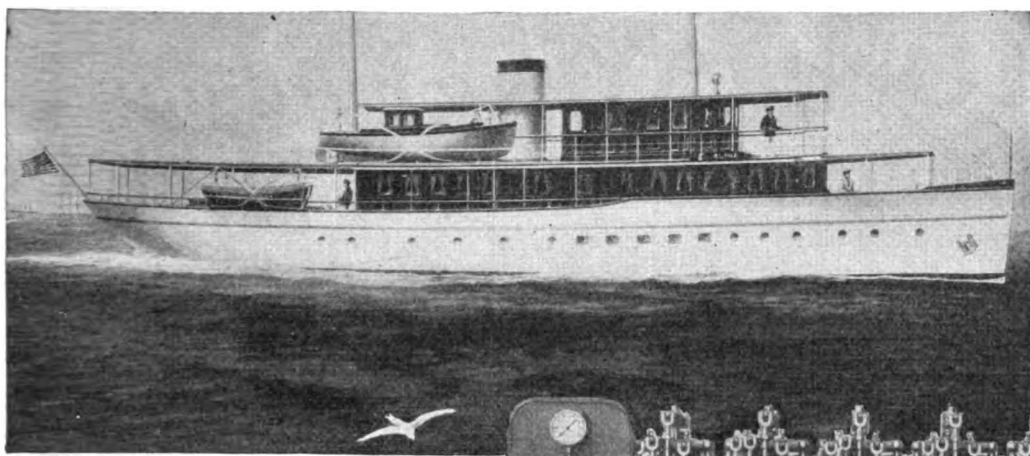
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SKF INDUSTRIES, INCORPORATED — 165 BROADWAY — NEW YORK CITY

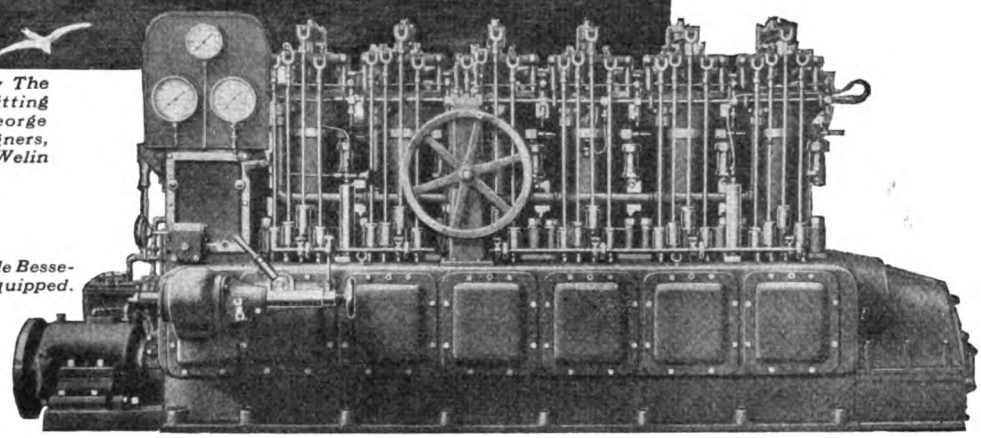
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Now—Diesel Engines with Timken Bearings



Timken Bearings were used by The Bessemer Gas Engine Co. in fitting the "Alpha." Owner, Mr. George Marshall Allen, New York. Designers, Henry J. Gielow, Inc. Builders, Welin Davit & Boat Corporation.



A 125-150 h. p. direct reversible Bessemer Diesel Engine, Timken-equipped.

No responsibility is too great for Timken Tapered Roller Bearings. Latest proof is the use of Timkens in Diesel engines, by The Bessemer Gas Engine Co., one of the great producers of internal combustion engines.

Only the most exhaustive comparative experiments by Bessemer certified Timkens for numerous Diesel mountings, including the marine propeller thrust position of a costly private yacht.

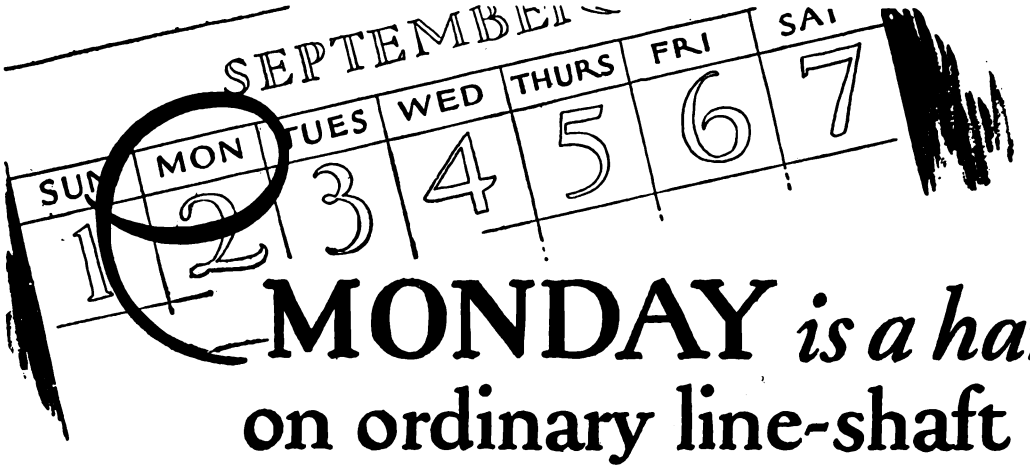
Speeding this 100-ft. vessel, of 250 h. p., at 12 knots or more, the Timken Bearings must and do perform infallibly. With their easy-rolling properties, tapered design, Timken-made steel, and *POSITIVELY ALIGNED ROLLS* Timkens bring power economy, smoothness, freedom from attention, and permanent precision.

THE TIMKEN ROLLER BEARING CO., CANTON, OHIO

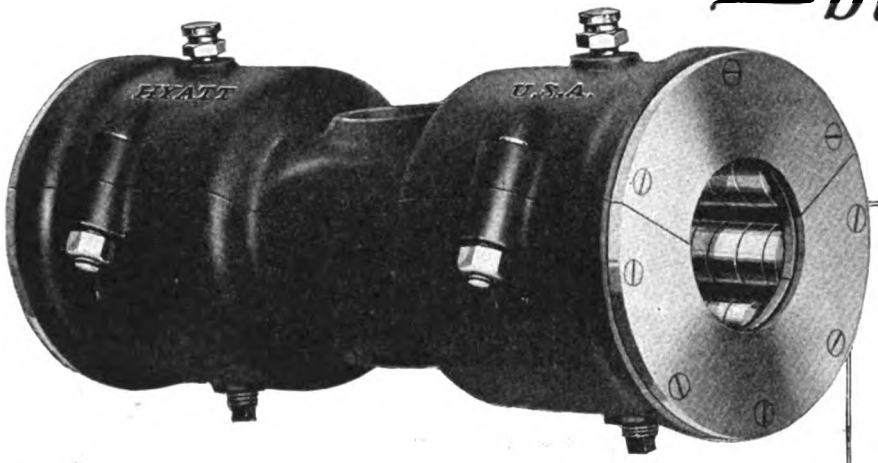
TIMKEN
Tapered
ROLLER BEARINGS

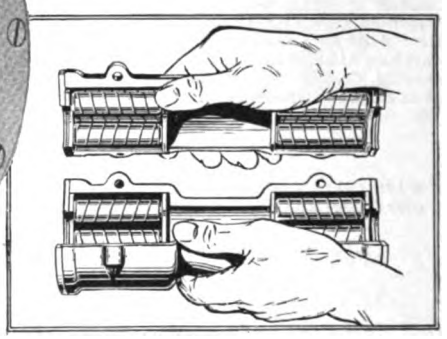
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MONDAY *is a hard day* on ordinary line-shaft bearings —*but not on* HYATTS





A TREMENDOUS tax is imposed on the performance and life of your plain bearings when the line shafting in your mill or plant is started Monday morning.

The week-end shutdown permits the lubricant to ooze off, leaving the plain bearing surface dry and unprotected—easy prey for friction and wear. Bearing life is shortened. Frequent replacements and production tie-ups are inevitable.

Hyatt Line Shaft Bearings, in contrast, are never dry. There is always a grease film between the rollers and the shaft as long as there is any lubricant left in the bearing.

The distinctive helical Hyatt rollers keep the lubricant circulating constantly over all bearing surfaces. They are flexible to absorb loads, vibration and irregularities in shaft surfaces.

Hyatt Roller Bearings require little attention—only three or four lubrications a year—reducing maintenance cost accordingly. Their smooth, easy rolling motion will cut 15% off your power bill.

The bearings and boxes are split for quick installation, without disturbing the shaft fittings. They are quickly adjusted to any hanger. The new, *narrow center* Hyatt bearing extends Hyatt service and economies to narrow transmission lines.

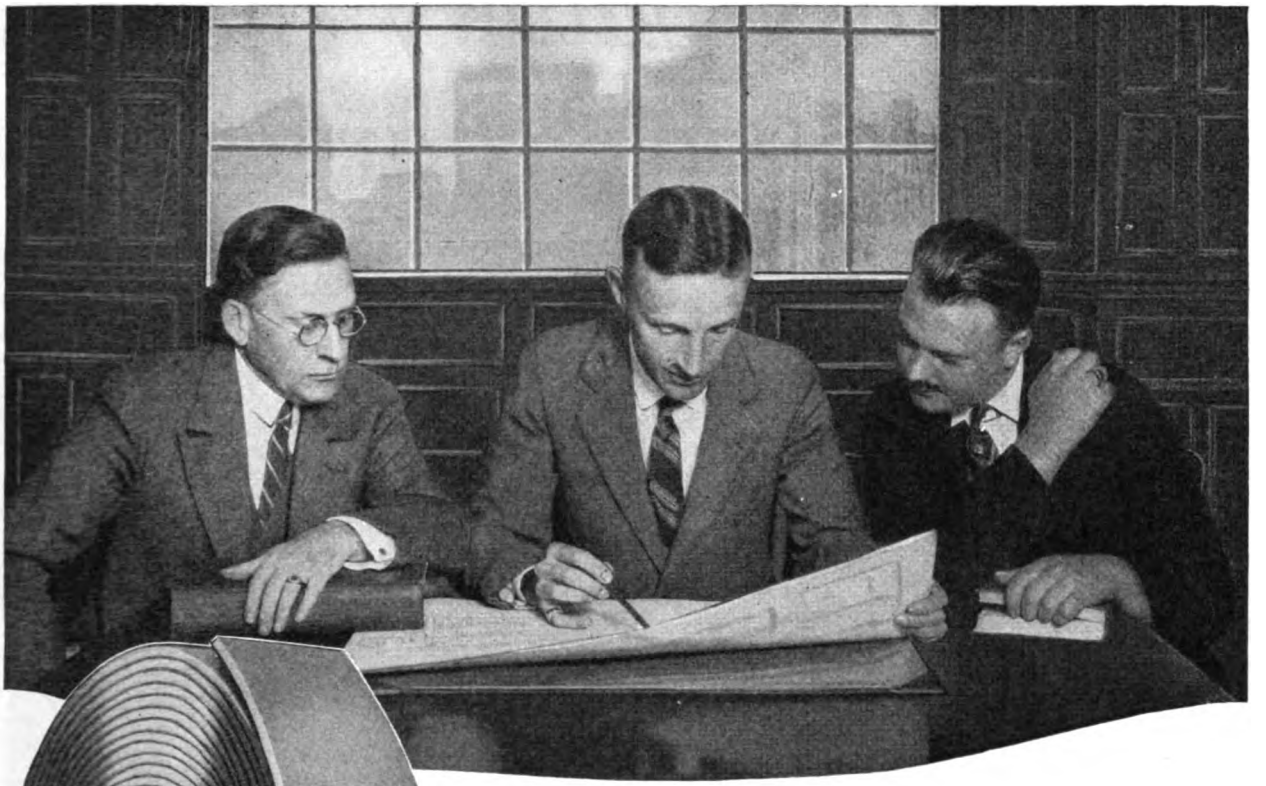
For high grade bearing efficiency, specify Hyatts from your nearest mill supply dealer.

HYATT ROLLER BEARING COMPANY
NEWARK, NEW JERSEY
Pacific Coast Address: San Francisco, Cal.

HYATT
ROLLER BEARINGS

There's a Hyatt Built to Improve Every Bearing Application

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"—and we are now specifying COCHECO BELTS throughout"

Men whose job is to O. K. belting bills, men who pass on the quality of belts in service and men who know the inside story of belt making are unanimous in ranking Cocheco Belting at the top.

When a meeting is called to approve plans for new equipment, there is seldom a dissenting vote when the spokesman says, ". . . . . as for belting, we have had experience with several kinds and we are now specifying Cocheco Belts throughout. We want to assure ourselves absolutely of good quality." Cocheco Belts are made of selected native, packer steer hides, tanned by the long oak bark process and finished by experts. They are the inevitable choice of those who require "more belt service per dollar."

COCHECO
TRADE MARK

BELTING

14-16 N. Franklin St. Chicago
71-73 Murray St. New York, N. Y.
111 Summer St. Boston, Mass.

I. B. WILLIAMS & SONS
DOVER, NEW HAMPSHIRE

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Easy battery charges and small book charges

At the charging panel a battery should respond to the current quickly and easily. But when it comes to running up charges on your books, a battery should be slow and stubborn.

WHEN you put a charging plug on an Exide-Ironclad Battery for the first time, you'll be surprised to see how quickly, easily and efficiently it takes in current. Its internal resistance is low, so that the plates are charged in a short time and its efficiency is high.

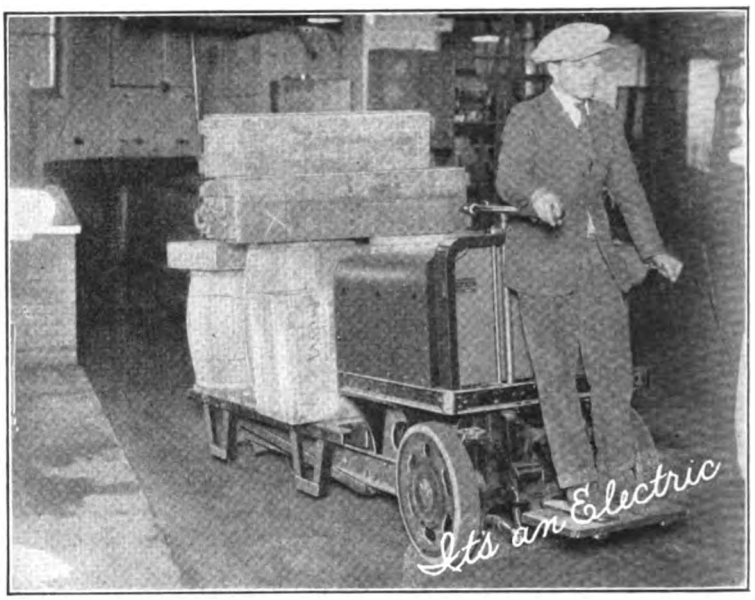
That kind of charging, of course, saves you money. But there are many other ways an Exide-Ironclad trims down your battery costs. For instance, you can cover more ground and handle more goods with this battery. It not only starts out full of pep and speed in the morning, but it still has speed to spare at night. Its voltage holds up well to the end of discharge period, and for that reason the Exide-Ironclad keeps your trucks moving at a good speed *all day long*.

When faced with a steep ramp or extra heavy load an Exide-Ironclad has the peculiar ability to deliver power in a flood, so that it rarely gets stuck. It always has something in reserve when extra power is needed.

An Exide-Ironclad will operate over rough surfaces just as well as on smooth level floors. It is built so rugged that it hardly ever needs repairs. The experience gained in making storage batteries for 38 years has taught us how to build a battery that will stand up for years even under difficult working conditions. And last but not least, the first cost of an Exide-Ironclad is reasonable.

It will be worth your while to find out more about the Exide-Ironclad Battery. Leading companies all over the country have cut their handling costs by installing it in their trucks. The names of a few of these companies are reproduced on this page. We will gladly send you our nearest representative without any obligation, or you can write for our booklet, "Facts for consideration in selecting a Storage Battery."

Member SERVICE THE SOCIETY FOR THE ELECTRICAL DEVELOPMENT OF SAFETY
Move It Electrically



In general service the storage batteries in your electric industrial trucks and tractors must be charged each day. And each time those batteries also run up charges on your books. Read the interesting story at the left of why the Exide-Ironclad Battery is unusually efficient on both charges.

A few of the many manufacturers that use Exide-Ironclads

Trumbull Steel Co., Warren, O.
Cleveland Automatic Machine Co., Cleveland, O.
Minnesota Steel Co., Duluth, Minn.
E. G. Budd Mfg. Co., Philadelphia, Pa.
National Cash Register Co., Dayton, Ohio
Remington Arms Co., Bridgeport, Conn.
Crane Co., Chicago, Ill.
Delco-Light Co., Dayton, Ohio
Cadillac Motor Co., Detroit, Mich.
Fisher Body Co., Detroit, Mich.
J. G. Brill Company, Philadelphia, Pa.
Buick Motor Co., Flint, Mich.
Dodge Bros., Inc., Detroit, Mich.
American Motor Body Co., Philadelphia, Pa.

Exide IRONCLAD BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

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The photographs at the right show how Barreled Sunlight is able to effect this great economy. Here is a paint finish so smooth it offers dirt no foothold, and can be washed like tile—and so durable that repeated washings will not wear it away.

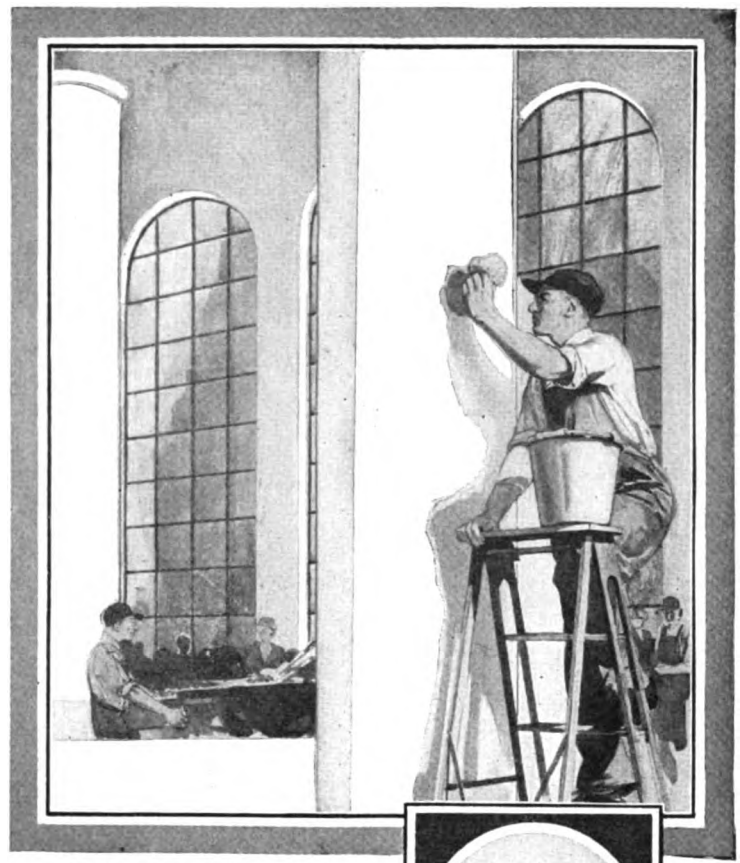
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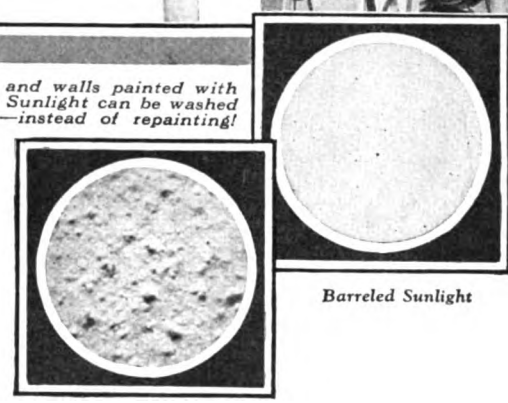
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Barreled Sunlight

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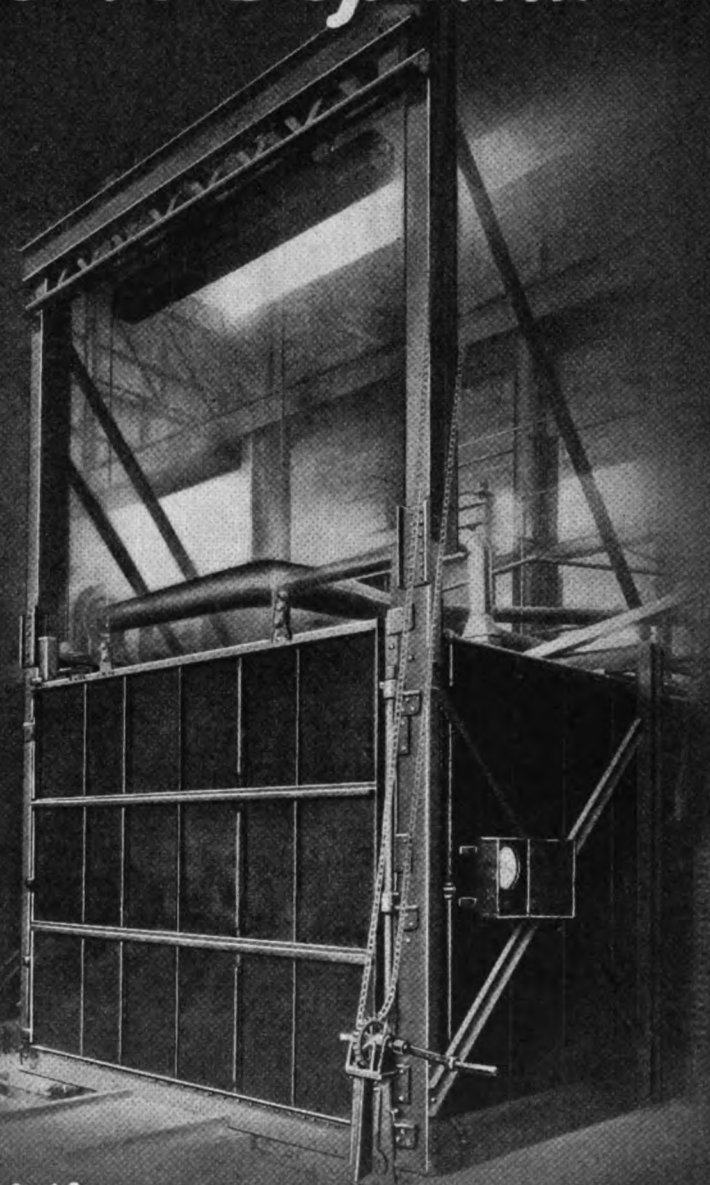
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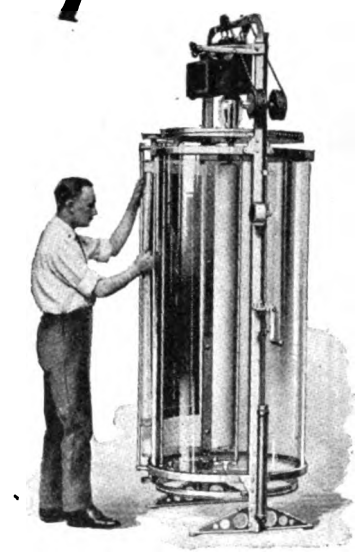
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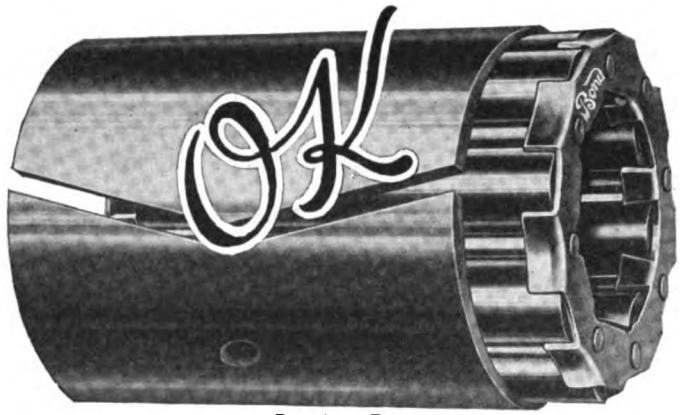
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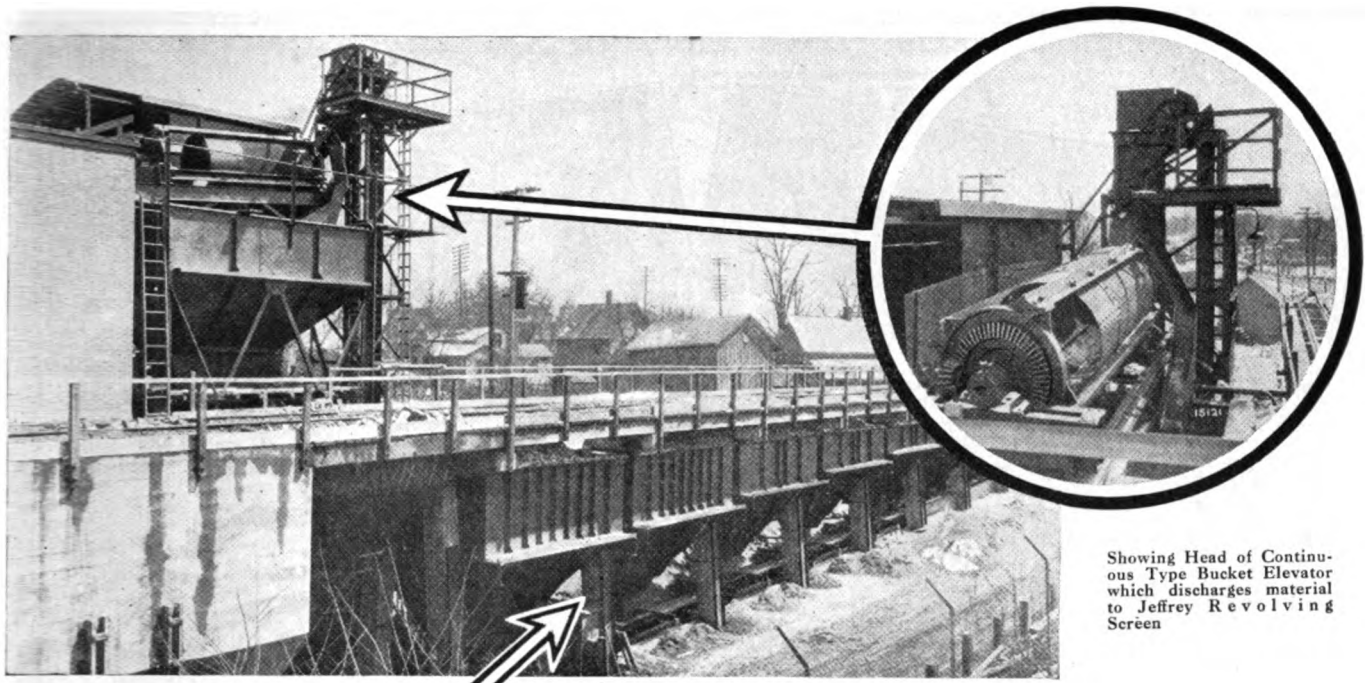
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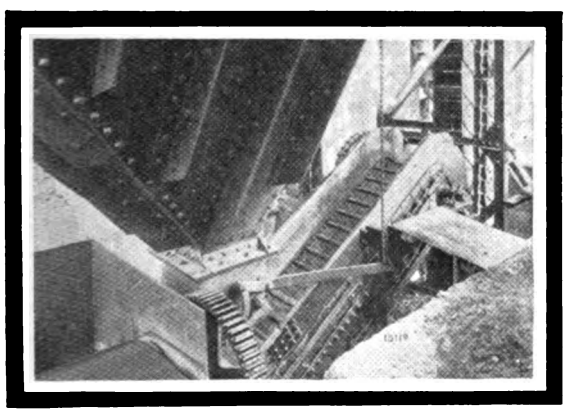
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Showing Head of Continuous Type Bucket Elevator which discharges material to Jeffrey Revolving Screen



Showing Belt Conveyor 108 ft. centers under Hoppers



Apron Conveyor which discharges from Belt Conveyor to Bucket Elevator

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Let Jeffrey Experienced Engineers make a complete plant investigation of your Elevating, Conveying, Crushing and Screening Requirements.

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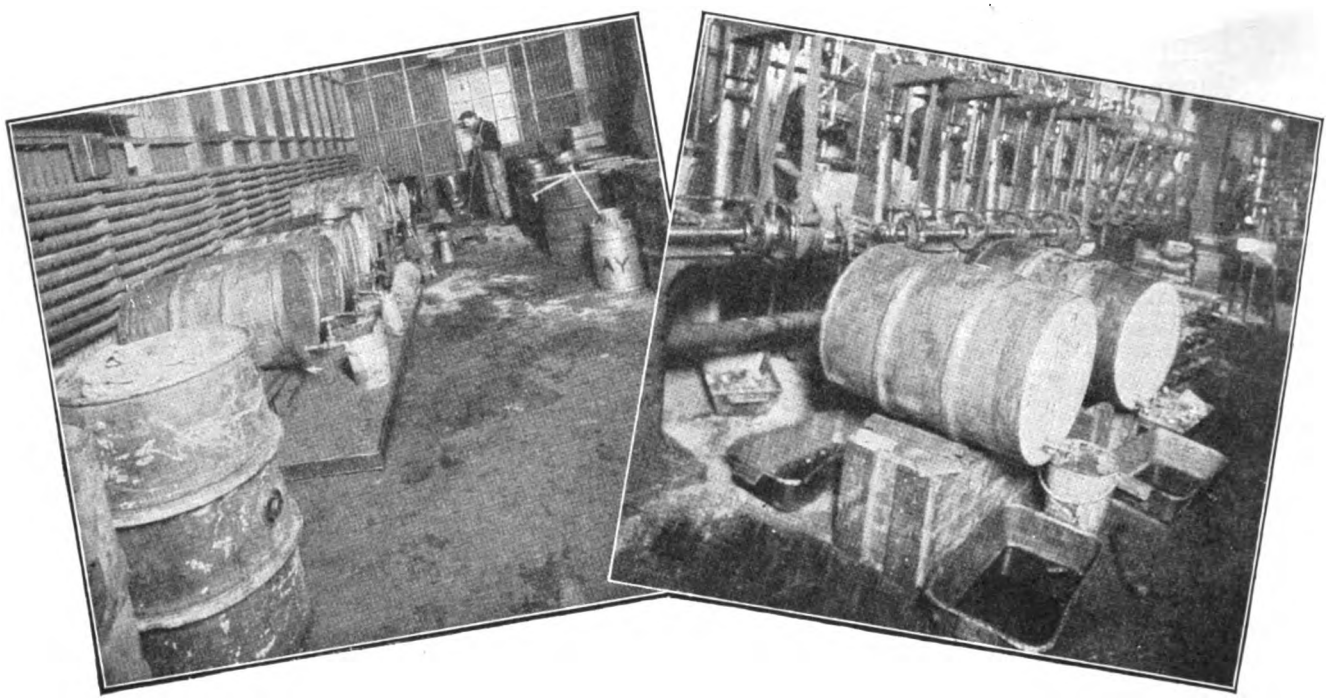
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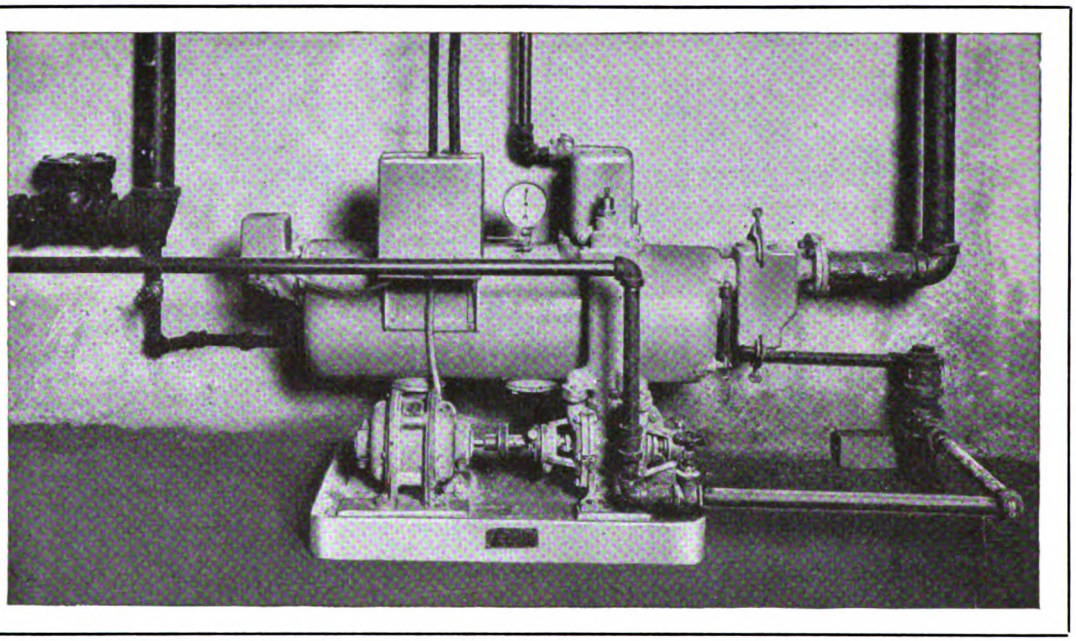
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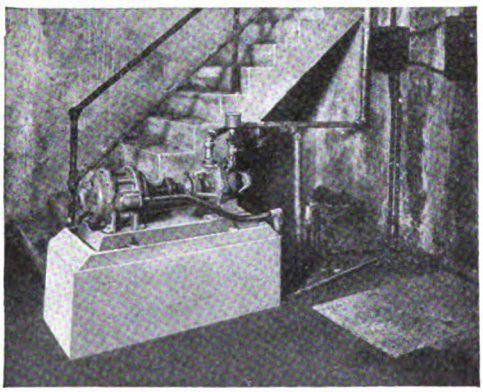
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As good years later as the day it was installed



Motor-driven Nash Hytor Compressor, size ½-0, installed as a sump pump in the Fox Building.

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Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures

JOHN H. VAN DEVENTER, *EDITOR*

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Associate Editor

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Art Director

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How to Choose and Use Your Files

By A. E. Culley

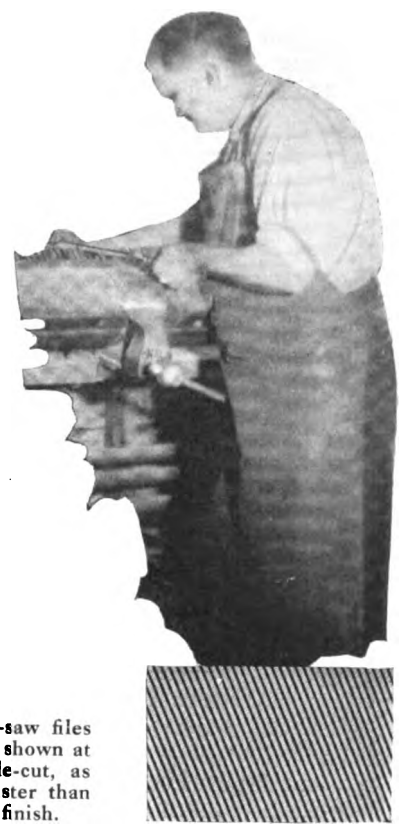
Supt., File Works, Simonds Saw and Steel Company



DOUBLE CUT

THE file is one of the most common tools of industry. Also it is one of the most useful ones. Yet it is frequently abused in shameful fashion, not only in its use but in its *choice*. For the proper use of a file begins with choosing the right one for the purpose. And there are many varieties and sizes to choose from.

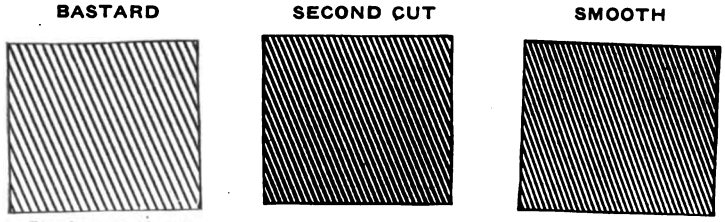
The purpose of this pictorial story on files is to help both in the choice and in the use of industry's faithful friend, the file.



SINGLE CUT

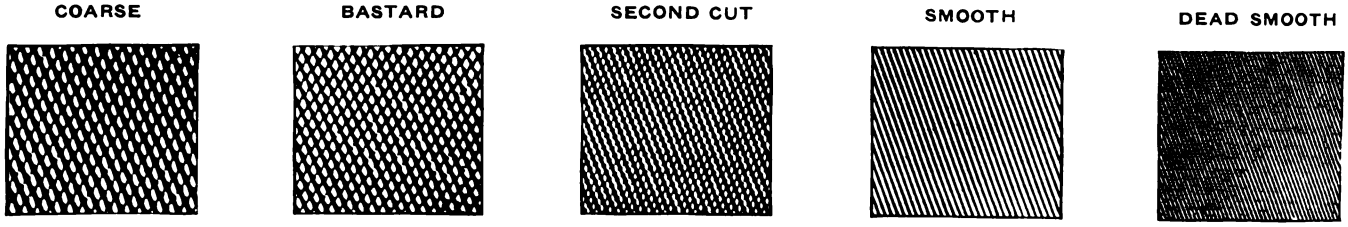
Regular, or standard, files have two divisions—saw files and machinists' files. Saw files are single-cut as shown at the right. Machinists' files are usually double-cut, as shown at the left. A double-cut file will cut faster than a single-cut but the latter gives a smoother finish.

BASTARD SECOND CUT SMOOTH



Single-cut files have three degrees of coarseness of teeth, as shown above, namely, "Bastard-cut," "Second-cut," and "Smooth-cut." The degree of coarseness, however, varies according to the length. Thus a 16-inch bastard is somewhat coarser than a 6-inch bastard. This applies also to second-cut and smooth-cut files.

COARSE BASTARD SECOND CUT SMOOTH DEAD SMOOTH



Double-cut files of the Flat, Hand and Pillar shapes have five degrees of tooth coarseness, as shown above. In addition to these five there is also a still coarser tooth, known as the Flat Babbitt, not shown, which is used for filing Babbitt metal. This, however, is single-cut.

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The Mill File



LATHE FILING

The Mill file is one of the most commonly used shapes. It is tapered in width about one-third of the way back from the point toward the heel, as shown below. While largely used for sharpening mill saws and planer knives, it is in large demand also for machinists' use in draw-filing and lathe-filing. The mill file in most general use is the mill bastard-cut.

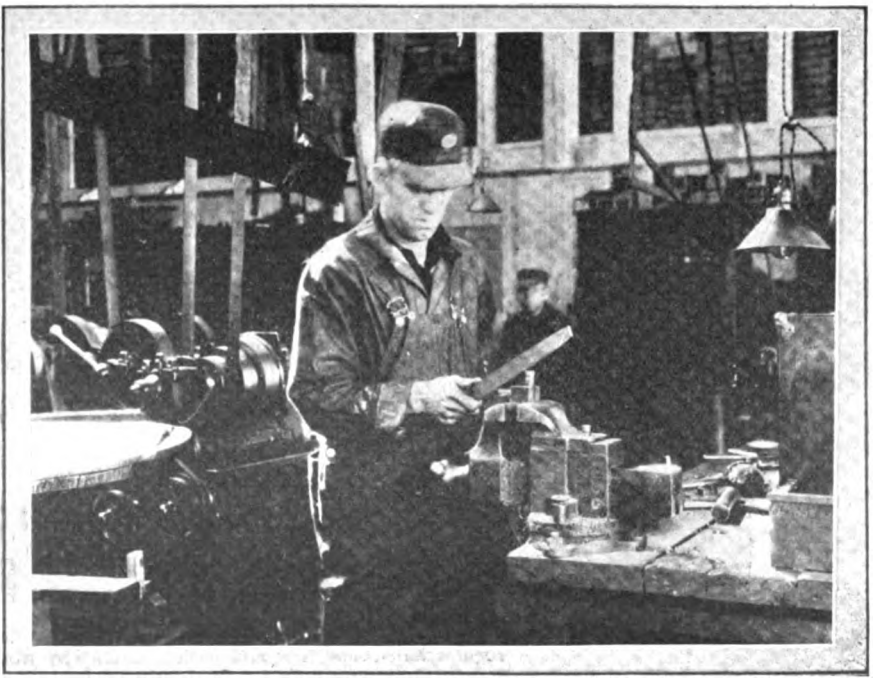


DRAW FILING

The usual section of a mill file is rectangular as shown below, but it is also made with either one or two round edges as shown at left and right. These are used in the gullets of the teeth of circular saws to prevent sharp bottoms.



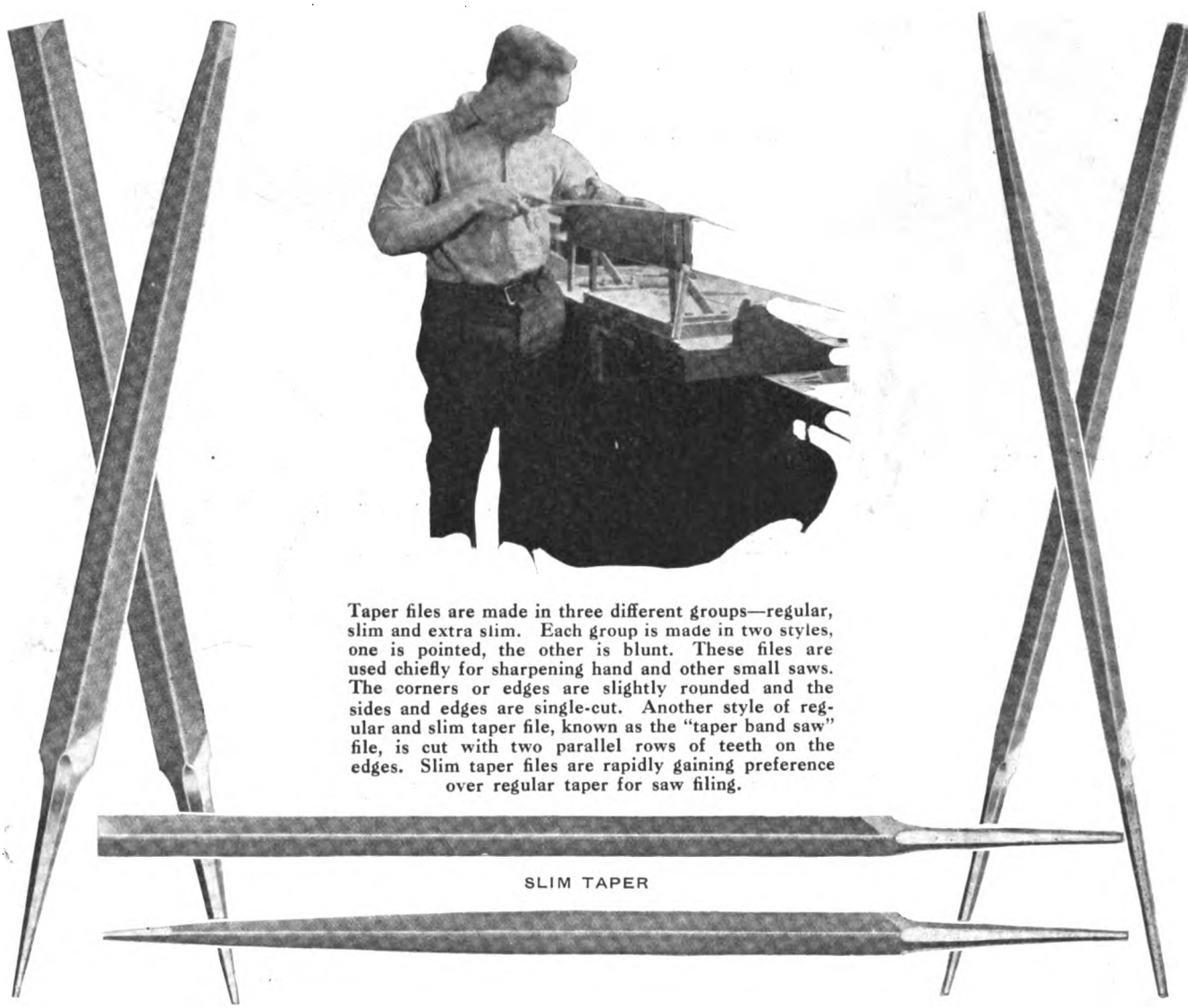
Don't use a file as a substitute for a hammer. It is not good for the file or for the work. Files are made of highly tempered steel and will break if abused in this manner.

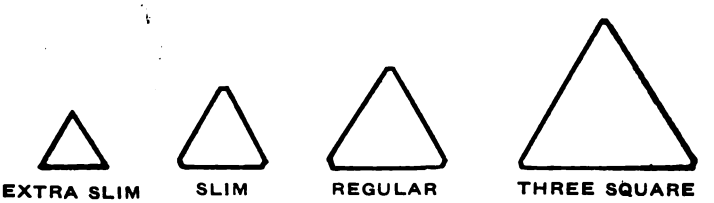


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Taper Files

Taper files are made in three different groups—regular, slim and extra slim. Each group is made in two styles, one is pointed, the other is blunt. These files are used chiefly for sharpening hand and other small saws. The corners or edges are slightly rounded and the sides and edges are single-cut. Another style of regular and slim taper file, known as the "taper band saw" file, is cut with two parallel rows of teeth on the edges. Slim taper files are rapidly gaining preference over regular taper for saw filing.





Above is shown the variation in cross section between 8-inch regular taper, slim taper and extra slim taper files. At the extreme right is a "three-square" file cross section. This file is the same as the regular taper except that it is double-cut on the sides and has sharp corners instead of rounded. It is used by machinists and tool makers.



The cabinet file, slightly tapered and double-cut, is a trifle wider and a bit thinner than regular half-round files and is used chiefly by woodworkers.

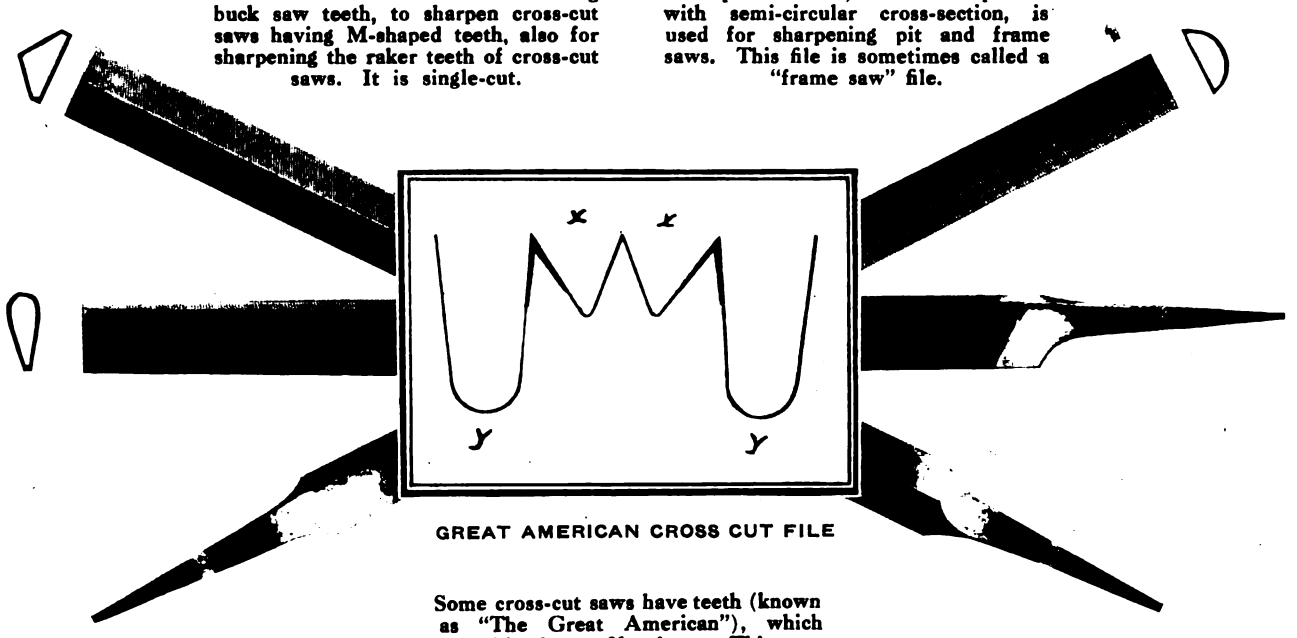
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CANT SAW FILE

The "cant saw" file is used for filing buck saw teeth, to sharpen cross-cut saws having M-shaped teeth, also for sharpening the raker teeth of cross-cut saws. It is single-cut.

PIT SAW FILE

The "pit saw" file, blunt in shape and with semi-circular cross-section, is used for sharpening pit and frame saws. This file is sometimes called a "frame saw" file.

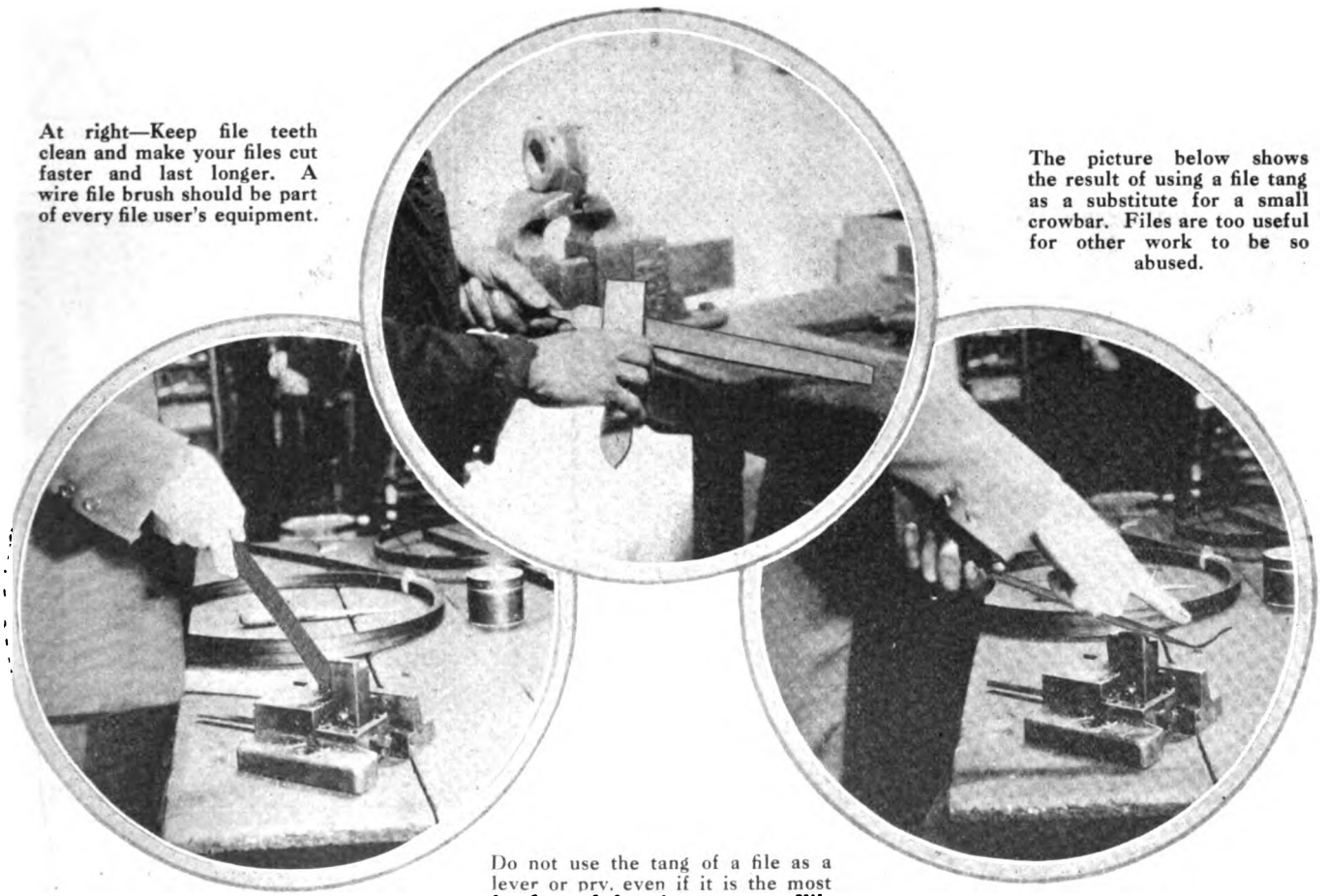


GREAT AMERICAN CROSS CUT FILE

Some cross-cut saws have teeth (known as "The Great American"), which resemble the profile above. This saw is sharpened by "The Great American" cross-cut saw file shown above. It has a rounded back for the heavy gullets and a bevel for the wedge-shaped teeth.

At right—Keep file teeth clean and make your files cut faster and last longer. A wire file brush should be part of every file user's equipment.

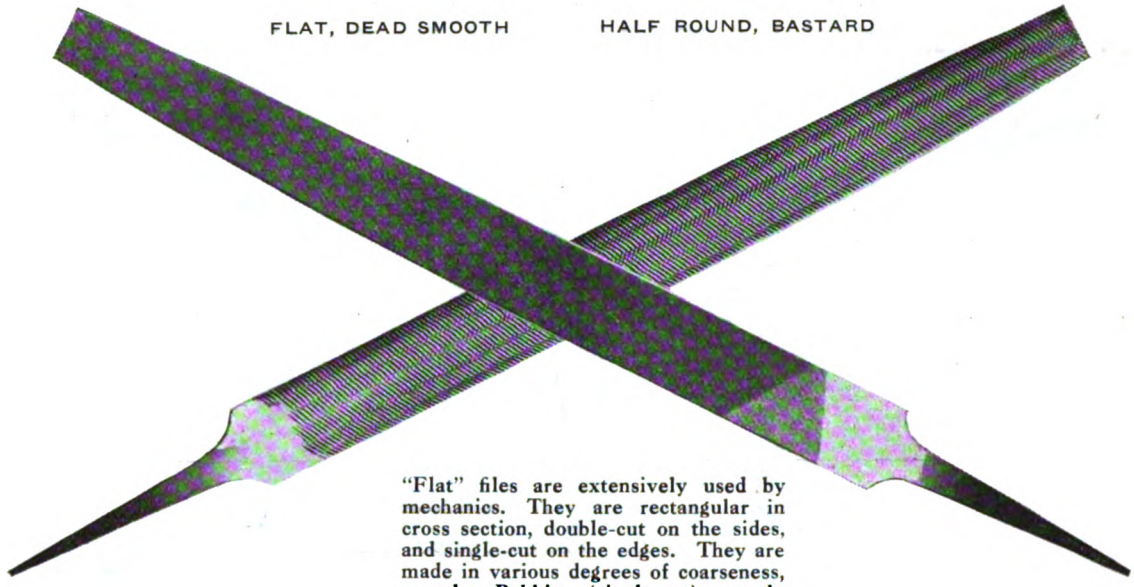
The picture below shows the result of using a file tang as a substitute for a small crowbar. Files are too useful for other work to be so abused.



Do not use the tang of a file as a lever or pry, even if it is the most handy tool for the purpose. File tangs are "drawn" soft, and will bend under such treatment.

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FLAT, DEAD SMOOTH HALF ROUND, BASTARD



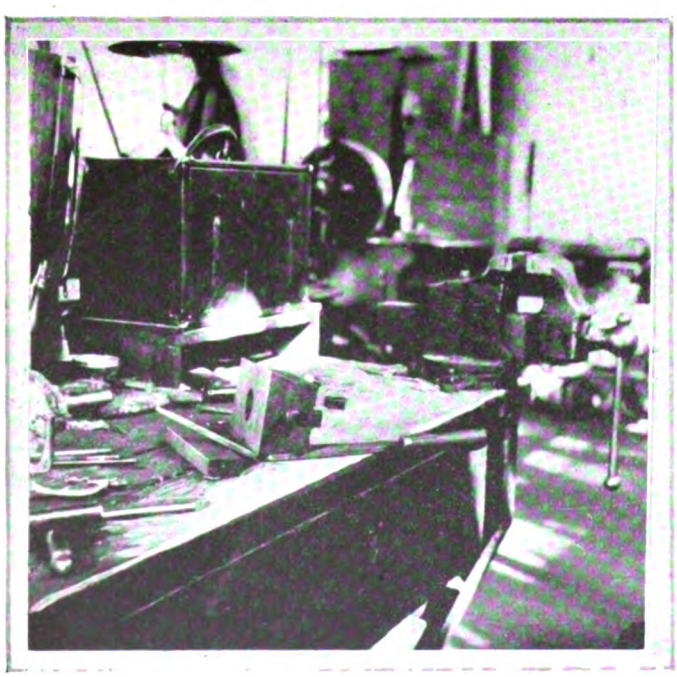
"Flat" files are extensively used by mechanics. They are rectangular in cross section, double-cut on the sides, and single-cut on the edges. They are made in various degrees of coarseness, namely, Babbitt (single-cut), rough, wood, coarse, bastard, second-cut, smooth and dead smooth.

The half-round file is also one of the most useful machine shop files. It is half-round in section, double-cut on the flat side and on the round side as well.

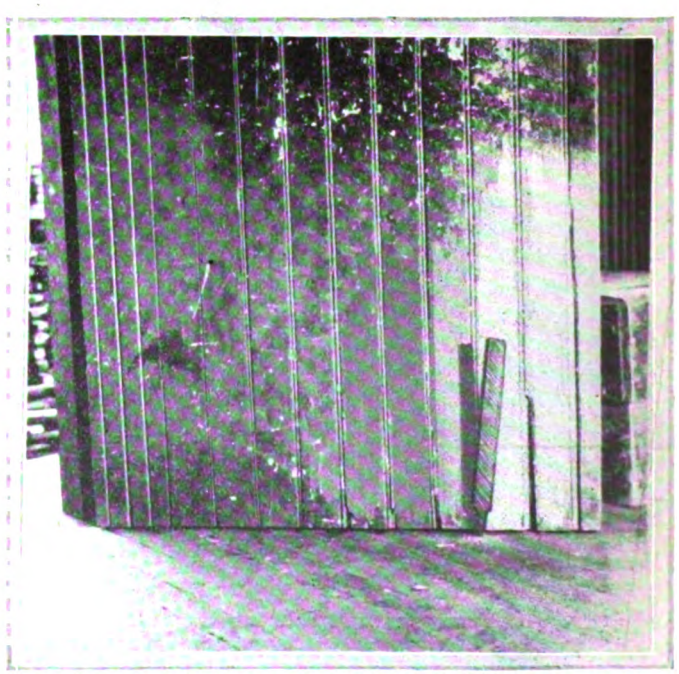
HAND, SECOND CUT



"Hand" files are usually cut with one "safe" edge (no teeth). They are tapered in thickness, but not in width. They are used mainly for finishing flat surfaces.



It is not good practice to lay a file upon a work bench, or to throw it into a drawer with other tools. A sudden impact with other tools or castings may dull the teeth or cause breakage.

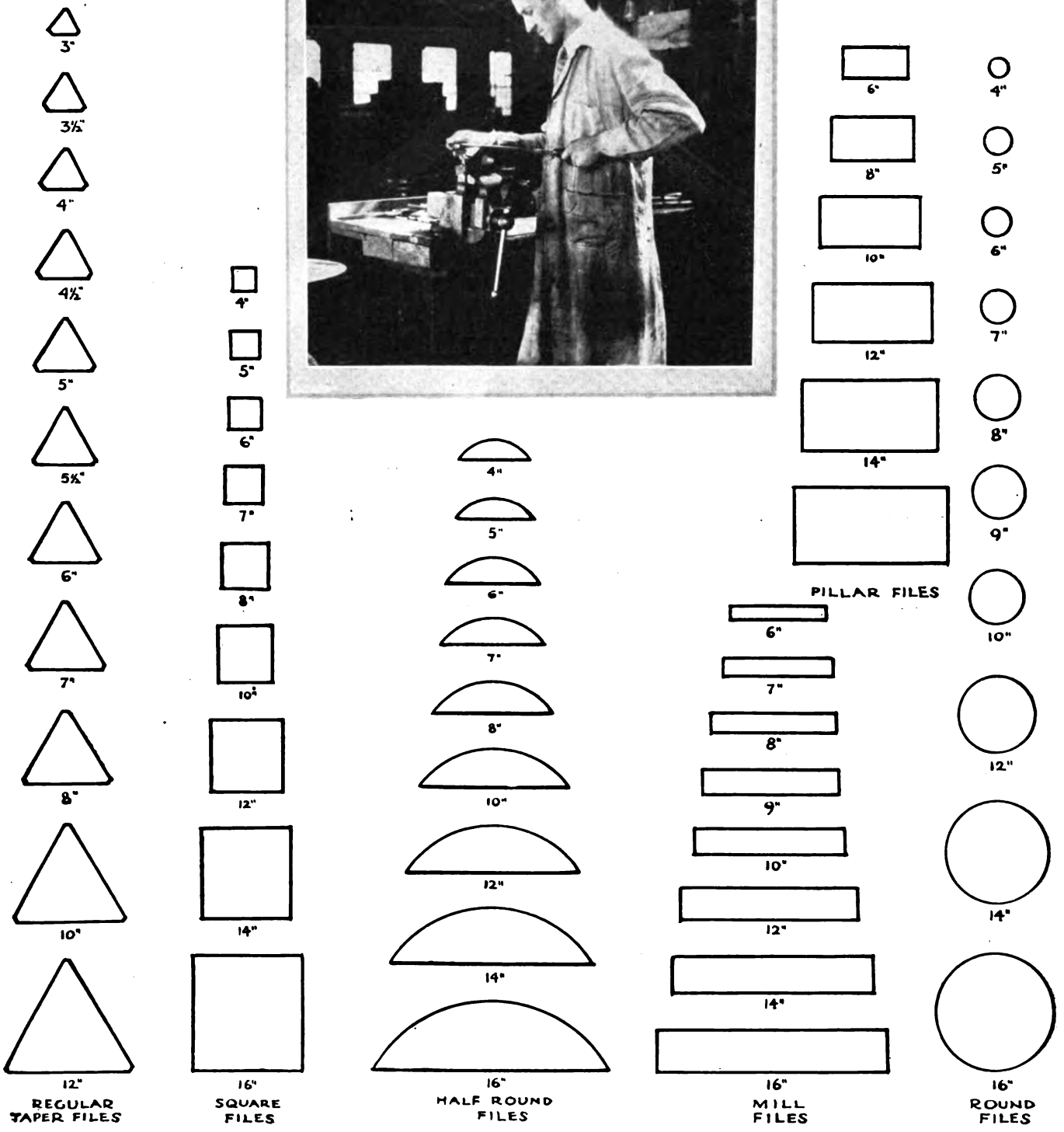


The file is one of the most widely used and highly abused tools of industry. It is not uncommon to find the sharp-pointed tang driven into the floor to hold a shop door open.

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This chart will help you choose the right size of file

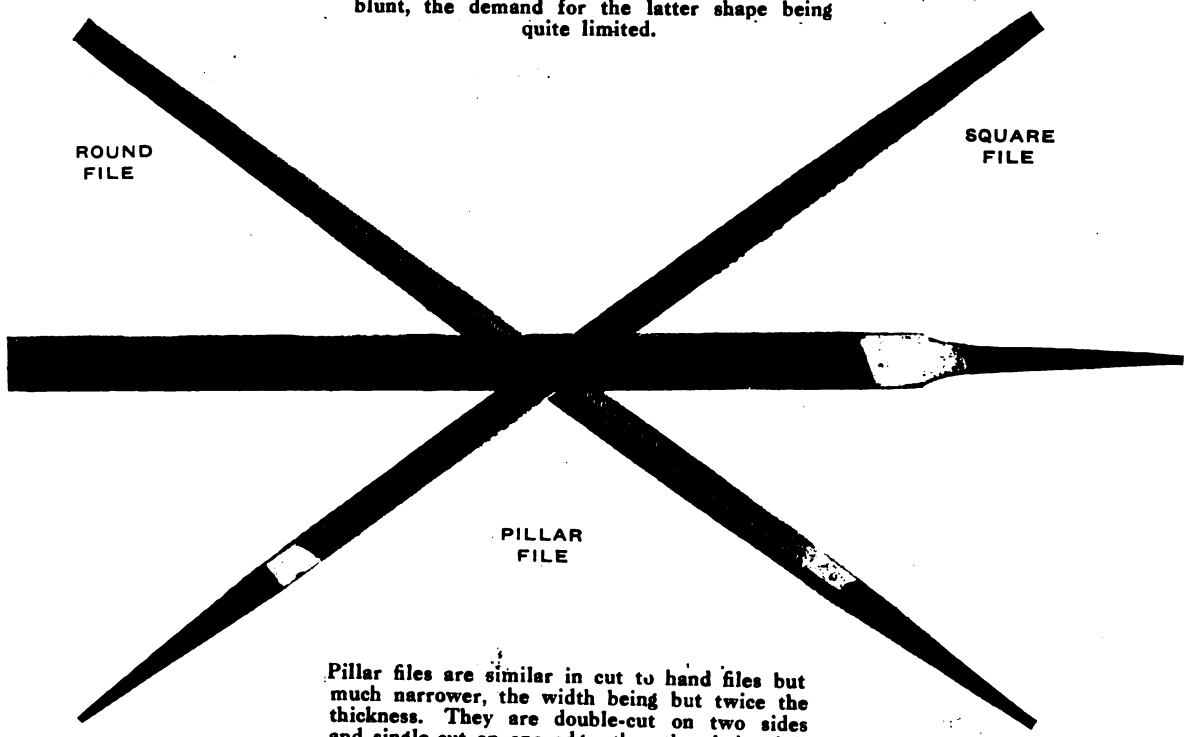




The cross sections of the various shapes of files vary according to length of file, thus a 16-inch round file is about four times the diameter of a 5-inch round file. In choosing a file, the cross section is an important factor. This chart, which gives the full size cross sections of various common shapes of files will be helpful for reference.

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Round files, known sometimes as "rat tail" files are tapered and used chiefly for enlarging holes. Square files are furnished both tapered and blunt, the demand for the latter shape being quite limited.

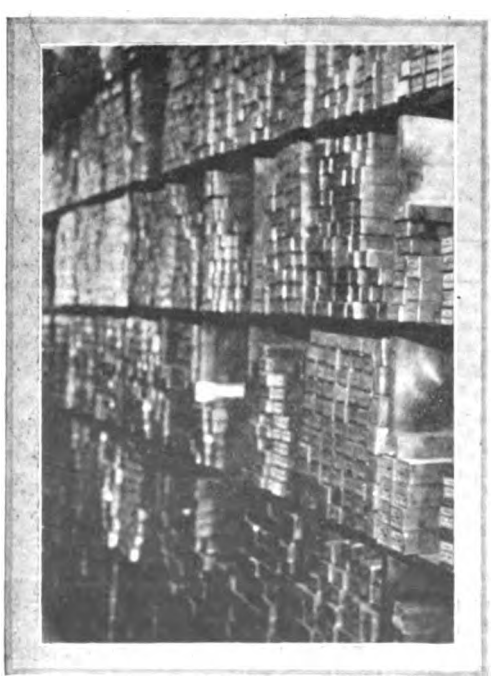


Pillar files are similar in cut to hand files but much narrower, the width being but twice the thickness. They are double-cut on two sides and single-cut on one edge, the other being left uncut or "safe." They are largely used for filing slots or keyways.



Knife files resemble in shape, a pocket knife blade. They are double-cut on both sides, single-cut on the thin edge while the back is left "safe." Used for die work, etc.

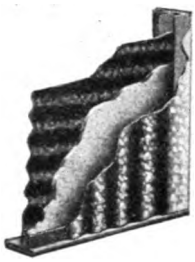
The warding file is of uniform thickness from end to end, but very thin. It is used chiefly by locksmiths for filing notches in keys, etc. It is usually double-cut.



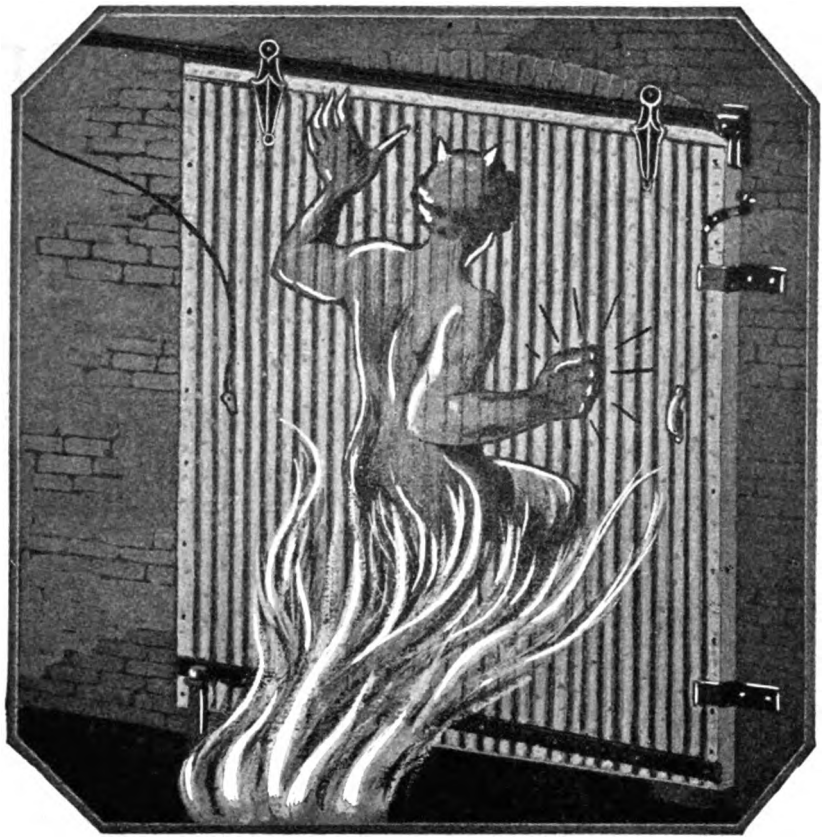
By leaving file boxes sealed, inventory is made easy. The number of boxes is counted instead of the individual files. Broken boxes are indicated by putting the cover of the box on the bottom instead of the top of the box.



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Cross section of R-W corrugated FyeR-Wall Doors —cost less than tin clad doors— guaranteed for 25 years.





R-W Fusible Links are made to fuse at any degree of temperature. Keep a supply on hand for emergencies.

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Cost Reduction by Efficient Routing

A Visit to the Kelly Press Divison of the American Type Founders Company, at El Mora Station, Elizabeth, New Jersey.

By Roy A. Dowd

MY first impression as I entered the shop was that there seemed to be plenty of room everywhere and there was no crowding of machines, men or work in process. The aisle spaces all through the shop are wide and clearly defined by white lines on the floors. All material in process or ready for movement is always so placed that the aisles are clear for transportation. Electric cranes are conveniently disposed for lifting and carrying and electric trucks make the handling of tote boxes or materials very easy.

The shop is very long and the arrangements when completed will be such that the rough material will come in at one end of the factory and go out when finished and assembled at the other. Castings are sand-blasted, snagged, cleaned, painted by dipping in a tank, and then baked or dried before machining. The dipping process saves much laborious hand painting and protects the castings from rusting while in process. Final painting is done at or just prior to assembling.

A very important detail in the arrangement of things in this factory is the grouping of work into two major classifications, viz.: (1) Round work, and (2) Flat work. Anything requiring turning, boring and facing operations is classed as "round work"; while that which is machined by planing, milling and drilling is classed as "flat work." These two classes



Fig. 1. General view of Kelly Press Division of American Type Founders Company at El Mora Station, Elizabeth, N. J. Above—large detail showing Colonial effect at front entrance.

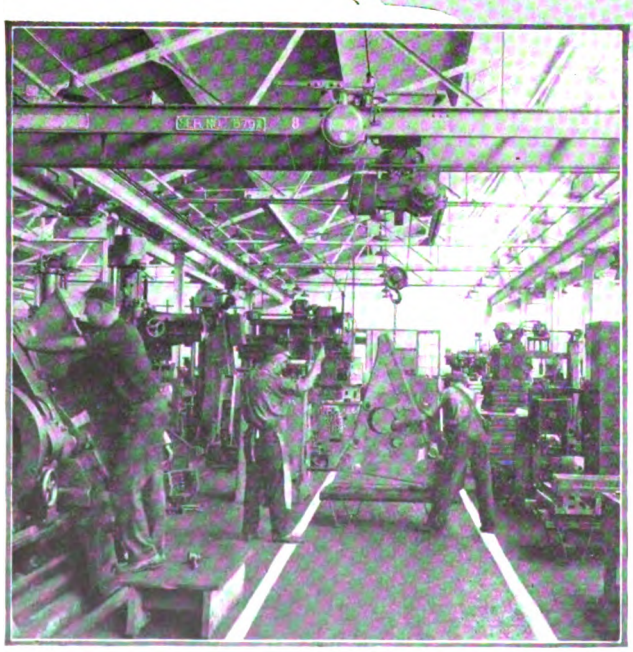


Fig. 2. Characteristic view of part of flat work department. Note that all work here is of such a nature that it requires planing, milling or drilling operations. There is no round work in evidence. Light electric cranes assist in the handling of heavy pieces. Aisle spaces are broad and outlined with white paint.

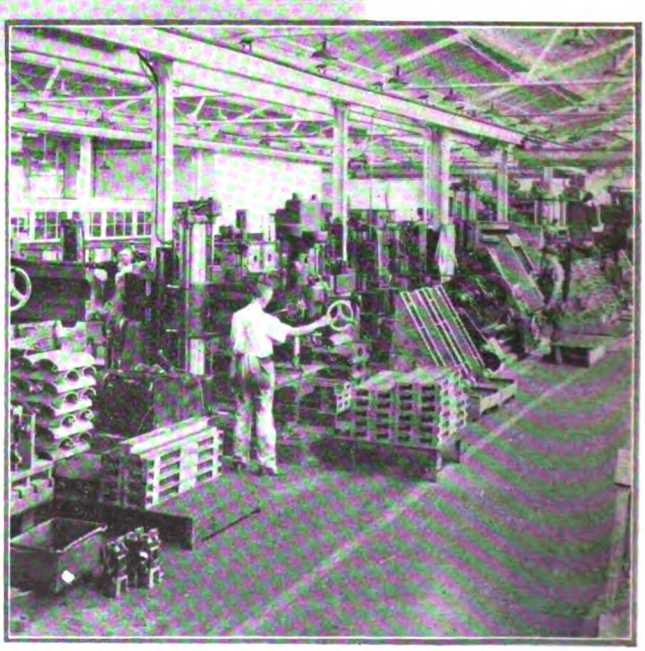


Fig. 3. Characteristic view of work and machines in flat work department. Note the well lighted interior, orderly arrangement of work and machines and ample room for work in process.

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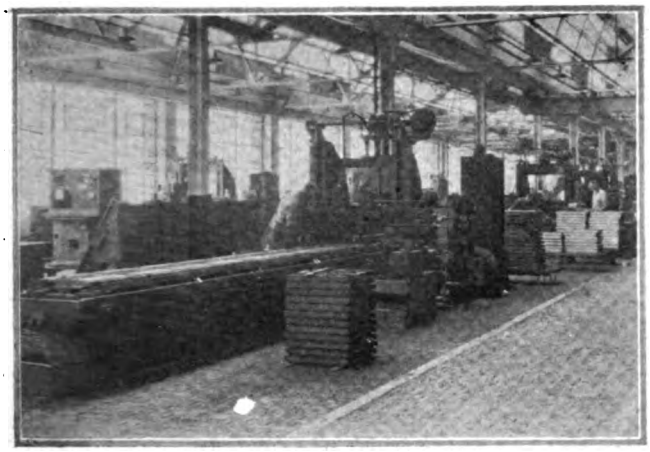


Fig. 4. Long planers used for flat work where accuracy of machined surfaces is essential. A large number of pieces are held at the same time with special arrangements on the table.

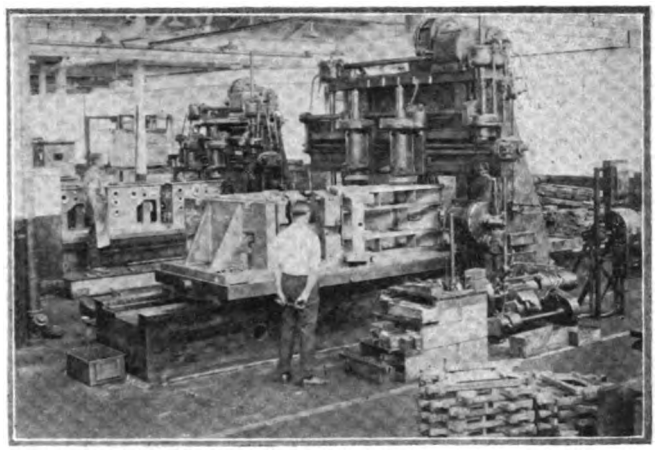


Fig. 5. Multiple cutting applications on large castings in flat work department. Several cutters working at the same time and several pieces set up on the table to minimize the time consumed in setting and removing work.

of work are handled on separate floors and the machine arrangements are such as to facilitate the progress without "doubling back" and thus losing time in extra handling. Tote boxes are purposely very heavy and made up with angle iron frames so that they cannot be moved except by means of a truck. When once placed in a certain position they remain there until ready to be shifted to another position. This scheme prevents cluttering up the aisle spaces by careless workmen.

In machining the flat work, surface grinders, planers and multiple head milling machines are used. There is also an excellent battery of duplex milling machines which machine both sides of quite a number of castings at the same time.

For the preliminary cutting off operations on bar stock, either flat or round, a continuous band saw type of cutting off machine is used and one man does it all for the entire shop. He is a specialist in his line and keeps his equipment in apple pie order. So also in centering round work, one man does it all and does it well, since he also is a specialist. Such details count in maintaining production.

The use of reamers for sizing holes is discontinued to a great extent, for it has proven more economical to grind the holes on an automatic sizing grinder. In addition to these machines there are others of similar construction which grind the outside of bushings or other work to an exact size automatically. Both these machines are very rapid in operation and the sizing feature lessens the losses often occasioned by faulty workmanship in the usual turning or

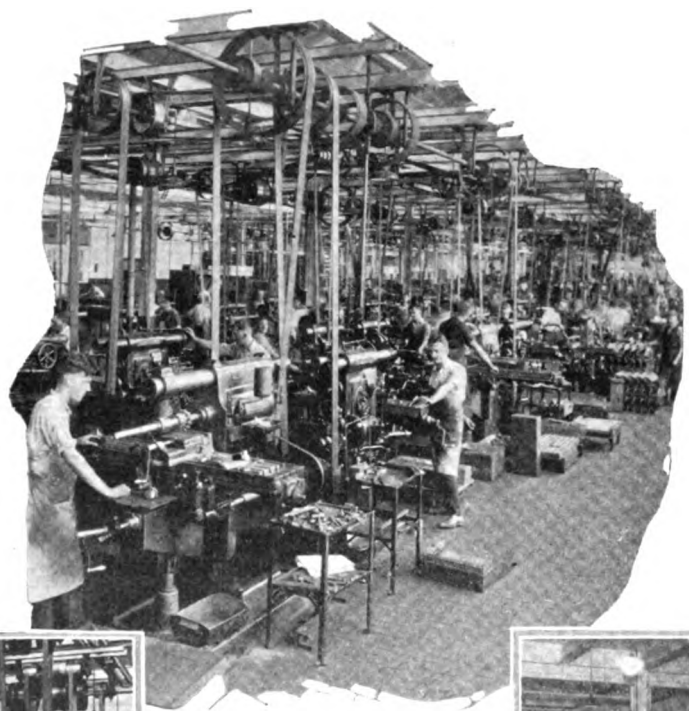


Fig. 6. Milling department for flat work of comparatively small size. Note ample space around machines for piling work in process.



Fig. 7. A battery of duplex milling machines used in surfacing both sides of the castings at the same time.



Fig. 8. Round work—straightening department. This work is all done in one place for the whole factory. After bars are cut off to length, they are straightened before any other operations.

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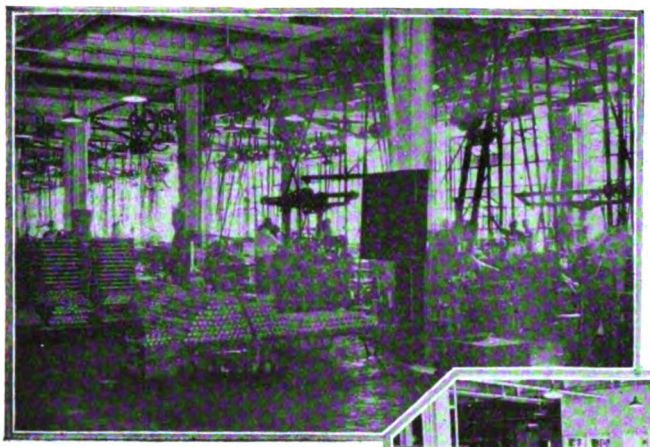


Fig. 9. Round work and nothing else. An examination of this photograph will show nothing but bars of round stock piled here and there convenient for the machine operators. There is no flat work anywhere in sight.

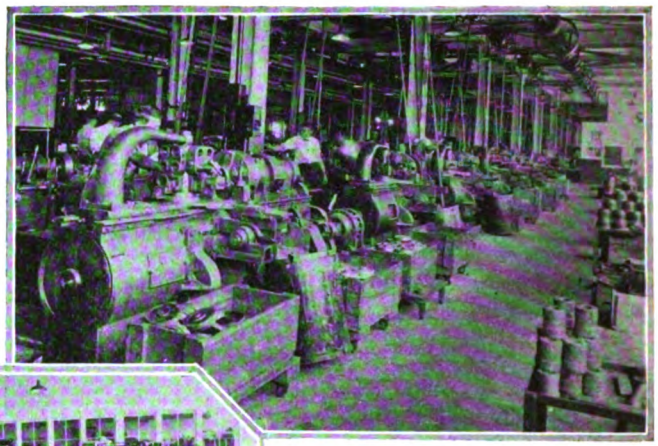


Fig. 10. Round work again in the chucking department. Semi-automatic machines are used for turning, boring and facing castings or forgings. One operator attends to several machines.



Fig. 11. Nothing but round work here. Castings which require turning and boring operations. This is a corner of the factory having a battery of vertical turret lathes used for chucking work.

reaming operations.

Inspection departments are conveniently placed here and there as needed and work after inspection is tagged or placed in boxes of different colors.

(a) Green box: Perfect work.

(B) Red box: Defective material.

(C) Blue box: Imperfect work—poor workmanship.

Tags of corresponding colors are also used in the same manner, so that to one familiar with their meaning, there is never any doubt as to the quality of the work in a certain box; if defective, the reason for the defect is plainly to be seen.

In assembling, the necessary parts are drawn from stock and units are assembled in several sections of the shop depending upon their final destination. After this comes the final assembling and testing, upon the completion of which machines are boxed for shipment.

A definite impression of high efficiency remains in one's mind after noting the forethought used in all of the handling and machining methods in this factory. There is no confusion, no rubbish piles offend the eye, everything is well lighted, clean and orderly. A pile of castings is machined at one place, goes to another machine, perhaps several others, until finally it reaches its particular place in the stockroom, where it remains until wanted. Then after leaving the stockroom to become a part of an assembled machine, it follows a straight path until finally with other units it is boxed for final shipment.

A casual glance at the exterior view of this factory (Fig. 1) gives the impression rather of a building on some university campus, than of an industrial plant. It is another example of a growing trend toward reconciling utility with beauty. There is no reason why the exterior of a modern factory should be an eyesore on the landscape. Modern management has learned to appreciate this fact, just as it has learned the value of good light, cleanliness, order, and good working conditions.

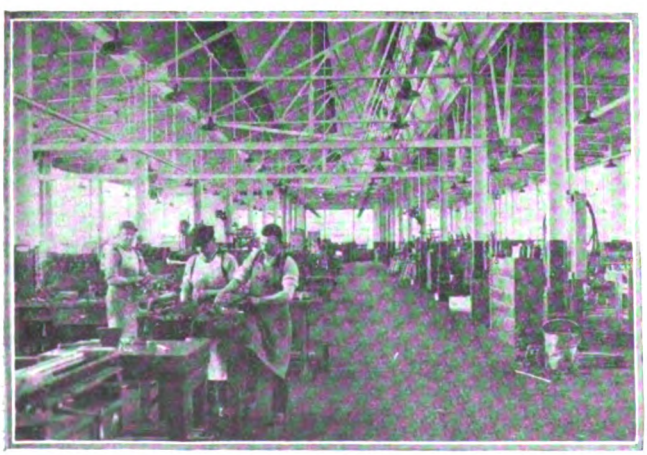


Fig. 12. Unit assembling. Here again we are impressed with the excellent light and plenty of room. Clearances for electric trucking are ample and units of various kinds are assembled at the benches shown.

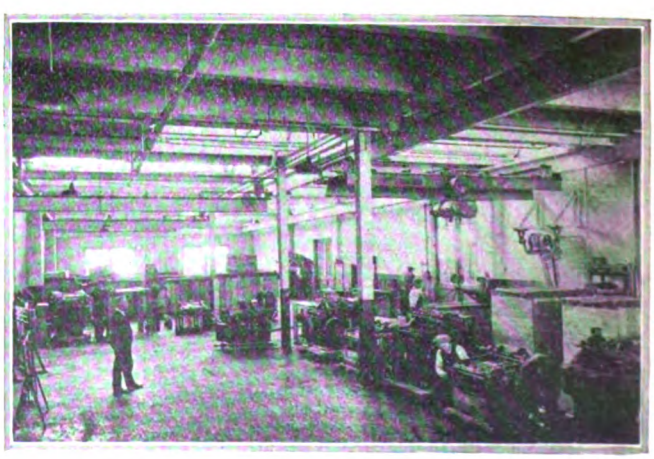
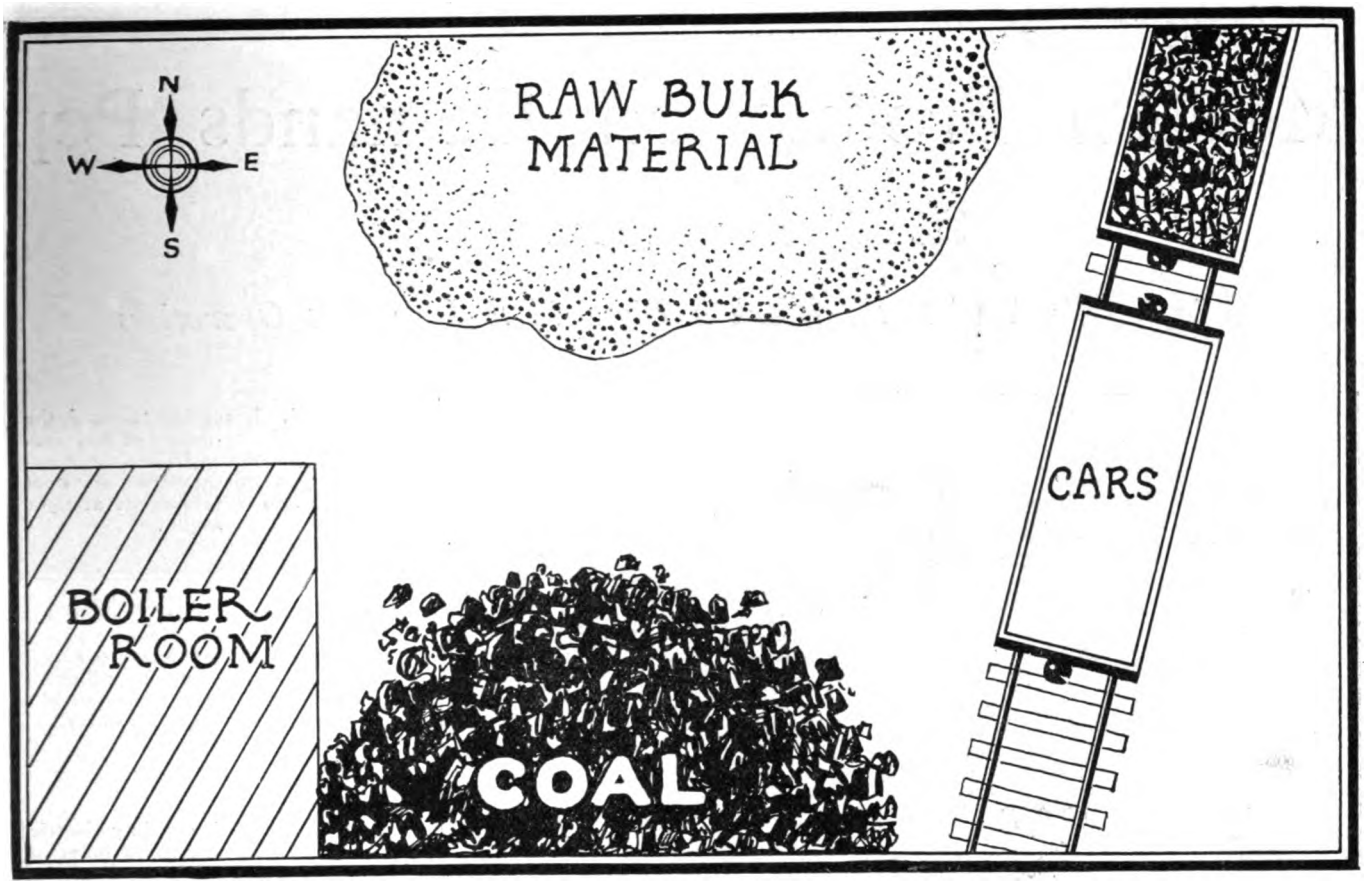


Fig. 13. Getting ready for shipment. After the final inspection machines are boxed, ready for shipment. The electric cranes pick up the boxes and carry them to the shipping platforms.

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Out Where the Costs Begin

IN the excitement of cutting labor costs inside the plant, the same kind of costs are easily and often overlooked in the yard outside.

Often, with present day manufacturing efficiency, more hand labor can be eliminated outside of the plant than can be eliminated inside.

To appreciate the importance of yard costs, watch your yard gang file by the paymaster's window.

With Barber-Greenes this indirect labor cost is cut and the savings are passed on just as they are when a cut is effected in the actual manufacturing process.

So, if you're interested in cutting production costs, turn to your yard.

Barber-Greene handling, loading and conveying units can be installed to fit your requirements exactly.

And they can be expanded or rearranged to meet the changing conditions easily, quickly, cheaply. They handle coal, coke, sand, gravel or practically any bulk material from car to storage, storage to boiler room or plant, or from storage to trucks.

The investment involved is small. The overhead introduced is practically negligible. Operating costs are low.

As a result Barber-Greenes can be used on short time work, for a few hours per day, at a profit.

This coupon will bring you Mr. Barber's famous *Scrapbook* with its complete information on what other plants have done to their yard costs with Barber-Greene Belt Conveyors, Bucket Loaders, and Car Unloaders.

Why not cut costs out where the costs begin? Send the coupon today.

One company reports in Mr. Barber's Scrapbook that a single Barber-Greene Permanent Conveyor cut the cost of handling coke and limestone from 75c to 16c per ton. When such savings can be so easily effected, without heavy investments or overheads, investigation is surely warranted.

For Mr. Barber's Scrapbook mail this coupon to The Barber-Greene Company, 500 W. Park Ave., Aurora, Ill.

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Modern Production Demands Pep and Portability

Bringing the Tool to the Work a Big Aid to Low Cost Operations

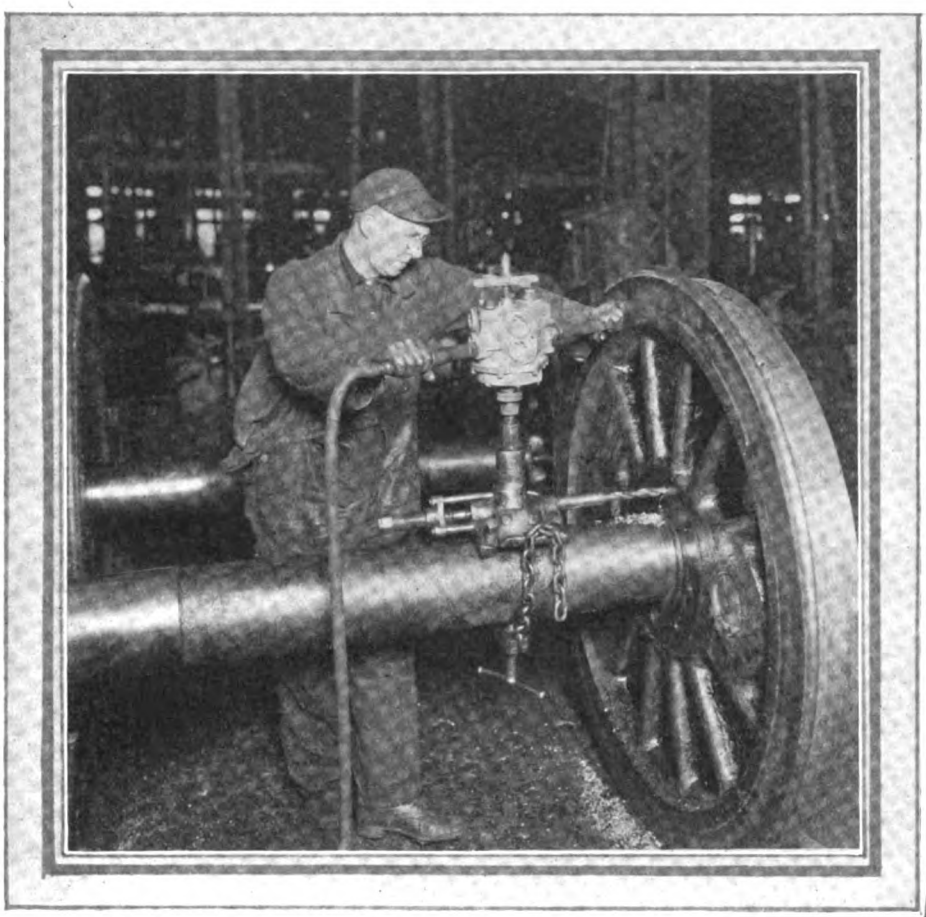


Fig. 1. It reaches "around the corner." By means of this special geared attachment, the operator of this portable air drill gets into close quarters at right angles.

Fig. 2. This heavy duty electric drill is busy at reaming holes in a large steel plate. Portable tools are particularly useful where work is bulky or hard to move.



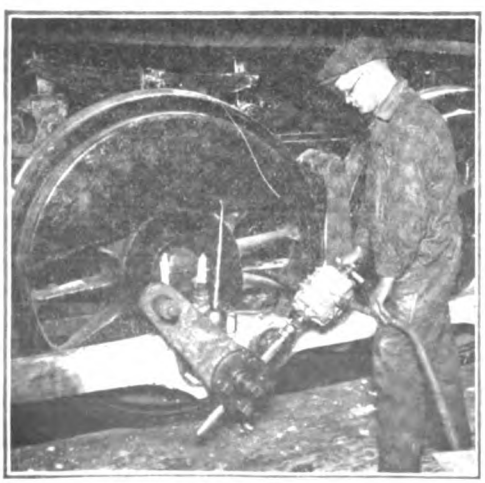


Fig. 3. The principle of bringing the tool to the work is well illustrated here. The operator is reaming the eccentric crank bolt holes on a locomotive repair job.

Fig. 4. Portable drills have many uses, limited only by the resourcefulness of the user. This electric drill, with wire brush attached, is cleaning ingot molds.



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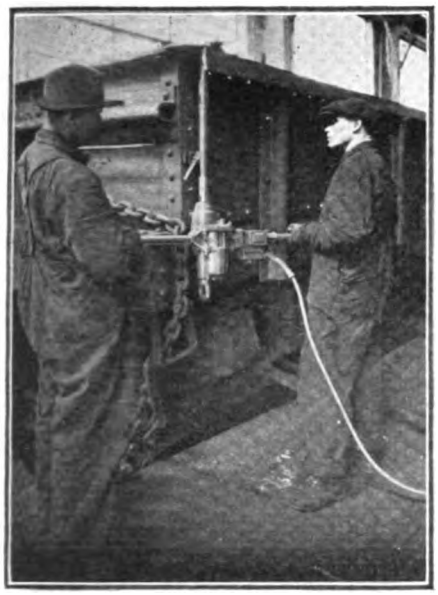


Fig. 5. Upside down, or right side up—it makes no difference to the portable drill. The portability and flexibility of these tools make them sources of profit making on many jobs.



Fig. 6. For "snagging" and cleaning castings, portable tools have many uses. This shows a corner of the White Motor Company's cleaning shed, with portable grinders being applied.



Fig. 7. Portable tools are very much at home in the auto industry. They are applied to production work on many operations. Here an air drill is being used to drive bolts home.

Fig. 8. This light high speed drill is being used to put the "tell tale" holes in boiler stay bolts. Only a portable drill could do this job properly.

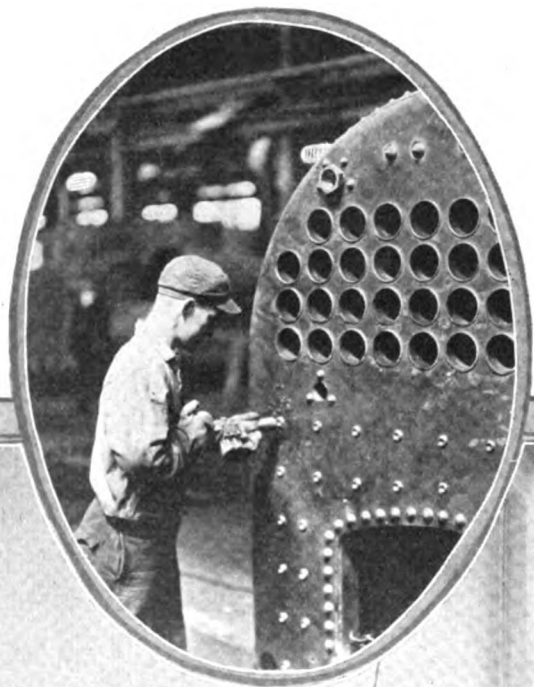
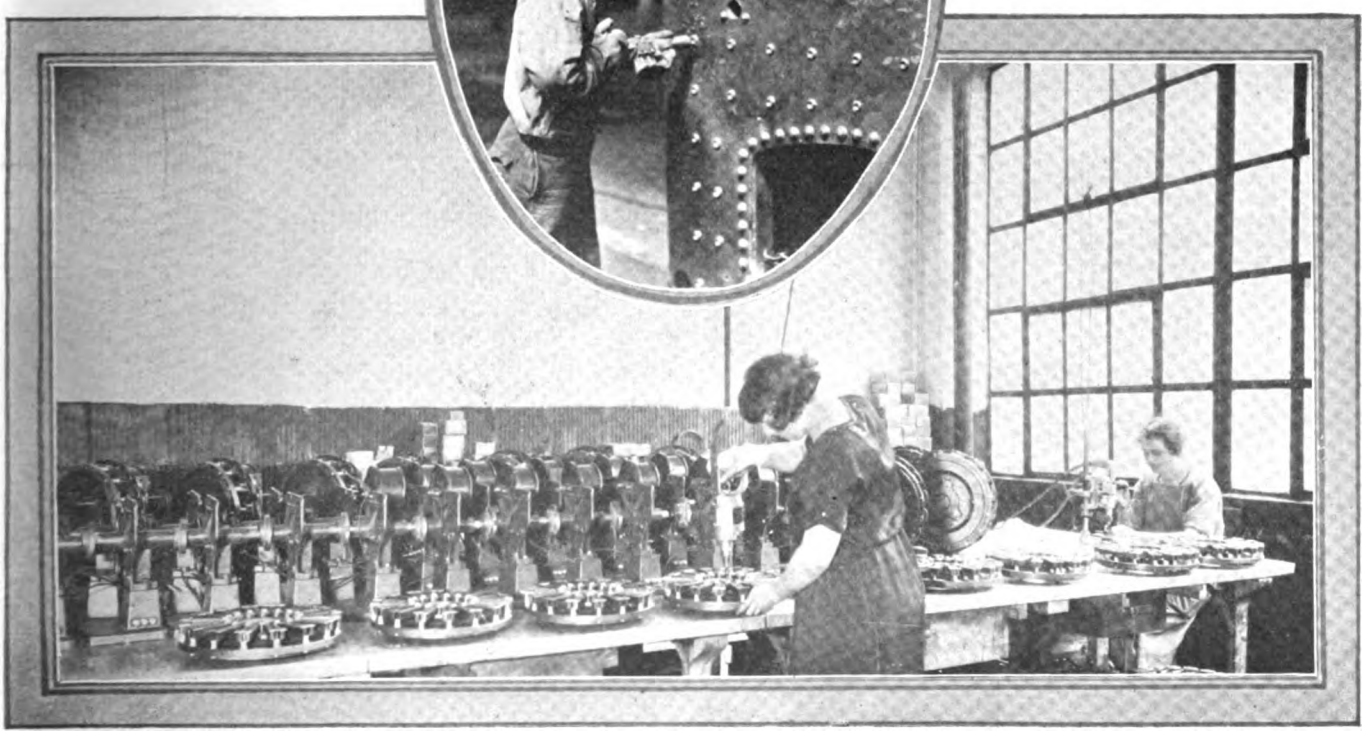


Fig. 9. Electric drills are part of this typical Ford assembly line. One of them is used as a drill, the other as a screw driver in this magneto assembly job.



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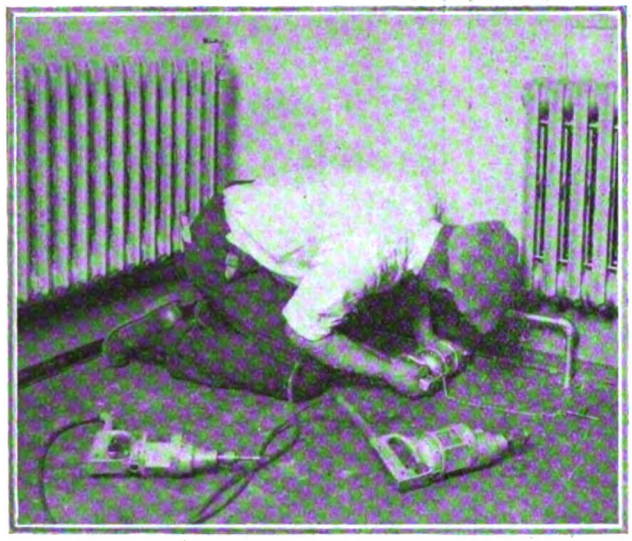


Fig. 10. This sheet metal worker finds it profitable to make use of three portable drills at once and thus save changing tools. The drill, screw driver and tapper are used in rotation.

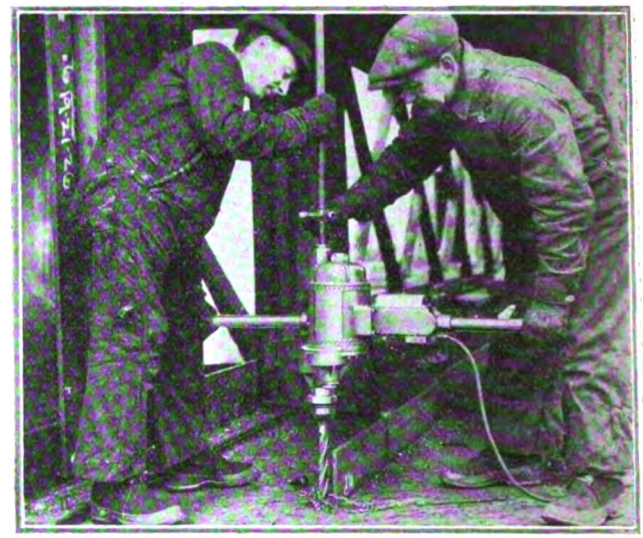


Fig. 11. The job of the structural iron worker is aided at many points by the portable tool. This one has drilled many thousands of rivet holes in one of the world's great bridges.

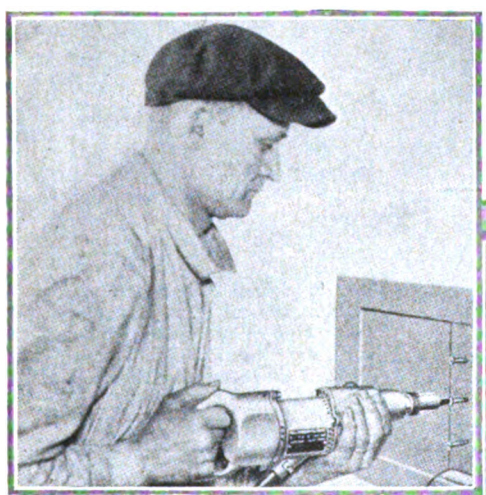


Fig. 12 Driving wood screws by hand is not fast enough to fall in line with modern production ideas. Hence this electric drill is utilized as a rapid fire screw driver.

Fig. 13. Below is another adaptation of a portable drill as a screw driver. In this case a small stand and lever convert the tool into a bench screw driving machine.



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Fig. 14. Autos and auto repairs would cost considerably more were it not for the high speed portable drill. It gets into close quarters and odd corners readily.

Fig. 15. Such jobs as this would be hard to do any other way. But with the portable drill the fitting of door handles becomes quick, easy and inexpensive.





Fig. 16. Inside as well as outside of the car, the portable drill finds a ready sphere of service. It is being used here to install a dashlight, as well as the other panel instruments.

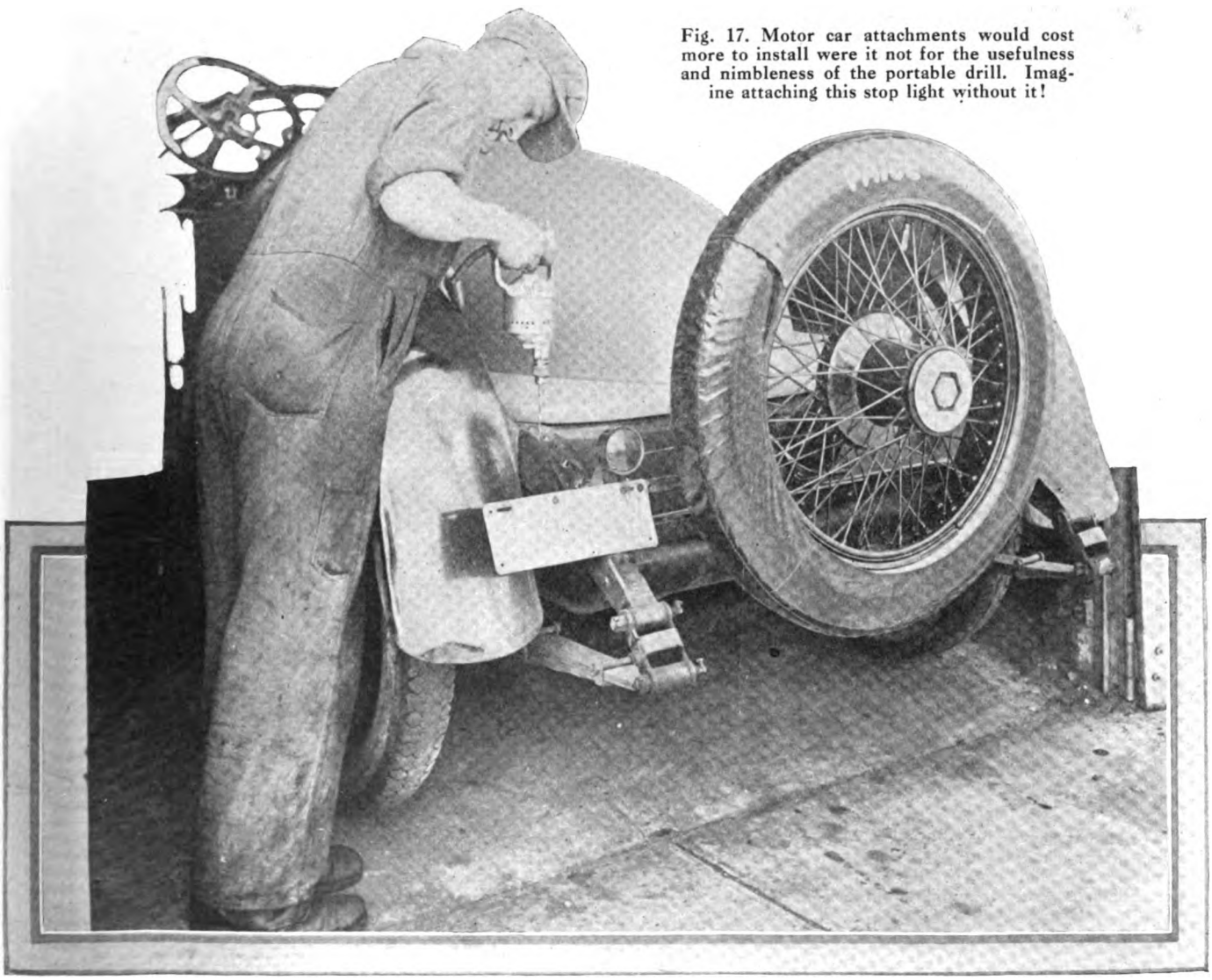


Fig. 17. Motor car attachments would cost more to install were it not for the usefulness and nimbleness of the portable drill. Imagine attaching this stop light without it!

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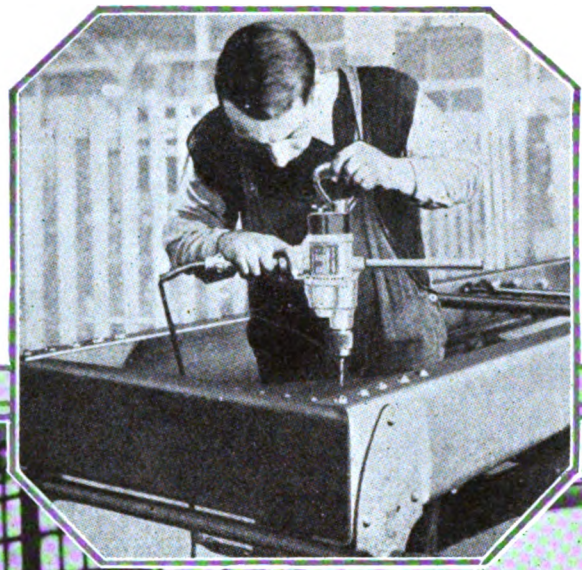


Fig. 18. For maintenance drilling, as well as for production purposes, the portable drill has become an indispensable tool. Here it is being used on a truck chassis.

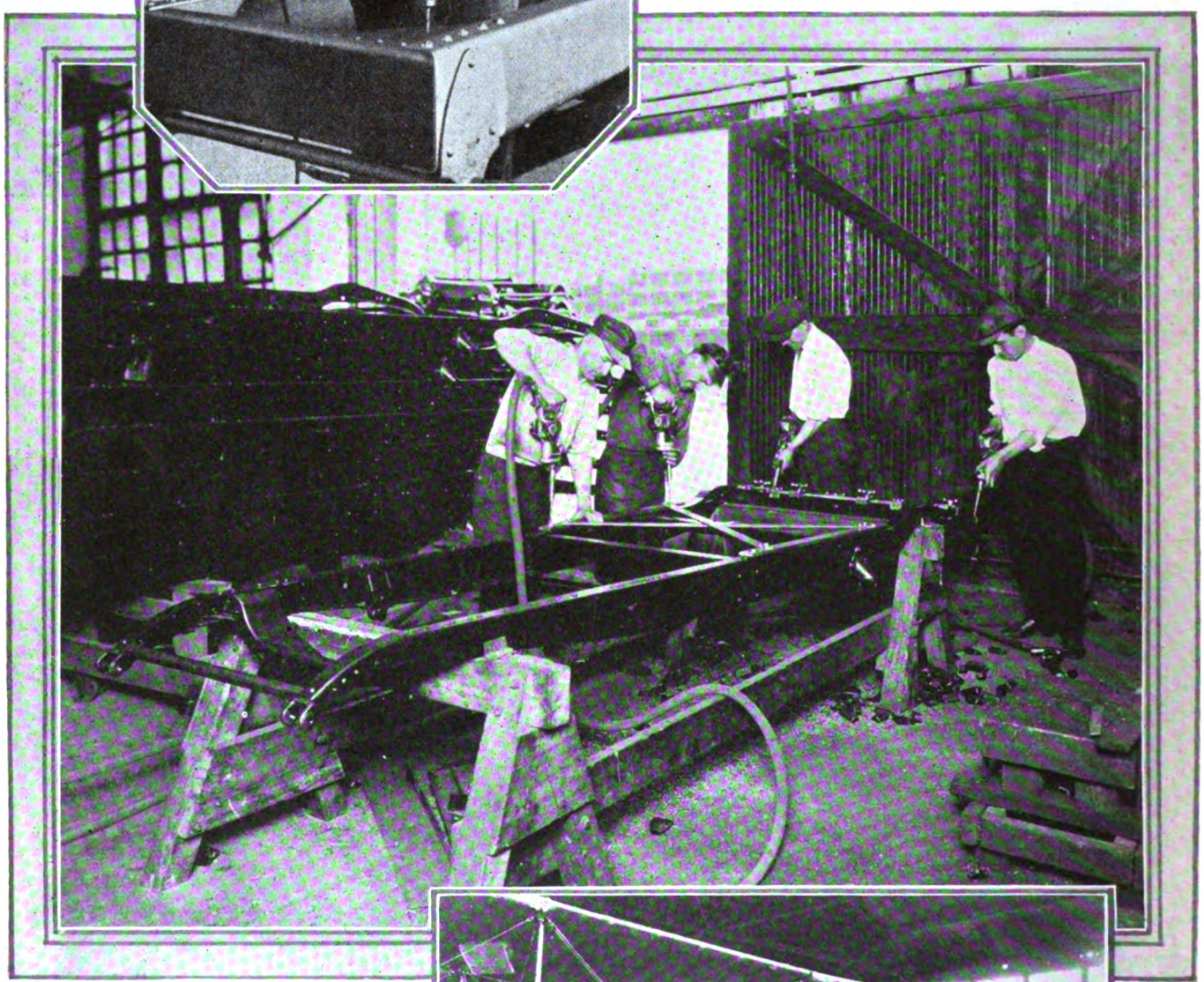


Fig. 19. It would be quite a job to take these Chrysler chassis frames to a drill press and manipulate them for drilling. So instead they bring portable tools and the job is done in a jiffy.

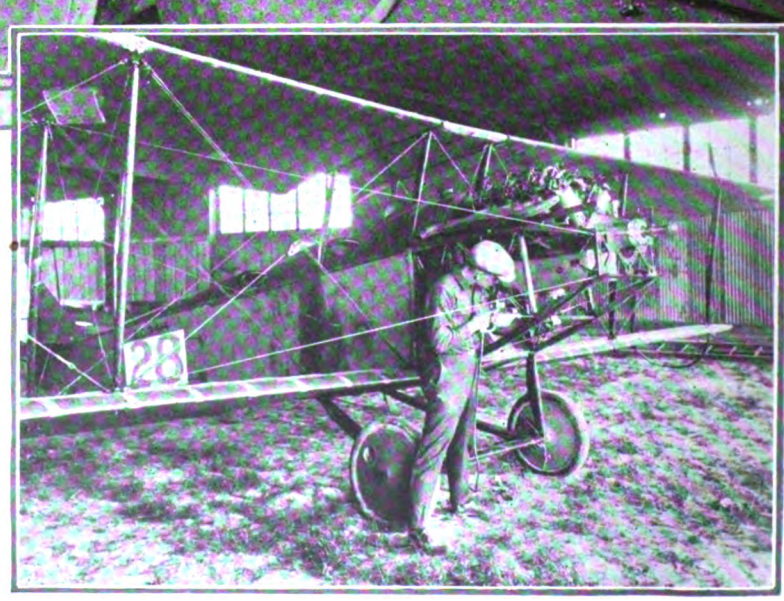


Fig. 20. Some say that in a few years the flying machine will be as common as the motor car. At any rate it will find the portable drill ready to aid in both construction and service.

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That the cost of re-winding burned out motors is reduced 70%, to say nothing of the increased production due to the motor's being on the job more of the time.

Since these motors need attention only at nine-month intervals, the cost of lubricating and inspecting is cut about 82%. Add to this a saving of 80% of the cost of new bearings and 88% of the expense of installing them. The saving in lubricant itself is still another item.

In their opinion, this experience warrants equipping the whole factory with ball bearing motors as rapidly as possible.

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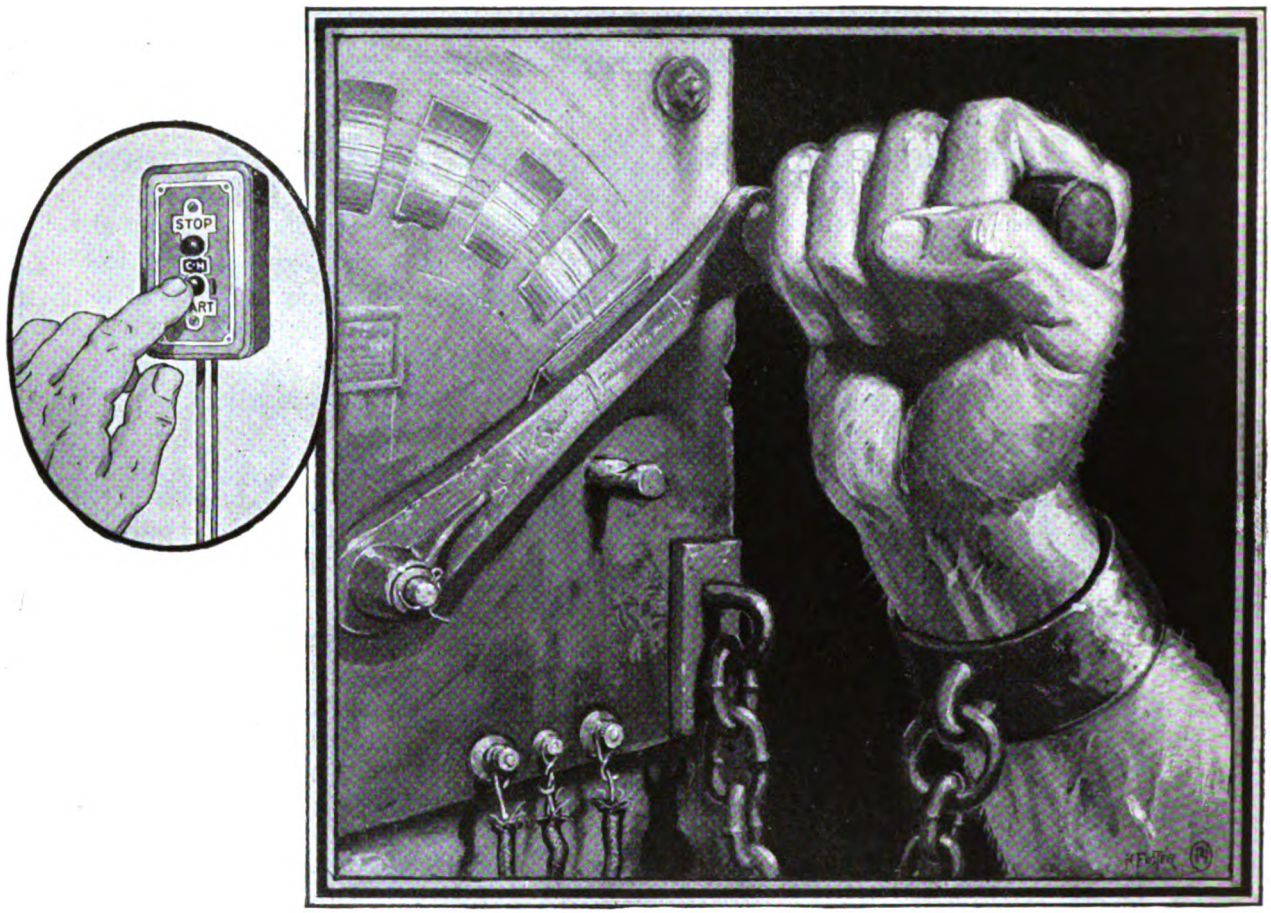
Detroit Chicago



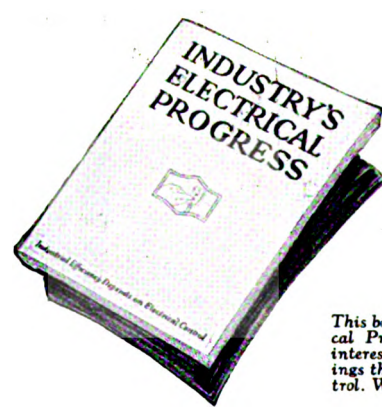
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Industry cannot afford this penalty!

Obsolete motor control takes a staggering toll from many so-called modern plants

ARE labor costs high?

Decidedly so in the plants where labor is shackled to obsolete equipment! It is an overwhelming handicap in the face of competitive conditions today.

This is especially true in the case of motor control equipment. For modern motor control saves where saving counts the most—in the wasted time of labor. And labor cost in practically every industry is usually the major item of manufacturing expense.

Too, it has been easy for plants to fall behind the progress made in the perfection of motor control. Paralleling the increased use of electric power in industry, this progress has been swift and tremendous. Since 1905 the electricity used for industrial power has increased 3000%. In the last ten years alone, it has multiplied by six.

Has industry's electrical progress left your plant behind?

Cutler-Hammer engineers have steadily kept motor control equipment abreast of industry's demands. And each new application—each new problem solved has proved a step nearer maximum economy in production.

Industrial executives today realize that it is high time to determine where their equipment stands in this race for lowest costs. The use of motors is practically universal in industry. Their advantage now lies in the labor saving obtained through their proper control.

Someone in your plant *must* investigate! To add to profits now through economies in production gives any plant an advantage in competition. To wait only postpones progress.

Call in the Cutler-Hammer field engineers! They will gladly counsel with your plant men or consulting engineers in making a survey of your motors to point out places where modern control will reduce costs. Their recommendations are based on control experience as old as motors themselves.

Demand the C-H trademark on the equipment you buy in which motor control is incorporated as an integral part. In the planning of any new drives, remember that motors by themselves are only brute force. The savings they produce depend on the effectiveness of their control.

The CUTLER-HAMMER Mfg. Co.
Pioneer Manufacturers of Electric Control Apparatus
1242 St. Paul Ave.
MILWAUKEE, WIS.

HAMMER

Depends on Electrical Control

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Some High Lights on Threading Operations

By F. S. Browning

Greenfield Tap and Die Corporation

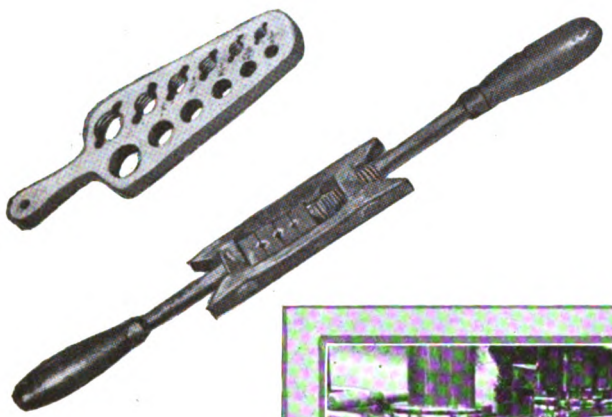


Fig. 1. It is quite a step, from the old fashioned screw plates such as are shown above, to the modern, highly specialized dies and threading machines which have helped to make high speed production a reality.

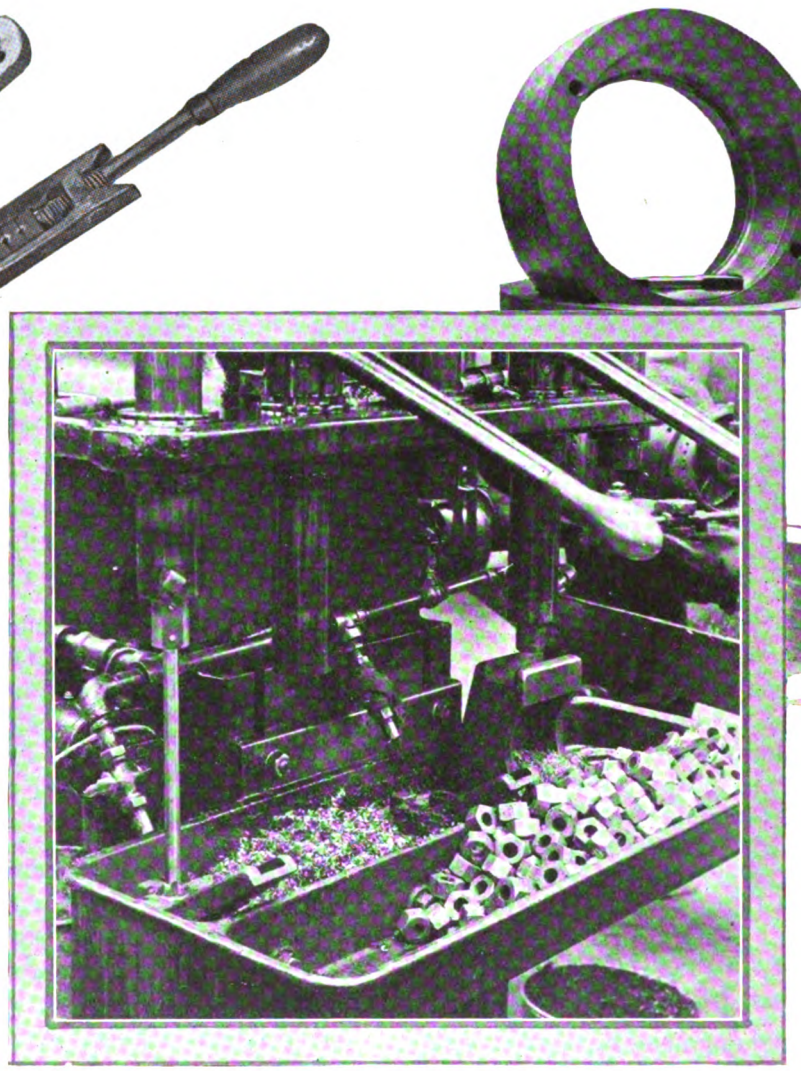


Fig. 3. A tapping machine, in which nuts are fed to the tap until the shank becomes filled with threaded nuts. The tap is then removed, cleared, and returned to the machine for another load.

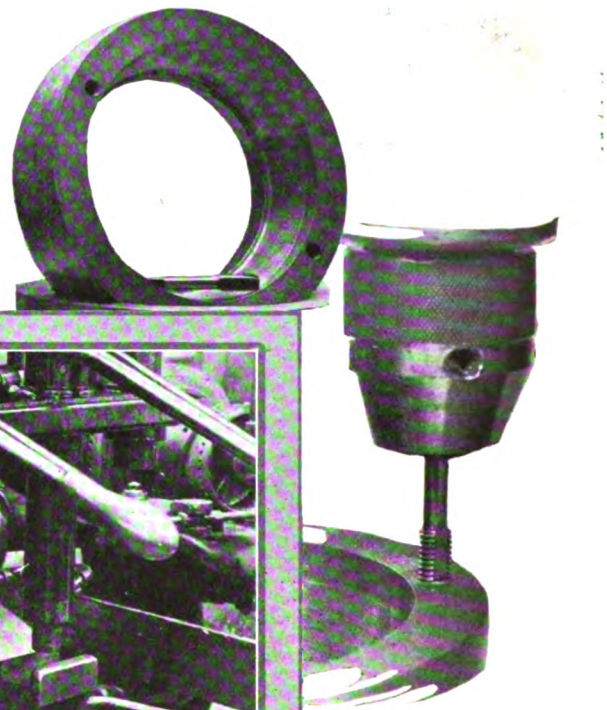


Fig. 2. Above — This cam ring has two tapped holes which, formerly, required a 3 tap serial set and cost 3 cents a hole to tap. With a single gun tap, the cost is ½ cent a hole, and production is increased 500%.



Fig. 4. Correct method of mounting a tap for threading a forging. The latter is rigidly held, and the tap is held in a reversible chuck with plenty of float that will allow it to find the center.

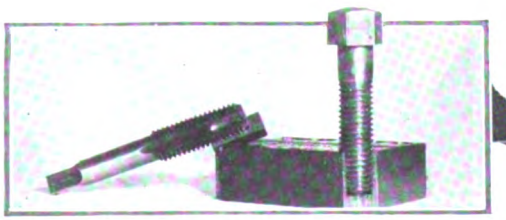


Fig. 5. Note the extra grinding at the point of this tap; which permits chips to curl up and escape in the flute, when tapping to the bottom of a hole.

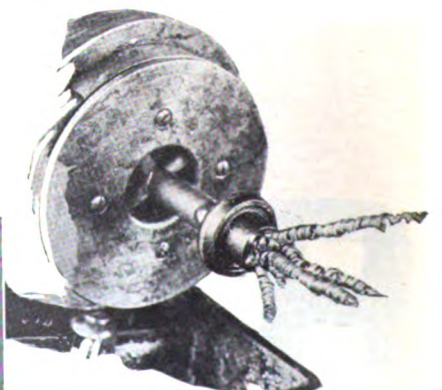


Fig. 6. This shows the chips thrown forward by a gun tap, in threading forgings which are held in a vise on the threading machine.

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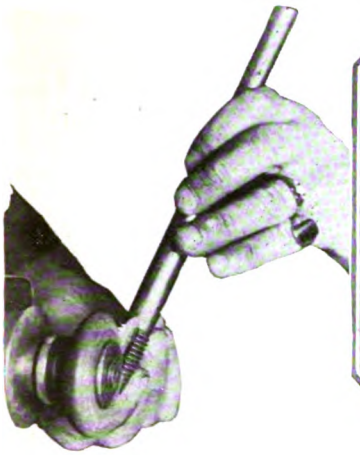


Fig. 7. Above — This illustrates the proper way to hold a gun tap for grinding and sharpening the gun flute by means of a rounded wheel.

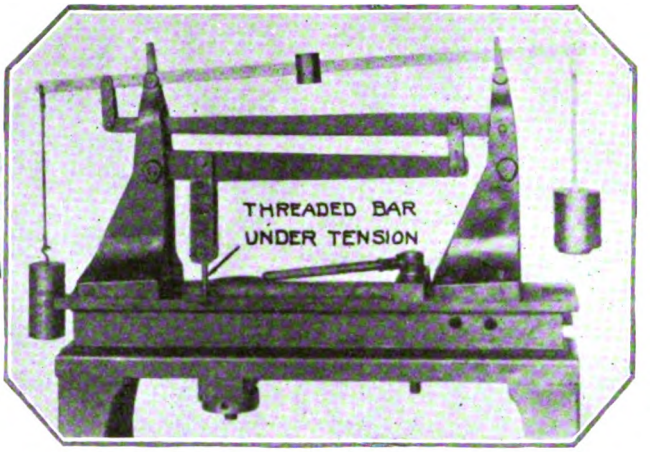
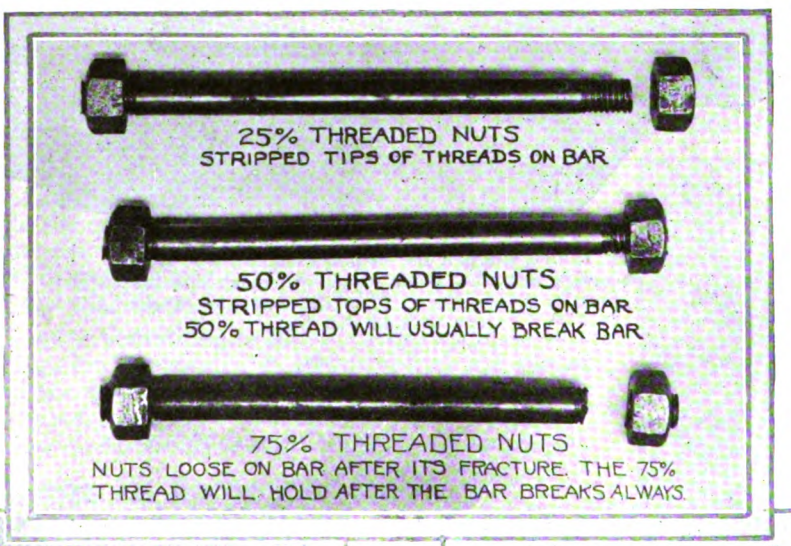


Fig. 8. A machine for testing the strength of threads. Note the results of tests, in Fig. 10.



Fig. 9. Above is shown the difference in chips from brass and from steel, made by the same tap or die. This difference must be provided for in grinding the flutes so that they will not clog.

Fig. 10. Below are shown samples, tested in the tension machine, of nuts threaded respectively 25%, 50% and 75%.



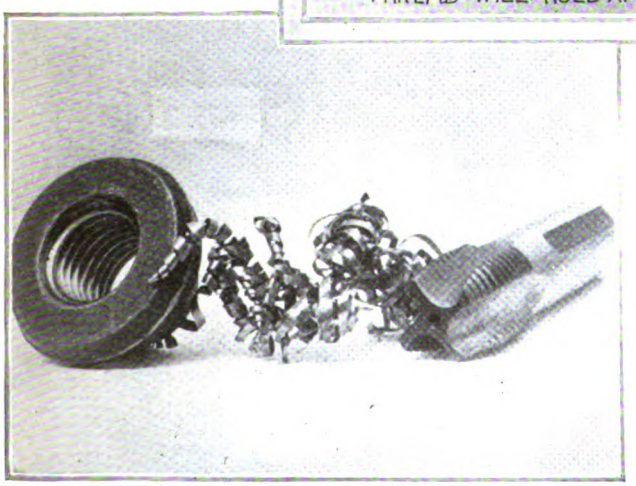


Fig. 11. Chips thrown forward by a gun tap in threading a drop forging. Obviously, the hole must be deep enough to accommodate the chips thrown forward.

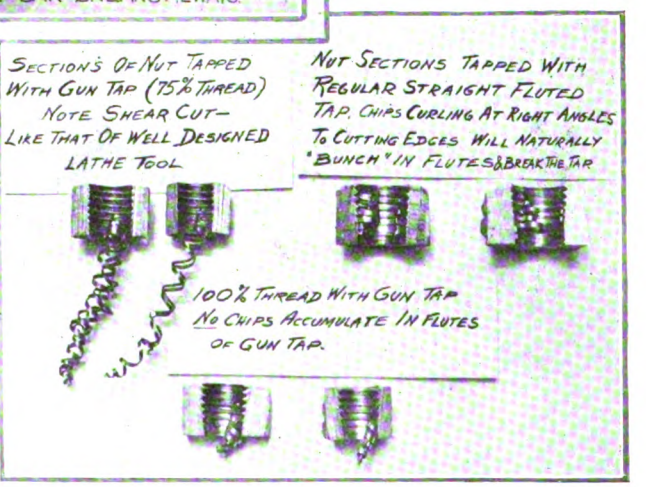


Fig. 12. Note the contrast in cuts and in finished threads, between the regular straight fluted tap and the gun tap; showing the better performance of the latter.

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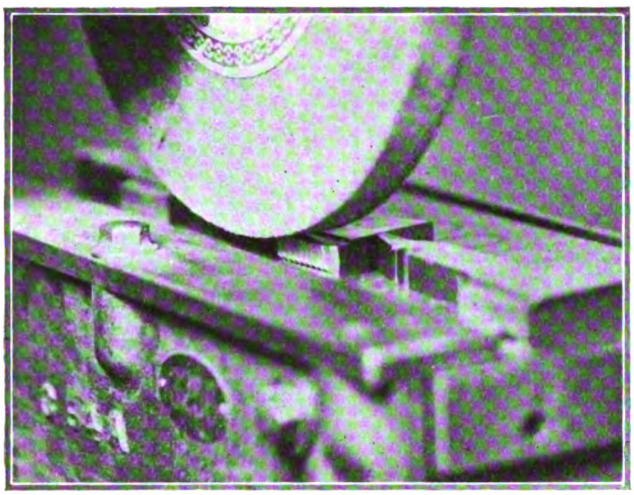


Fig. 13. Above is shown the proper method of holding a die chaser for grinding. The chaser is rigidly held at the proper angle to give the desired hook for cutting.

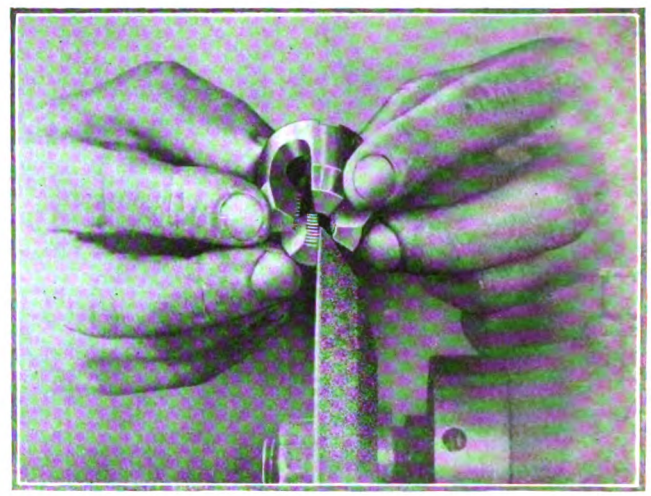


Fig. 14. Sharpening special types of dies is merely a matter of having the proper shape wheel and knowing the angle at which to hold the die.

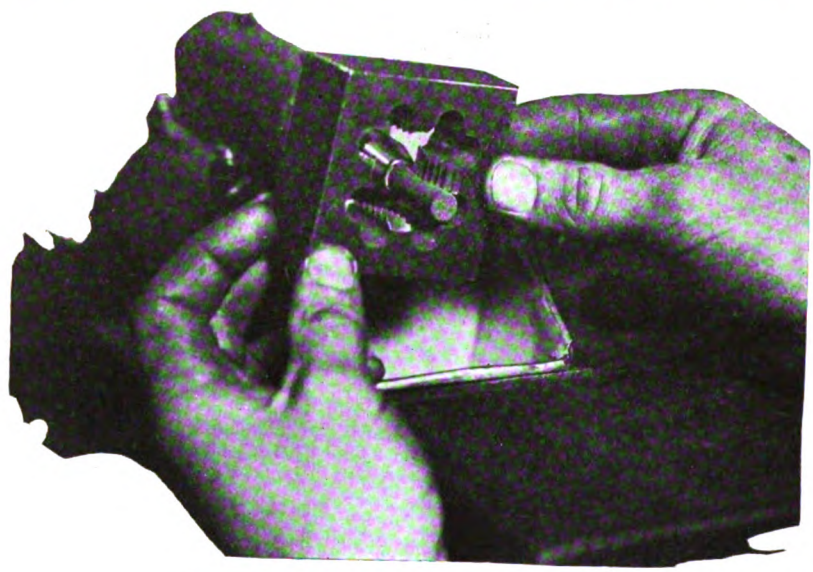


Fig. 15. To sharpen the ordinary square die, it is necessary to have a stone which will reach into the spaces, as shown above. This illustrates the proper way to hold the die.

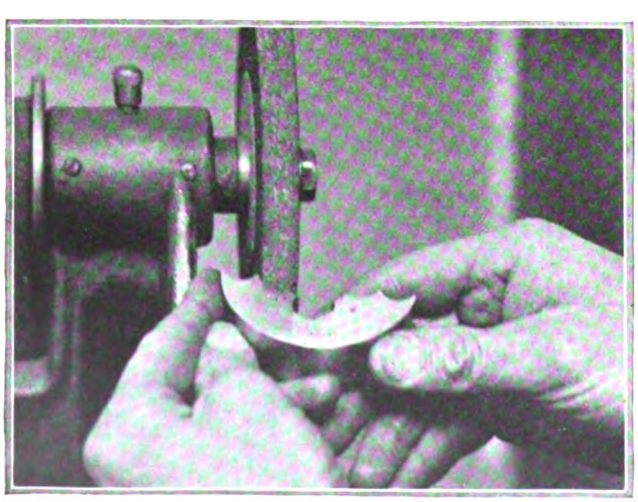


Fig. 16. A two-piece round die can be sharpened as shown here, without requiring a special pencil-shaped stone. The stone should, however, be dressed to proper curve.

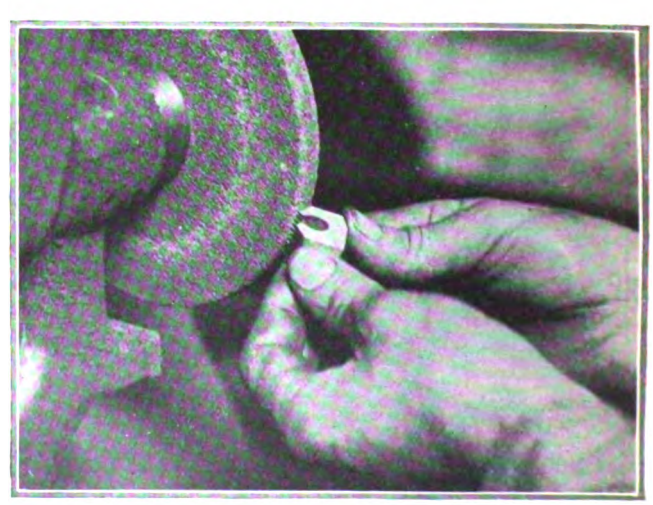
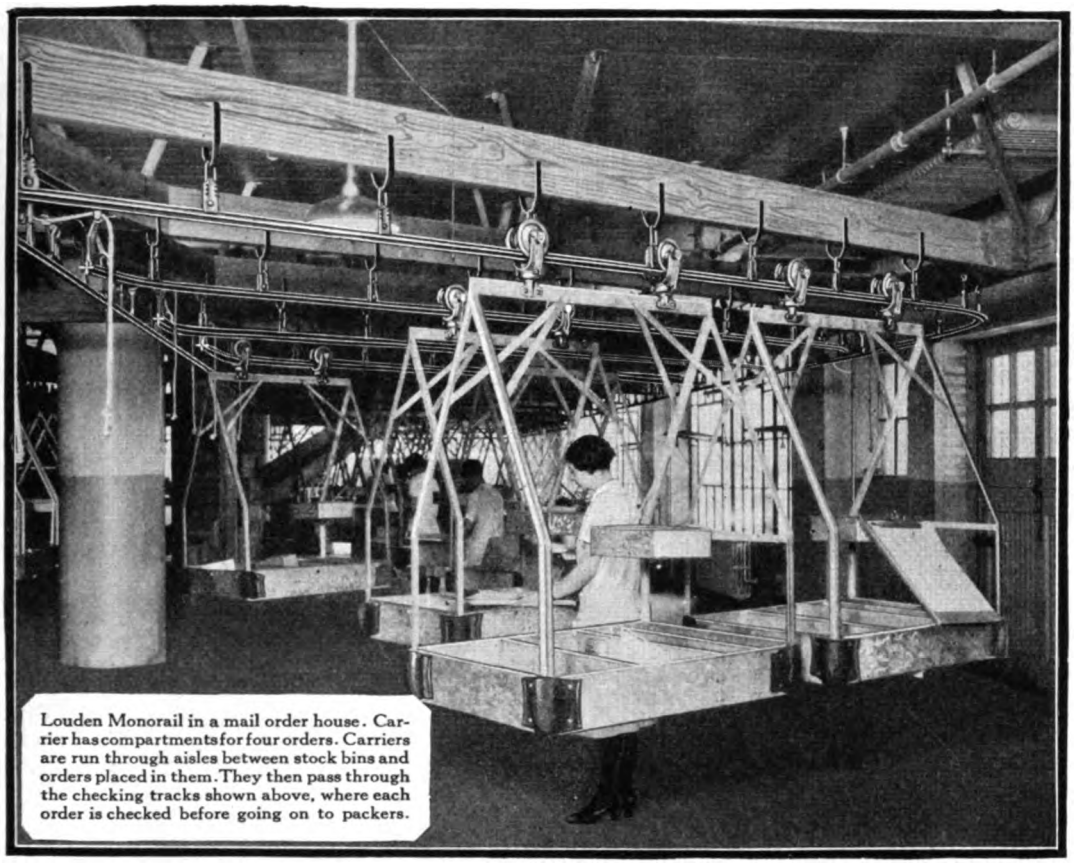


Fig. 17. The two-piece block die may readily be sharpened on a straight-edge wheel; being held as shown here.

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Louden Monorail in a mail order house. Carrier has compartments for four orders. Carriers are run through aisles between stock bins and orders placed in them. They then pass through the checking tracks shown above, where each order is checked before going on to packers.

"It Breeds Economies"

—says Forrest Crissey, well-known industrial writer, of Louden Monorail

"If there is another simple piece of mechanism which can turn its hand, so to speak, to as many different forms of service, I would be interested to find it. Almost without exception it becomes, in the hands of workers, a theme which inspires its users to exercise their own ingenuity and resourcefulness to the end of getting larger benefits from it. I think this can be said of relatively few machines or mechanical devices."

Every man whose business has something to move—every engineer who becomes familiar with Louden Monorail—is astonished at the places where it can ease up and speed up the work, as well as save money. In lifting and carrying loads weighing up to one ton it is the exception, rather than the rule, if Louden Monorail cannot be profitably employed.

Applications in Every Industry

We ourselves, whose business is the interesting one of applying Louden Monorail to material handling jobs of many kinds, are amazed at its constantly broadening and apparently unlimited range of applications.

It obligates you to nothing to discuss Louden Monorail with one of our experienced Engineers, located in or near your city. A word from you and he will call, with that understanding. Or, ask for a copy of our Overhead Carrying Equipment catalog. Write us today.

THE LOUDEN MACHINERY COMPANY

5001 West Avenue (*Established 1867*) Fairfield, Iowa

Albany—Boston—New York—Philadelphia—Buffalo—Pittsburgh—Cincinnati
Cleveland—Toledo—Detroit—Chicago—St. Louis—St. Paul—Los Angeles



Louden Monorail in a foundry. Castings are brought from moulding room to tumblers on Louden System. After tumbling and sand blasting they are delivered through chute from soft iron gallery to floor below, as shown above, into carrier tub on Louden track and then taken to sorting tables. The work is so organized that not more than eight different patterns ever get to one sorting table. Part of a sorting table is shown at right. The lids on this table cover pipes that lead to storage bins in the shipping room below.

LOUDEN

INDUSTRIAL MONORAIL SYSTEMS

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A Simple Method of Making Belts Endless



By Roy C. Moore

Chief Engineer, Chas. A. Schieren Company

THERE are probably two questions that come to the mind of the man investigating the subject of the endless leather belt: first, what will the endless belt do for me; and, second, is there any simple, standard method of making belts endless?

As to the first question there should hardly be any doubt in the mind of the average man that the tapered lap is the best method of making a permanent joint in a leather belt. It is an integral part of the belt itself and will not pull apart or cause injury to the belt, and, too, there is undoubtedly less slip and loss of power where endless belts are used.

In many places the endless belt is indispensable. Motor belts and belts on idler drives, for example, should always be made endless, as well as those used on countershaft pulleys for machine drive.

The work of making belts endless is a very simple proposition nowadays. There are several inexpensive machines on the market for cutting taper laps, and with the aid of one of these, or without it for that matter, a man who can handle tools can make a belt endless in a very short time.

The method shown here has been devised by the Chas. A. Schieren Company, has been used by their belt men, and has stood every test of practicability.

Before starting to make a belt endless it must be remembered that the work defeats its own purpose unless enough stretch is taken out of the belt. Too much time cannot be spent in removing the stretch, which usually amounts to about

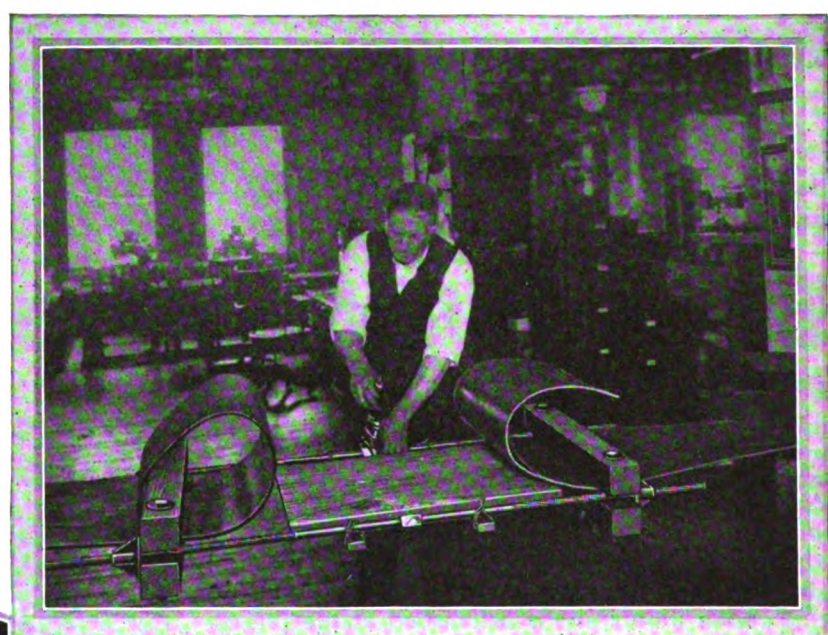


Fig. 1. A smooth board, tied to the clamp rods, makes a good work table. Remember that it is highly important to take out all the stretch before joining, else the whole purpose of the job will be defeated.



Fig. 2. This shows the first step in opening up the lap, on an old belt, by running the rounded end of a screw driver (or a regular lap opener) along the point.



Fig. 3. Enter the edge of the lap opener about 2½ inches, to open the lap gradually, without tearing.



Fig. 4. A straight pein hammer serves to finish opening up the lap, as shown here.



Fig. 5. Having cut the tongue end to the correct length, a plane or spoke shave is used to form the tapered edge.

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¼ inch to the running foot. This point is most important for proper installation. In adjusting the clamps and rods be sure that the clamps are centered on the belt and that they are square across it. Tie a smooth board to the rods under the lap and use this as your work table. Be sure the board selected is free from depressions and rough places because a rough board would be apt to cause some unevenness in the finished lap.

Pull the belt up taut by tightening the rods. Give the pulleys a half turn or more. This will make it possible to pull the stretch out of that portion of the belt around the pulleys and equalize the pull on both strands. Repeat this operation several times. Taking out enough stretch is the most important point in making a belt endless. Be sure the maximum amount of stretch has been removed before proceeding further.

Special waterproof cement should always be used on belting that is to operate in damp climates or under con-



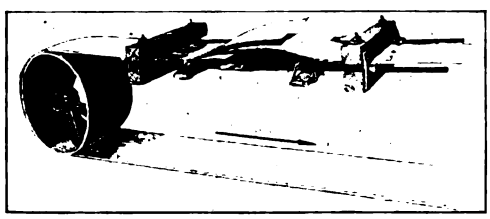
Fig. 6. The rough surface, after planing, is smoothed by the scraper; using a square to assure a straight line.

Fig. 8. Below—Cement should be applied by daubing on with a pounding stroke, to get it into the deeper fibers. Take care that the cement is too thin, rather than too thick. Have the squeeze clamps ready for immediate use.





Fig. 7. After scraping, the fibers must be raised by "scratching up" by means of coarse sand-paper or wire brush.



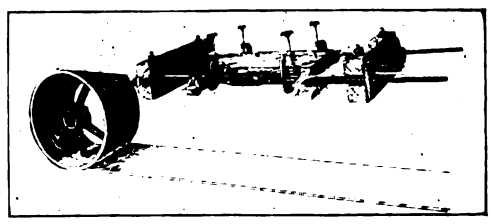


Fig. 9. The lap must be clamped tight immediately after the last coat of cement is applied. Do not attempt to apply cement to an area larger than that of the squeeze clamps; do such areas in sections.



Fig. 10. The scraper used on belts is made by grinding a medium hard blade to a sharp, slightly curved edge on a wet stone. The scraping edge is formed by turning it at right angles to the blade.



Fig. 11. As the scraper is used, it becomes filled and requires occasional cleaning. A slender pointed rod about ⅛ inch in diameter will serve as a tool for cleaning it and for smoothing the cutting edge.

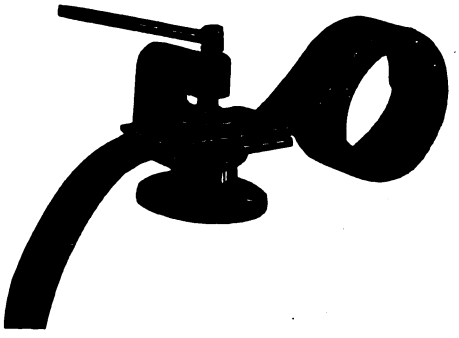
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ditions where moisture would be likely to cause trouble with laps made with ordinary cement.

Where ordinary belt cement is used, one coat of cement is all that is necessary. The squeeze clamps should be set about 30 minutes and at the end of an hour the belt can be back at work on the pulleys.

When cementing the laps of large belts do not attempt to apply cement to an area larger than that of your squeeze clamps. On very large belts it will be necessary to make two or three cementings, moving the squeeze clamps ach time. For the ordinary small belt one cementing with one application of the clamps is sufficient.

Fig. 12. Below—This shows a press especially designed for cementing belt joints, and made in sizes up to six inch.



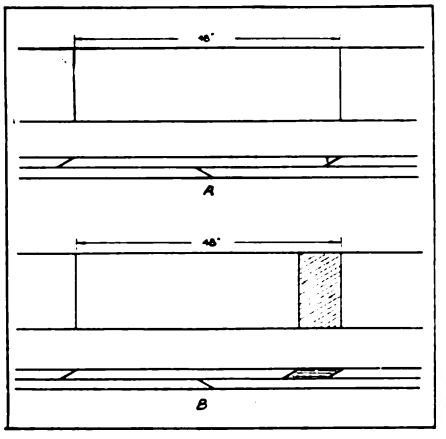
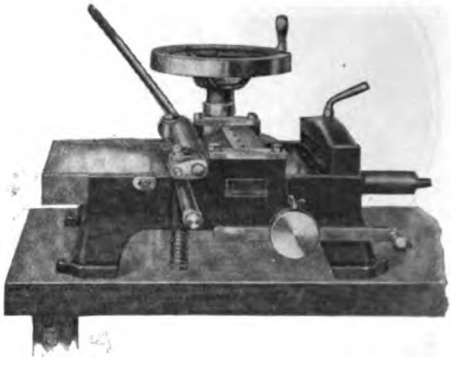


Fig. 13. Above—In case of damage to any portion of a belt, it can usually be restored by setting in a new section; opening the lap nearest the injury.

Fig. 14. Below is shown a machine, hand operated for scarfing the ends of leather belting preparatory to splicing.



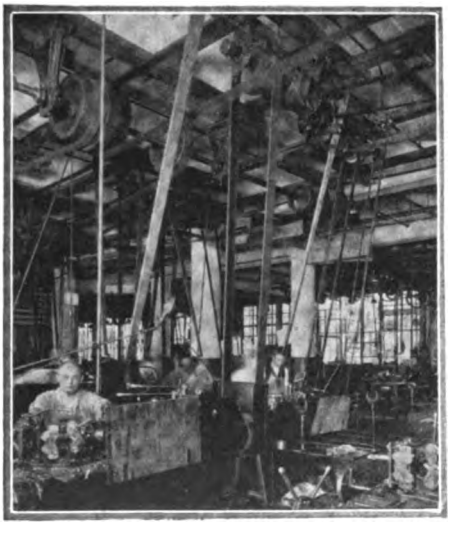
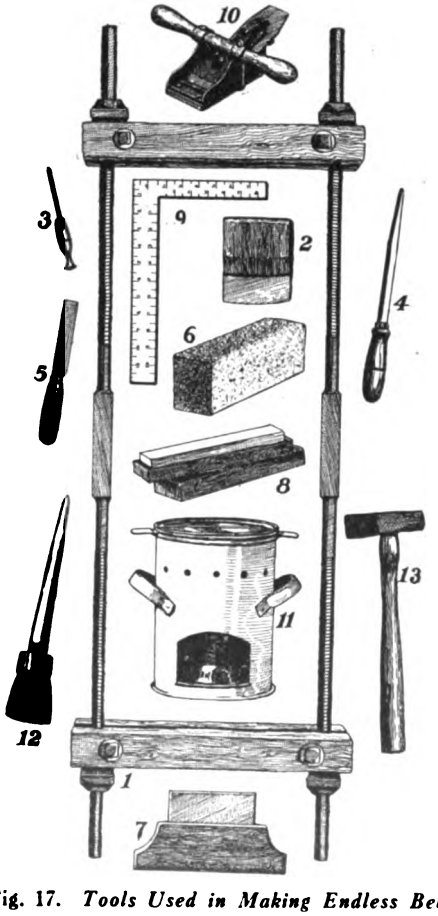


Fig. 15. In many places, the endless belt is almost indispensable. Motor belts, and idler driver belts, for example, should always be made endless, as well as those on countershafts.



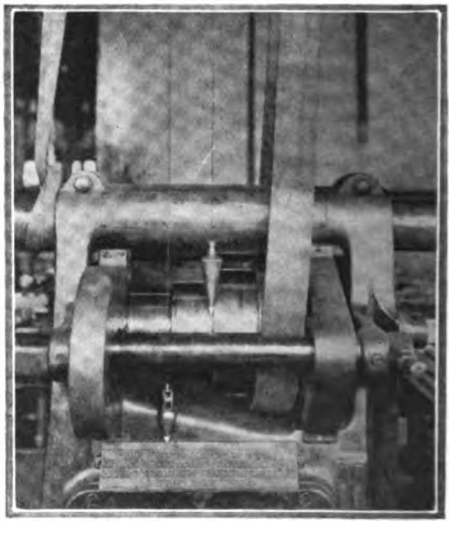


Fig. 16. In lining up the pulley steps on a countershaft drive, it is important to insure accuracy. The method is simple, requiring only the use of plumb bobs.

Fig. 17. *Tools Used in Making Endless Belts*

(1) Clamps and Rods. (2) Scraper. (3) Finger Steel, for sharpening and cleaning cutting edge of scraper. (4) Turning Steel for turning cutting edge of scraper. (5) Knife. (6) Sand Stone, for sharpening knife, etc. (7) Rubstone. (8) Oil Stone, for sharpening belt plane. (9) Steel Square or Tri-Square. (10) Belt Plane. (11) Belt Cement Heater and Pot. (12) Belt Cement Brush. (13) Straight Pein Hammer.

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"Mr.

REED—How Did You Do It?

"Reed, come here a minute—I want to ask you about that roof over there."

The Plant Foreman walked briskly up to where the Superintendent was standing.

"Some time ago you asked for an appropriation for a new roof, which was not approved, and I'd like to know just how you put that old worn-out roof in such good condition. Looks to me like it would last forever."

Reed came right back—he was proud of his achievement and wanted the world to know it. "Well, I'd been considering VALDURA ASPHALT PAINT ever since the Atwell people had such splendid success with it on their roof. But first I got in touch with other users—found out that VALDURA had twice the covering capacity, four to five times longer life, was absolutely waterproof and weatherproof and had for its base genuine 99.5% pure Gilsonite Select Asphalt—also that it actually protected the surface covered, whether inside or outside, above ground or below ground. And, incidentally, that you paid for satisfactory results only."

The Superintendent was right on his toes—he believed in economy too. "Reed—I want the entire plant, from top to bottom, gone over—all smokestacks, roofs, walls, window and door frames, foundations; even the tanks, derricks, structural steel, fencing, etc., that are in need of paint, give them a protective covering of VALDURA."

Write us for detailed information—no obligation on your part.



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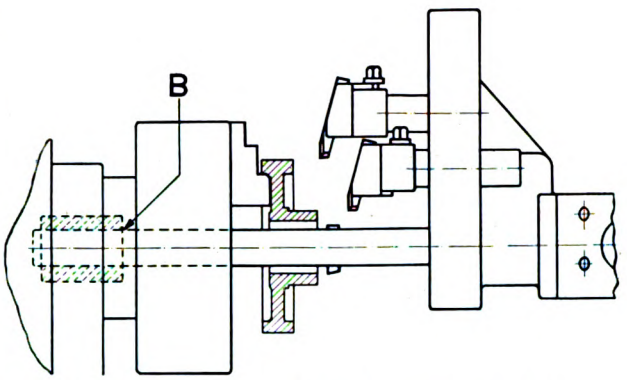


Fig. 1. By center piloting is meant a special pilot bar held in the center of the turret face and passing into a bushing in the spindle or chuck.

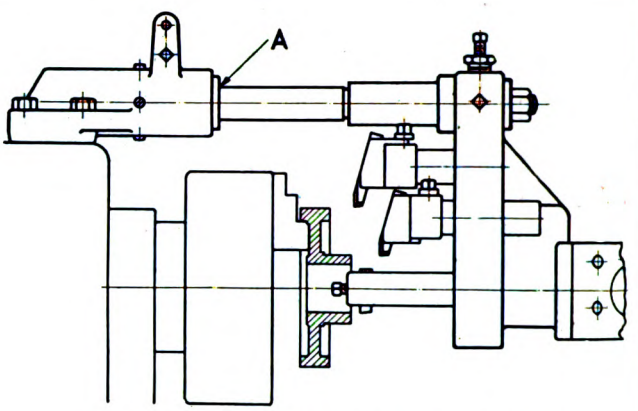


Fig. 2. Overhead piloting calls for a standard pilot bar adjustably mounted in the top of turret tool and passing into an adjustable bracket.

Tips on Tooling

Reducing the Tool Cost for Chucking Work

By M. E. Lange, Production Engineer, and H. P. Bailey, Assistant to the President

The Warner & Swasey Co., Cleveland, Ohio

IN reducing the tool cost for chucking work care must be taken to select equipment which will increase production to the maximum, as well as keep the investment low.

A careful study of all the work to be produced on one machine in a particular shop will give the answer to the important question, "Will piloting increase the feeds and hence the production, without loss of accuracy?" If so, then the chucking equipment for the given shop requires the feature of piloting.

Where piloting is necessary for maximum production, the question arises, "Shall we use overhead or center piloting?"

By center piloting we mean a special pilot bar held

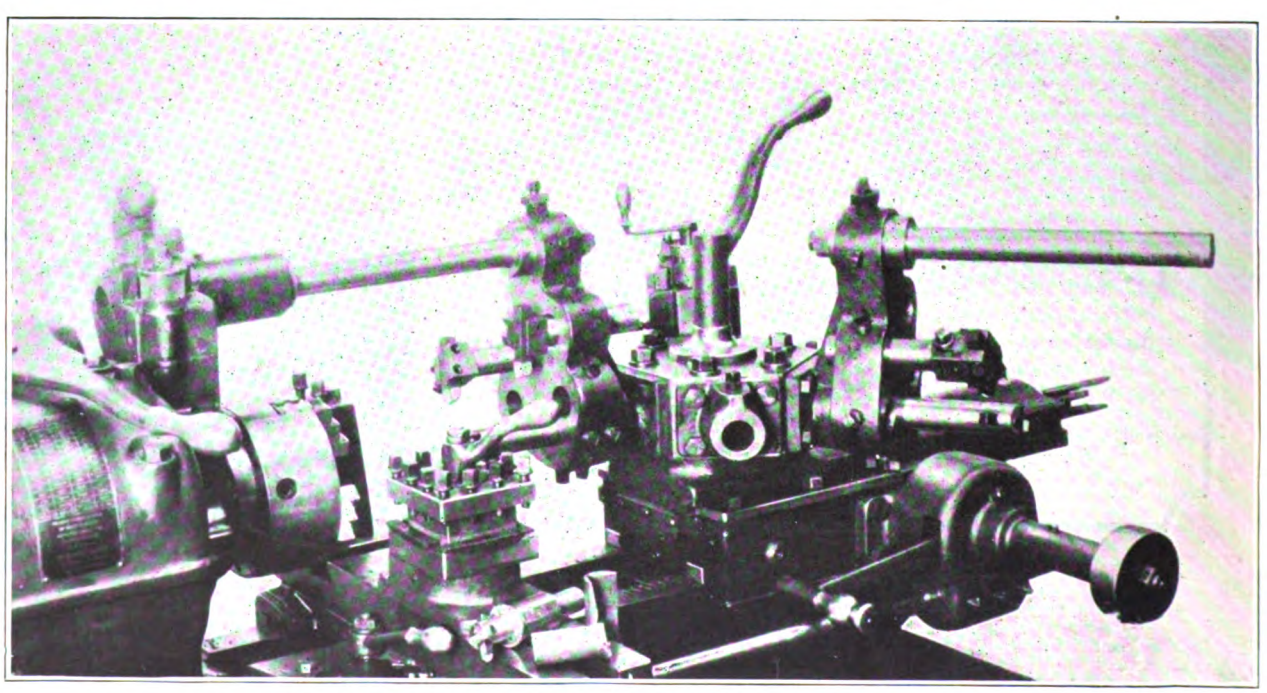


Fig. 3. This shows a set of universal chucking equipment arranged with overhead pilots. The individual tools are listed in the text on the following page.

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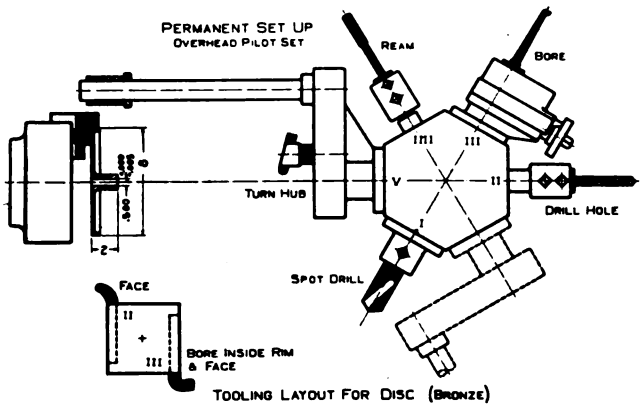


Fig. 4. The tooling layout for a bronze disk. The drawing is self-explanatory.

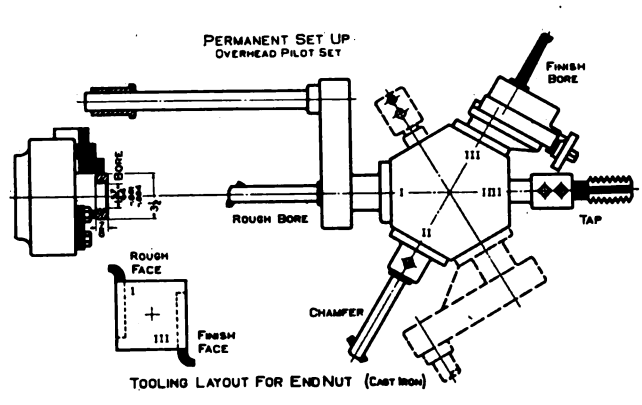


Fig. 5. Overhead pilot set, showing the tooling layout for a cast iron end nut.

in the center of the turret face, and passing into a bushing in the inside of the spindle or chuck, as shown in Fig. 1.

By overhead piloting we refer to the new type now available, where a standard pilot bar is adjustably mounted in the top of the turret tool, and passes into a bushing adjustably held in a bracket on the head of the machine, as illustrated in Fig. 2.

With these features in mind we may now suggest a practical, every day answer to the question of overhead or center piloting, for shops with types of work where production may be increased through the use of piloting.

Small Lot Production. Where work is made in quantities of five to one hundred pieces in a lot, the investment in one set of standard overhead piloted tools with stub boring bars is suggested to handle the great variety of work. Center piloting requires a variety of special bars of different sizes for different jobs, which is unduly expensive for small lots.

Quantity Production. Where work is produced in large quantities relatively few special and expensive bars are needed and center piloting becomes permissible. However, center piloting cannot be used for work without any center hole, for work with too small a hole, or for work on a ram type machine which is so long that the center piloted bar cannot be withdrawn from the work.

Fig. 3 shows a set of universal chucking equipment arranged with overhead pilots. The individual tools are as follows:

1. Multiple turning head with overhead pilot bar and bracket.
2. Flanged tool holder.
3. Multiple turning head with overhead pilot bar.
4. Vertical slide tool.
5. Drill or tool holder.
6. Floating tool holder.

Such a set will handle the majority of chucking work, at the same time making possible maximum production. The new development of standardized overhead piloted tools has opened up a wide field for the application of overhead piloting, and these tools can now be obtained from the manufacturer as a standard universal tool. The resultant low cost of the application of this tooling has removed the former objection of excessive tool and installation cost.

For example, the complete set of chucking equipment for a 16" ram type costs only 22% of the value of the machine itself. The substantial increase in production through heavier feeds where piloting can be used to advantage will soon pay for this small difference in the cost of tooling.

The Permanent Set-up

The tools in this chucking equipment may be arranged in a permanent set-up on the hexagon turret, similar to that described for bar tools. Then the only changes necessary in changing from job to job are the shifting of cut-

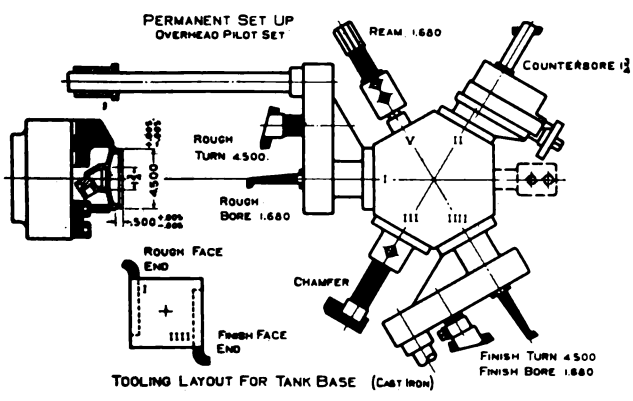


Fig. 6. A tooling layout for a cast iron tank base. The text gives set-up times on all these layouts.

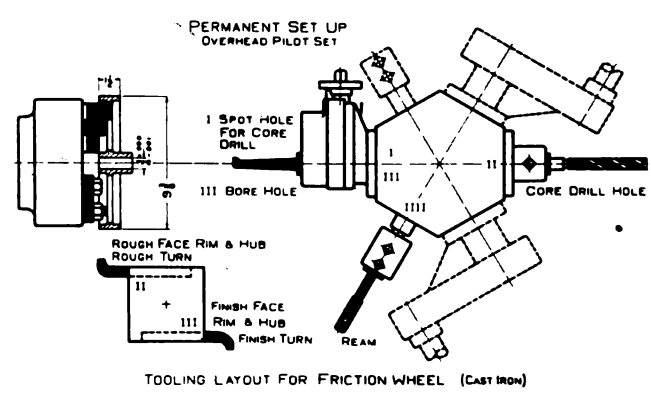


Fig. 7. See text for explanation of heavy shading on these four tooling layouts.

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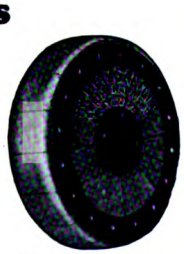
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ters and cutter holders and the setting of the stops of the machine.

In order to illustrate this more clearly, four set-ups (Figs. 4, 5, 6, 7) for a variety of types and kind of work, but on the same machine, are shown. The different jobs vary considerably in the type and kind of work, but the lots are all one hundred or less.

Many other jobs are similar to the tank base and require piloting for maximum production with stellite cutters, so that overhead pilots are used.

Any changes necessary from the previous job are indicated by solid black. A study of the exact changes from job to job will emphasize the simplicity of tooling up for a new job when the permanent set-up is used. The table below gives the set-up time for each one of these jobs.

Job No.	Name	Quantity per lot.	Total Set-up Time.	Set-up Time per Piece.
1	Disc	50	60 min.	1.20 min.
2	End Nut	35	70 min.	2.00 min.
3	Tank Base	100	105 min.	1.05 min.
4	Friction Wheel ..	20	50 min.	2.50 min.

The importance of reducing the set-up time is obvious. When the Permanent Set-up is used, the time necessary to arrange the tools for maximum production is very much less than is generally believed, and makes possible the use of improved tooling for small lot production.

TO the management executives of more than 1,500 industrial companies throughout the United States and Canada, the National Machine Tool Builders' Association has issued a prospectus of what, it declares, is to be the first of an annual series of merchandising and buying centers for the entire range of modern machine tools, machine tool equipment, supplies, etc., essential to modern machine tools' industrial utilization.

According to this prospectus, the First National Machine Tool Builders' Exposition will occur in Cleveland September 19th to 24th inclusive, 1927.

The Association points out in its prospectus that "the machine tool industry is among those to which an actual exposition of products is necessary for effective distribution. There has been no coherent, effective presentation of their products, to identifiable users, by the machine tool makers as an industry.

"As a result machine tools are displayed and demonstrated to sundry sections of the industrial public, and even to sections of the general public, in various and numerous regularly and intermittently scheduled expositions. In these expositions they are grouped either with miscellaneous industrial equipment or with displays primarily of a specialized technological character not always directly related to machine tool technique or utilization. It has become obvious to builders of machine tools that there must be centralization and simplification of their exposition energy and outlay.

A basic feature of the Exposition will be the absolute exclusion of all persons not having a reasonably direct interest in machine tools and their accessories. Admission will be by registration only. There will be no entrance fee.

The Exposition headquarters are: Room 635, 1328 Broadway, New York, N. Y.

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The Preparation and Handling of Coke for Industrial Use

By Edward J. Tournier

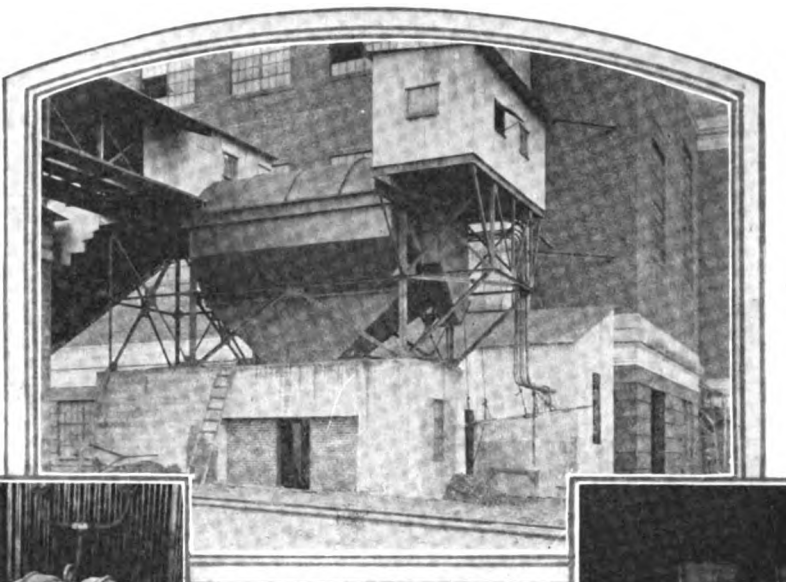


Fig. 1. Above is a coal breaker, for cleaning and crushing coal, preliminary to pulverizing it for coking.

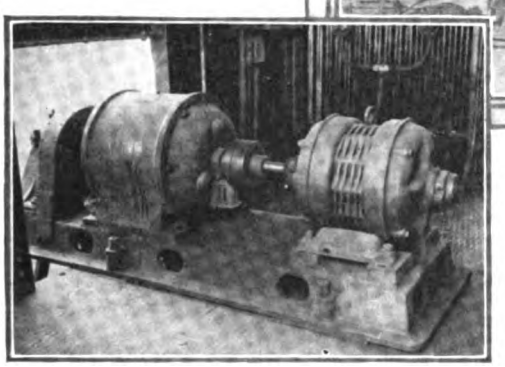


Fig. 2. Below—A spur gear speed reducer and motor for conveyor drive, with chain drive to conveyor.

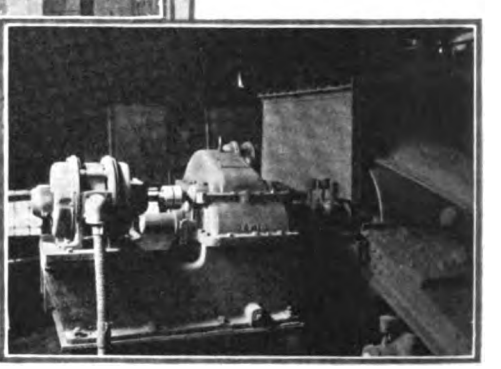


Fig. 3. Below—A herringbone gear reducer and motor, the reducer direct-connected to belt conveyor drive shaft.

COKE is a fuel about which we are destined to learn considerably more some day, when we wake up to the wasteful extravagance of burning bituminous coal without recovering its valuable by-products. In the meanwhile, the chief uses of coke are in iron and steel production and in gas making. For these purposes, coke is produced in the United States to the extent of some 63 million tons per year.

The handling of such a huge mass is, quite naturally, beyond the power of man alone, but with the addition of mechanical aids it is entirely feasible. It is quite the ordinary performance at a by-product coke plant to handle 100 tons of coke per hour from the cooling wharf to the preparation station.

The process of coal carbonization ends when the coke ovens have discharged their contents into waiting quenching cars. The coke, portions of it still red with the oven fire, must be cooled as well as possible before it can be handled efficiently in large quantities. The general practice is to spread the coke on an inclined plane of the proper area for cooling and with just the right inclination to allow the slow progression of material toward the bottom. These open air cooling areas, or wharfs, are usually about 22 ft. wide, and vary from 48 ft. to 300 ft. in length, depending on the size of the plant.

The discharge of the coke from quenching cars to the wharf is the cause of a certain amount of breakage which is unavoidable. After this initial discharge, it is of the utmost importance to avoid breakage, so important in fact that the length of chutes for transferring from one unit to the next is strictly limited. It is a sign of faulty design when extremely long spouts for lump coke are found. For use in foundries, gas generators and for domestic use, this fuel must be graded as carefully as anthracite coal, and breeze is a product of inefficient handling. There are occasional and exceptional cases of course where

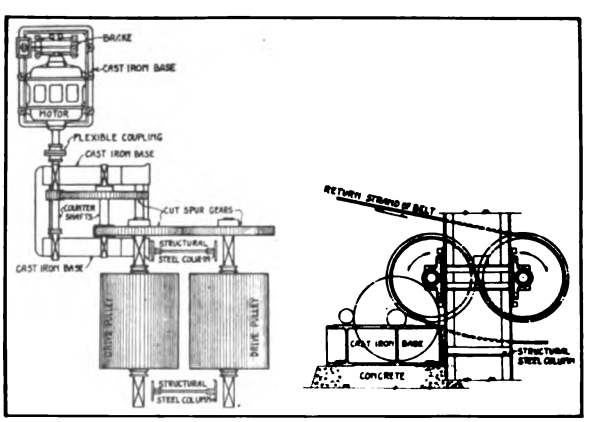


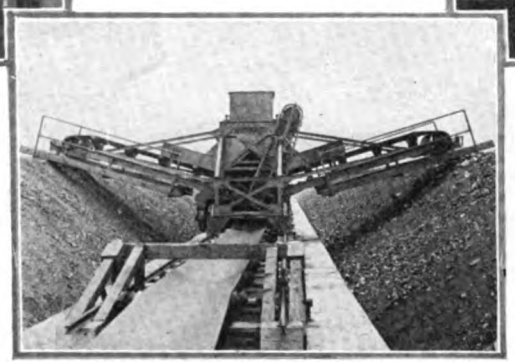
Fig. 4. In belt conveyors, when a single drive pulley does not provide sufficient arc of contact, a tandem drive of the type shown may be used; permitting the use of a lighter belt.

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Fig. 5. Above—A screen for separating the fine powder and delivering only the clean coke. Note the small belt drive for agitating the screen.

Fig. 7. Coke is fragile, and requires careful handling. Below is a special discharging unit used in connection with a reversible belt conveyor, for storing and reclaiming coke.



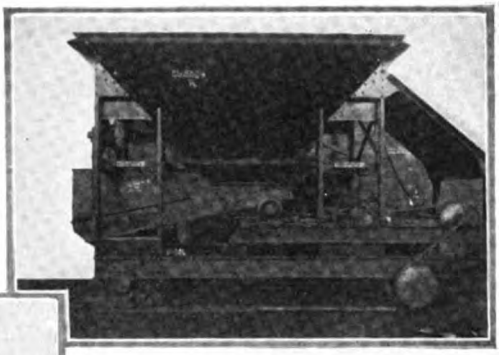


Fig. 6. Above is shown the propelling machinery and reciprocating feeder on a traveling hopper, with geared drive and chain connection to the axle.

breeze for boiler fuel is required in excess of the approximately 10% present in oven run coke.

The mechanical handling of by-product coke plants equipment is now practically standardized as to type, probably 75% of these plants having the same kind of conveying machinery. Belt conveyors are used wherever possible, even when it is necessary to elevate materials.

The matter of placing sized coke in the various bins of the screening pocket or building, is a problem deserving, and now receiving careful attention. It is no longer permissible to drop expensively prepared coke 25 or 30 ft. from the screens to the concrete floor below. It is sometimes argued that after the pile has been started and the initial breakage discounted, the coke falls on a layer of the same material and prevents further

(*Continued on page* 54)

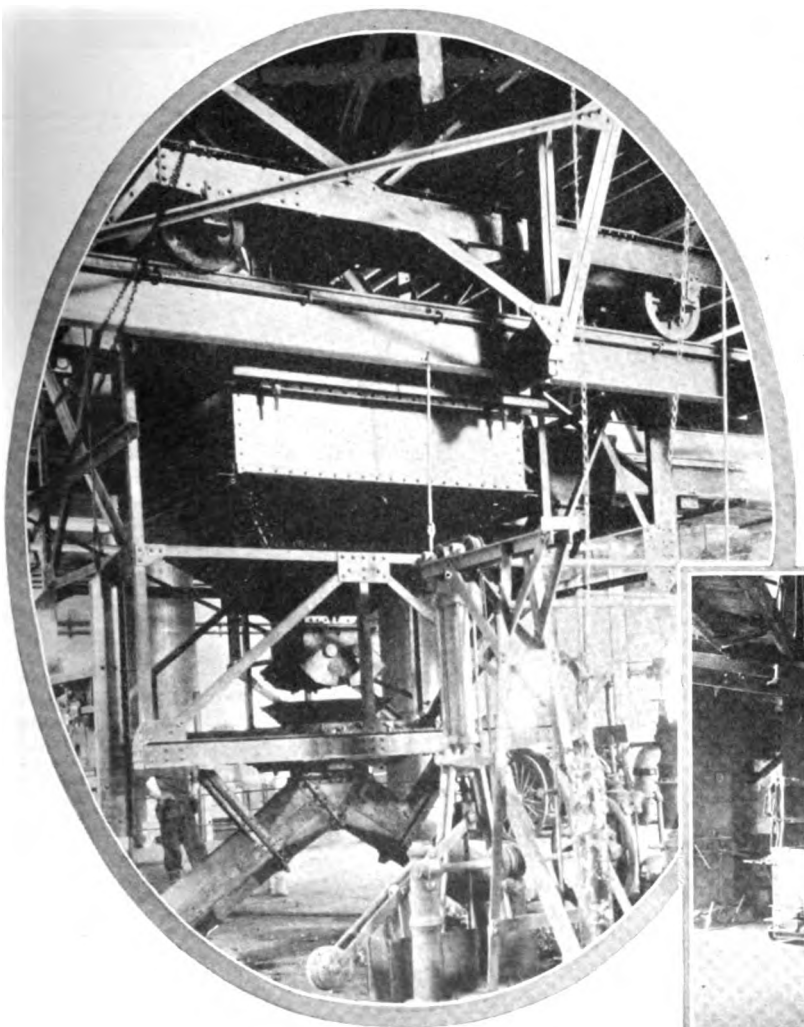


Fig. 8. This view shows a 6 ton capacity weigh larry charging gas generators with top openings, at the Nassau Works of the Brooklyn Union Gas Co., Brooklyn, N. Y.

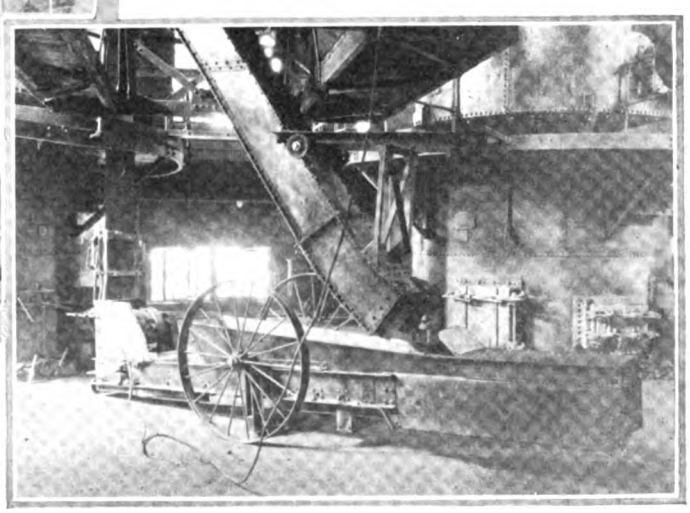


Fig. 9. This high speed belt conveyor takes the coke from a weigh larry and delivers it in the gas generator; a special device developed where low head room prevented direct delivery.

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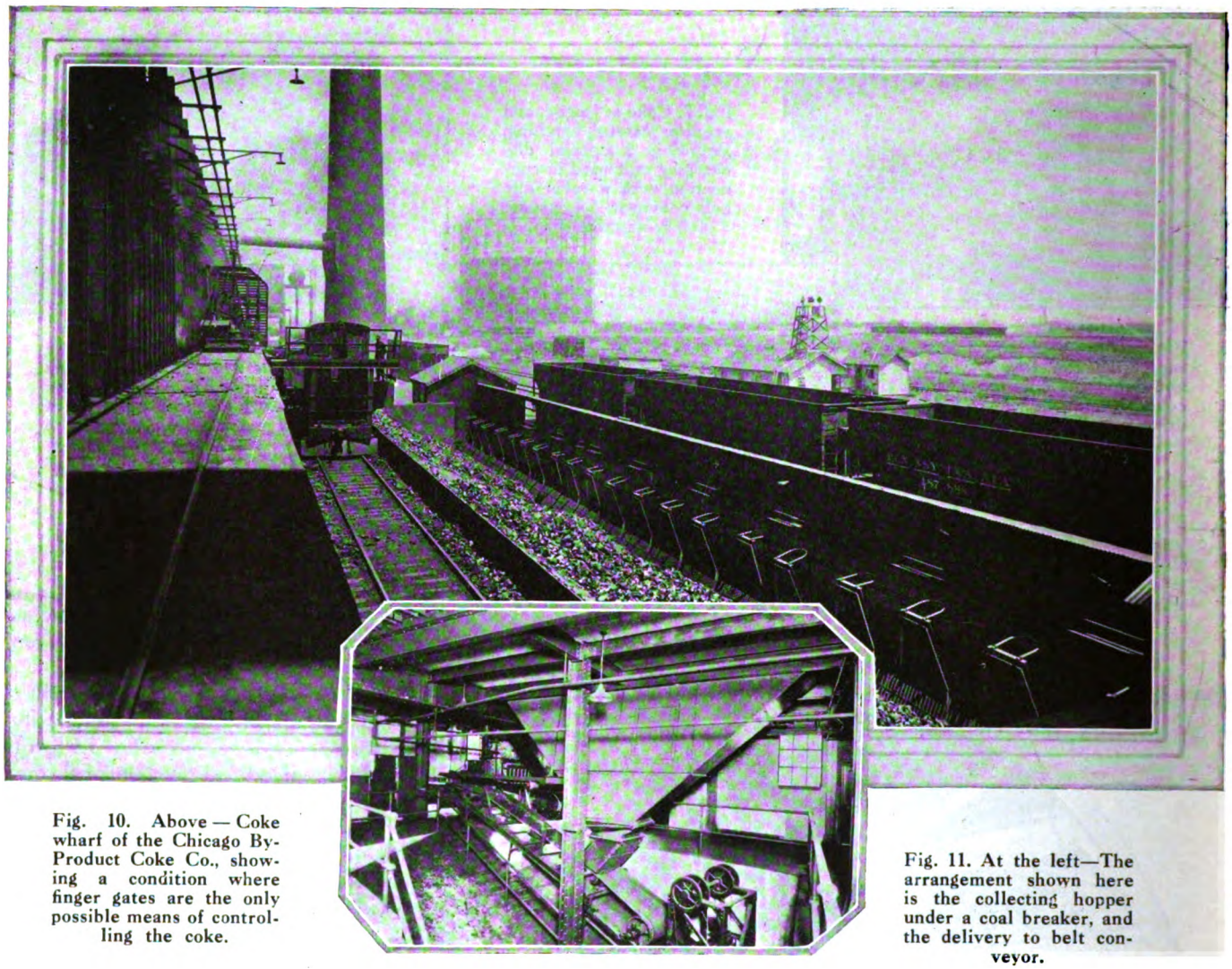


Fig. 10. Above — Coke wharf of the Chicago By-Product Coke Co., showing a condition where finger gates are the only possible means of controlling the coke.

Fig. 11. At the left—The arrangement shown here is the collecting hopper under a coal breaker, and the delivery to belt conveyor.

Fig. 12. At the left—The miscellaneous collection of refuse which a coal breaker removes from the coal fed to it.

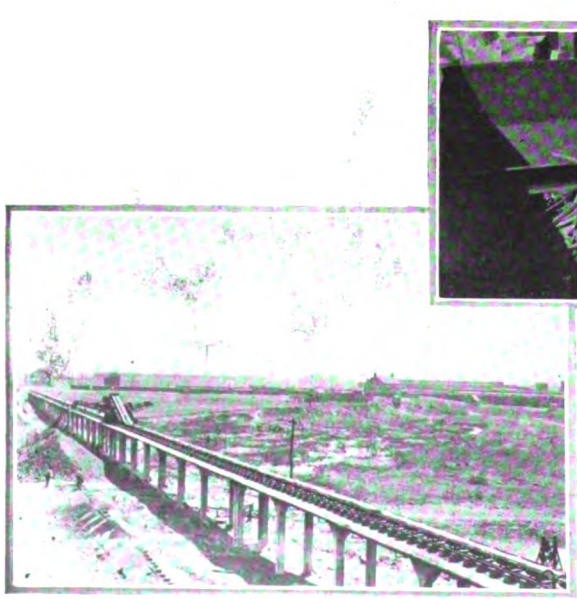


Fig. 13. A reversible conveyor with special tripper, for storing coke in the open.

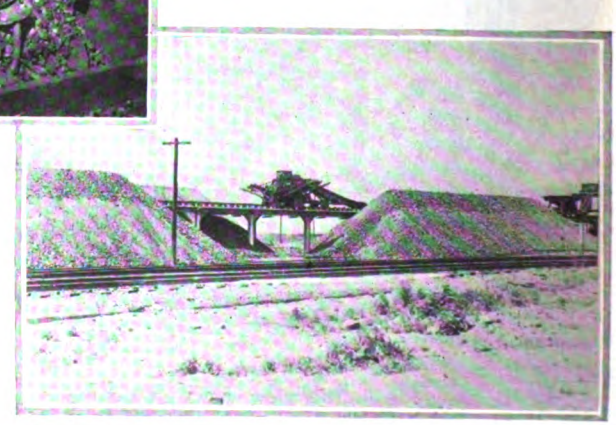


Fig. 14. Here are shown the piles of coke formed by the installation in Fig. 13. Reclaiming is by locomotive crane.

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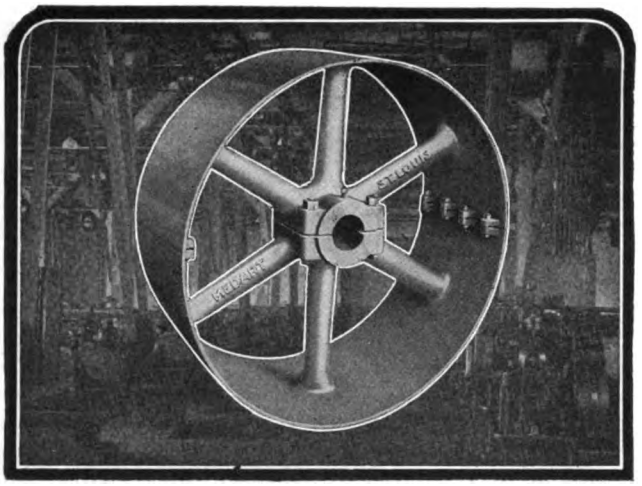


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(Continued from page 37)

breakage. This is possibly true, but the point is that it no longer is satisfactory.

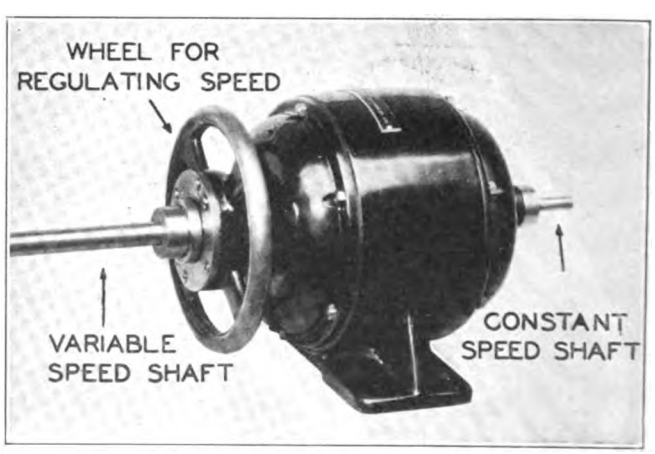
To provide for excess production open storage must be considered in the plant design. The first question arising in this case is whether or not the coke shall be screened before placing in reserve storage. The better practice is to stock out before screening, for two principal reasons. The first is that the latter method produces the least breakage and the second is that less work is performed than if the coke were first screened and then stored. It should be stated, however, that many stations are designed for storing prepared coke.

The millions of tons of coke produced yearly in by-product plants travel many hundreds of miles before reaching their industrial destiny. Part of the energy and fuel employed in transporting this great mass might conceivably be diverted to more useful purposes, if industry were both able and willing to do so. One of the large public utilities, at least, realizing the many benefits of centralization, is planning the construction of a central fuel handling and carbonization plant. From this its subsidiaries in the metropolitan district will draw all of their fuel, already prepared for use.

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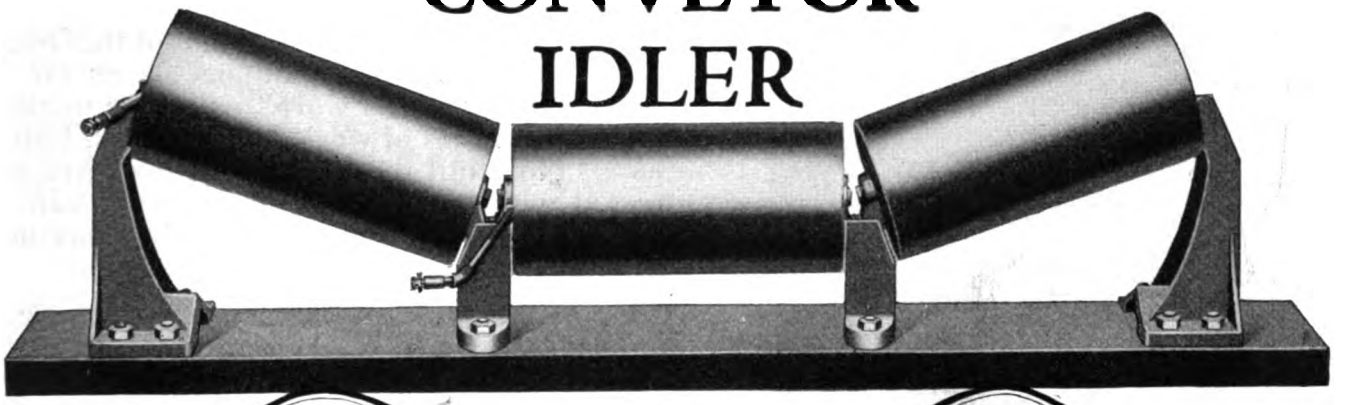
The unit consists of a special form of roller bearing. The input, or constant speed, shaft, which is shown extending to the right in the accompanying cut, rotates the inner races of the bearing. The output, or variable speed

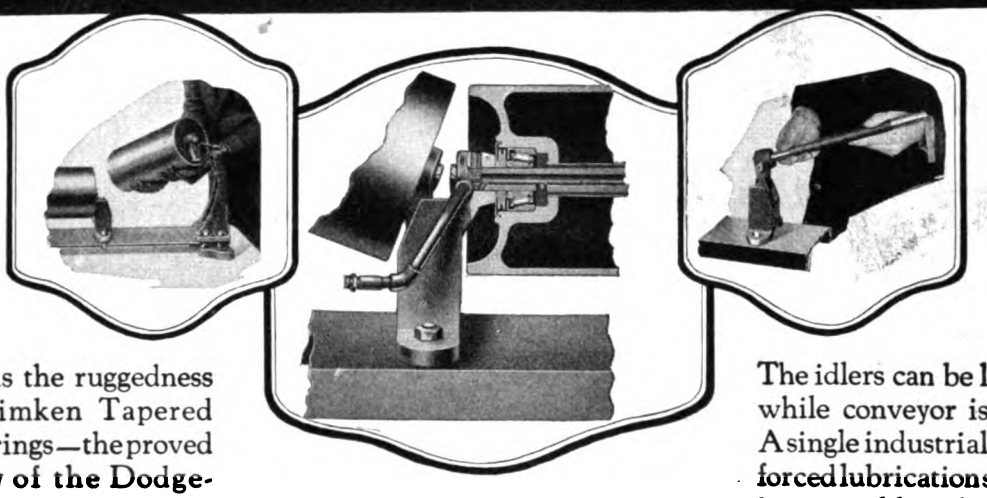


shaft, rotates with the rollers of the bearing. The outer races are held from rotating, but are moved axially as the speed control wheel on the left of the frame is turned. In this way the points of contact of the rollers and races are shifted, and variation of the speed ratio is effected. The pressure between the rollers and races is supplied by springs and is made less than that allowed in good grades of commercial roller bearings. An important feature stressed by the makers is that the design of the rollers and races is such as to balance all pressures against each other and thus to eliminate all bearing reactions.

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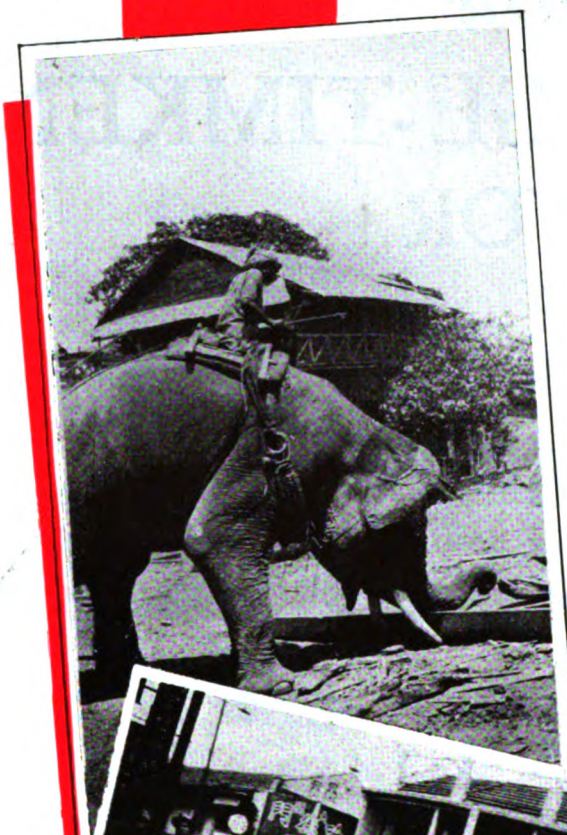
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WORK~

In these days of mechanical achievement it is interesting to note that in many sections of the world the most primitive methods of industrial accomplishment are still in vogue.

With the exception of certain parts of the Orient, where manufacturing conditions are as far advanced as any in the world, primitive methods of doing all kinds of work are employed East of Suez. Not until these crude methods are contrasted with our own advanced ways can we realize the great improvement that has been made in just plain work.

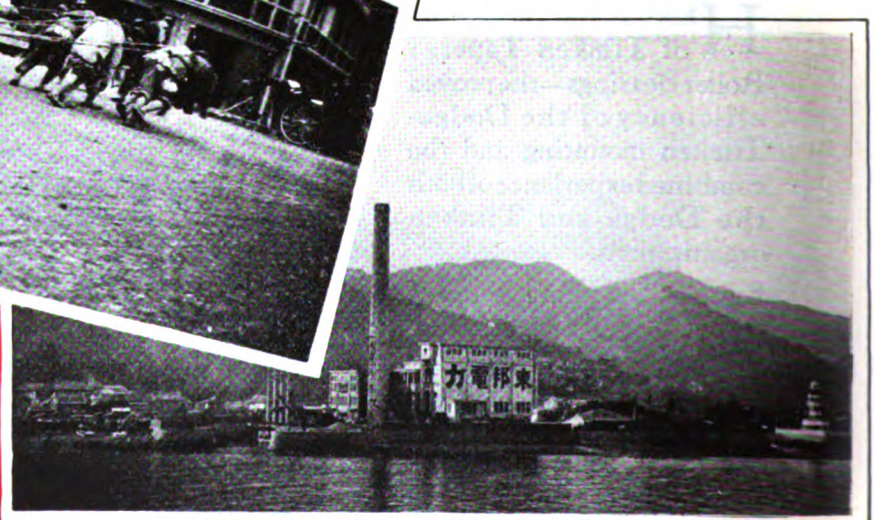
Lack of adequate machinery and the use of manual labor keep workers in that part of the world on a low wage and living scale, whereas in the United States and other large production centers the use of machinery ever tends toward the improvement of the worker and his conditions.



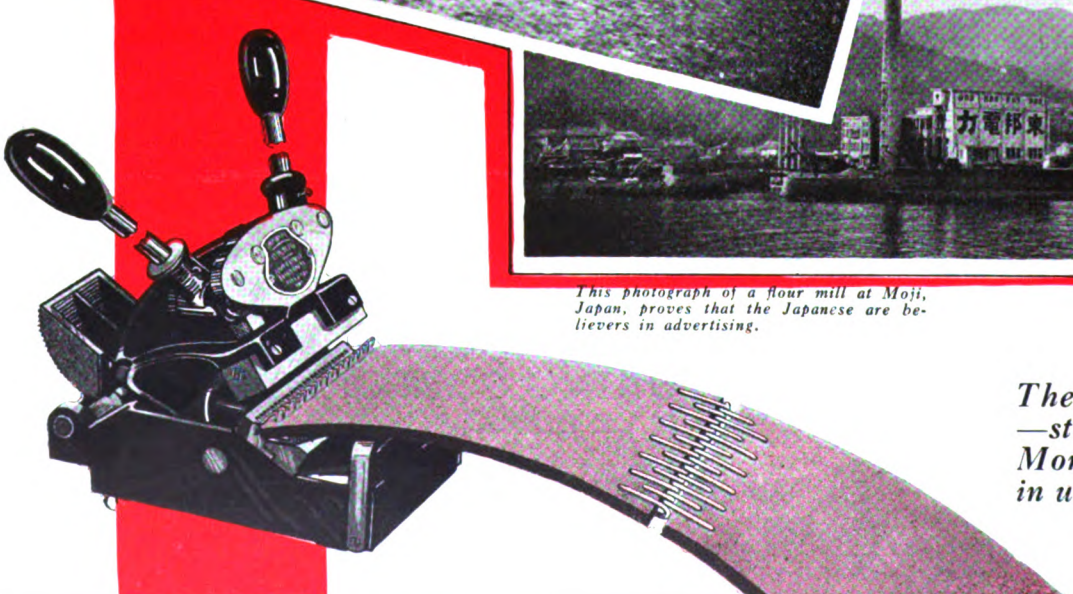


Upper left—A work elephant in Rangoon, India, moving timber. His tusks are forced under the timber while his trunk goes over it, securely holding it.

Left—A load of timber on two wheels being moved through the streets of Shanghai, China. One man with a tractor could do the job very well.



This photograph of a flour mill at Moji, Japan, proves that the Japanese are believers in advertising.



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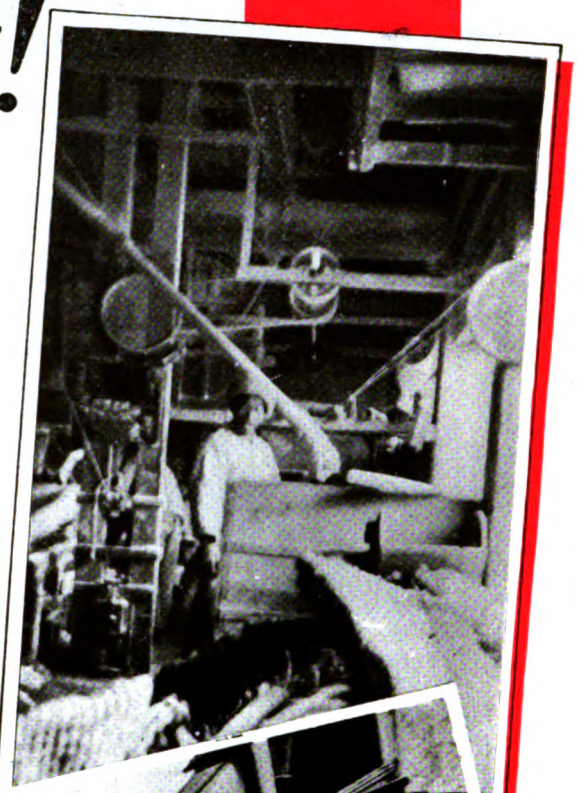
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east of Suez!

While manual labor still predominates in many parts of the world, machinery is found in the advanced sections, often determining the degree of civilization. Wherever we find machinery we generally find belting and wherever we find belting we almost invariably find a *Clipper* machine like the one below. This machine embeds belt hooks into each end of a belt so that when the *Clipper Pin* is inserted the belt ends are flexibly and securely joined.

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Upper right—The interior of a grist mill at Seoul, Korea. A slight resemblance to a modern factory.

Right—A nice job for a warm day. A man carrying hay in Buitenzorg, Island of Java.





A saw mill at Iamaichi, Japan.

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Pitfalls of the Conditional Sale Contract

When Machinery So Sold May Become Subject to Mortgage Executed by the Buyer

By Leslie Childs

AS a general proposition of law, where machinery is sold under a conditional sale contract the title thereto will remain in the seller until the conditions of the sale have been complied with. And, in view of this, many manufacturers and sellers of machinery consistently sell their product by this method, as a safeguard against possible losses through unsecured accounts.

And, while a sales policy based on conditional sales contracts will as a general rule furnish ample protection to the seller, it is well to remember that such contracts are subject to certain limitations, where they involve the transfer of machinery or equipment that is intended to become a part of the realty or plant owned by the buyer. In other words, while a conditional sale contract may at all times be good, as between the parties, if the subject of sale becomes attached to the buyer's premises it may become such a fixture as to be, under certain circumstances, subject to the claim of a third party under a mortgage or other encumberance.

The possible danger to the seller of machinery in a situation of this kind is illustrated in a number of well reasoned cases, among them being the Indiana case of J. H. Day Company vs. Public Savings Insurance Company, 151 N. E. 361. And in view of the facts and holding of this case it becomes a decision well worth a brief review by sellers of machinery and heavy industrial equipment in general.

Machinery Sold on Conditional Sales Contract

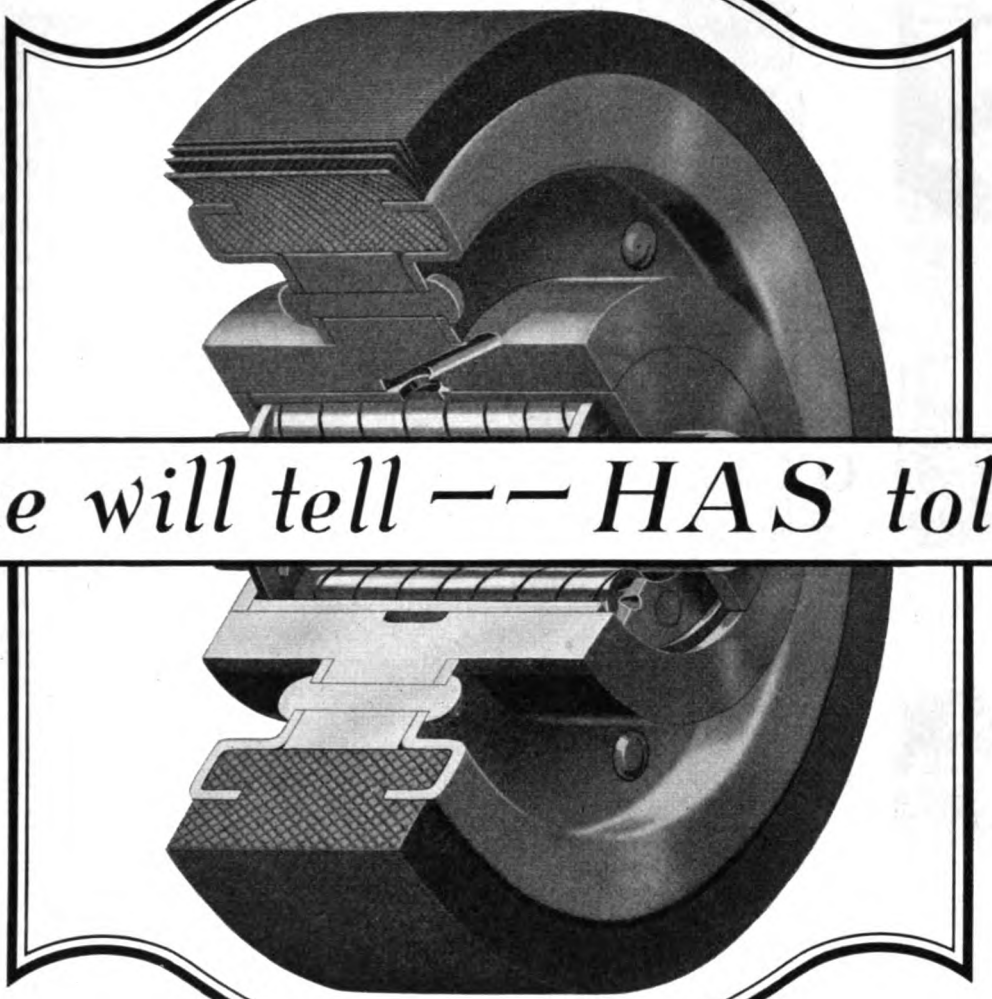
In this case the J. H. Day Company and the Peterson Oven Company both sold the Hudson Baking Company a bill of machinery and equipment, which amounted to several thousands of dollars. This equipment, consisting of ovens, etc., was sold under conditional sales contracts which left the title in the selling companies until the machinery had been fully paid for.

Following the installation of this equipment upon its premises the Hudson Baking Company executed certain notes to the Public Savings Insurance Company. These notes were secured by a mortgage upon the premises, fixtures, machinery, equipment and all personal property upon the premises of the baking company. Thereafter the insurance company brought the instant action upon the notes and to foreclose the mortgage noted above.

In answer to this action the J. H. Day Company and the Peterson Oven Company claimed the title to the machinery they had sold to the baking company, by virtue of their conditional sales contracts. The Day Company claimed an unpaid balance of $7,450, and the Oven Company claimed a balance due of $6,900, so the amounts involved were considerable.

In defense to this the insurance company set up that the machinery involved was attached to the baking company's premises in a permanent manner and was a part

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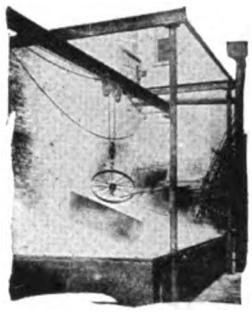
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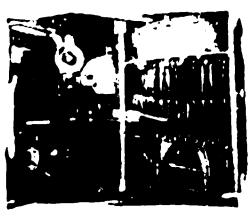
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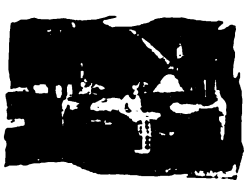
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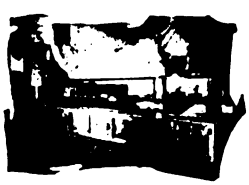
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of the premises; that the loan evidenced by the notes and mortgage was made without knowledge of the claims of title to the machinery on the part of the Day Company and the Oven Company; that in view of which the mortgage should be deemed to cover such machinery and equipment.

The trial of the cause resulted in a judgment in favor of the insurance company. In other words, the trial court held that the evidence did not show knowledge of the claims against the machinery on the part of the insurance company when the loan was made, and that the latter's mortgage claim therefore became superior to the claims of title by the Day Company and the Oven Company. From this judgment the Day Company and the Oven Company prosecuted an appeal to the higher court, and here in reviewing the record in respect to the character of the machinery involved the court, in part, said:

The Language of the Court

"That the machinery, ovens, and equipment were sold by appellants (Day Company and Oven Company) to the baking company with the understanding that the same were to be installed as a part of the baking plant is admitted by each of the appellants . . .

"Further, the character of the property sold by each of the appellants indicate that it was sold for the purpose of being installed by the bakery plant, for it was such property as was suitable only for that purpose. By such installation, under such circumstances, and with such purpose, the machinery, equipment, and ovens became fixtures, and, as such, a part of the real estate involved, and subject to mortgage along with the real estate as a part thereof . . . ."

Following the above review of the record in respect to the character of the machinery, etc., after its installation, the court turned to the contentions of the appellants that their conditional sales contracts should protect them to the title to the property they had sold. In passing upon this phase of the case, the court, among other things, said:

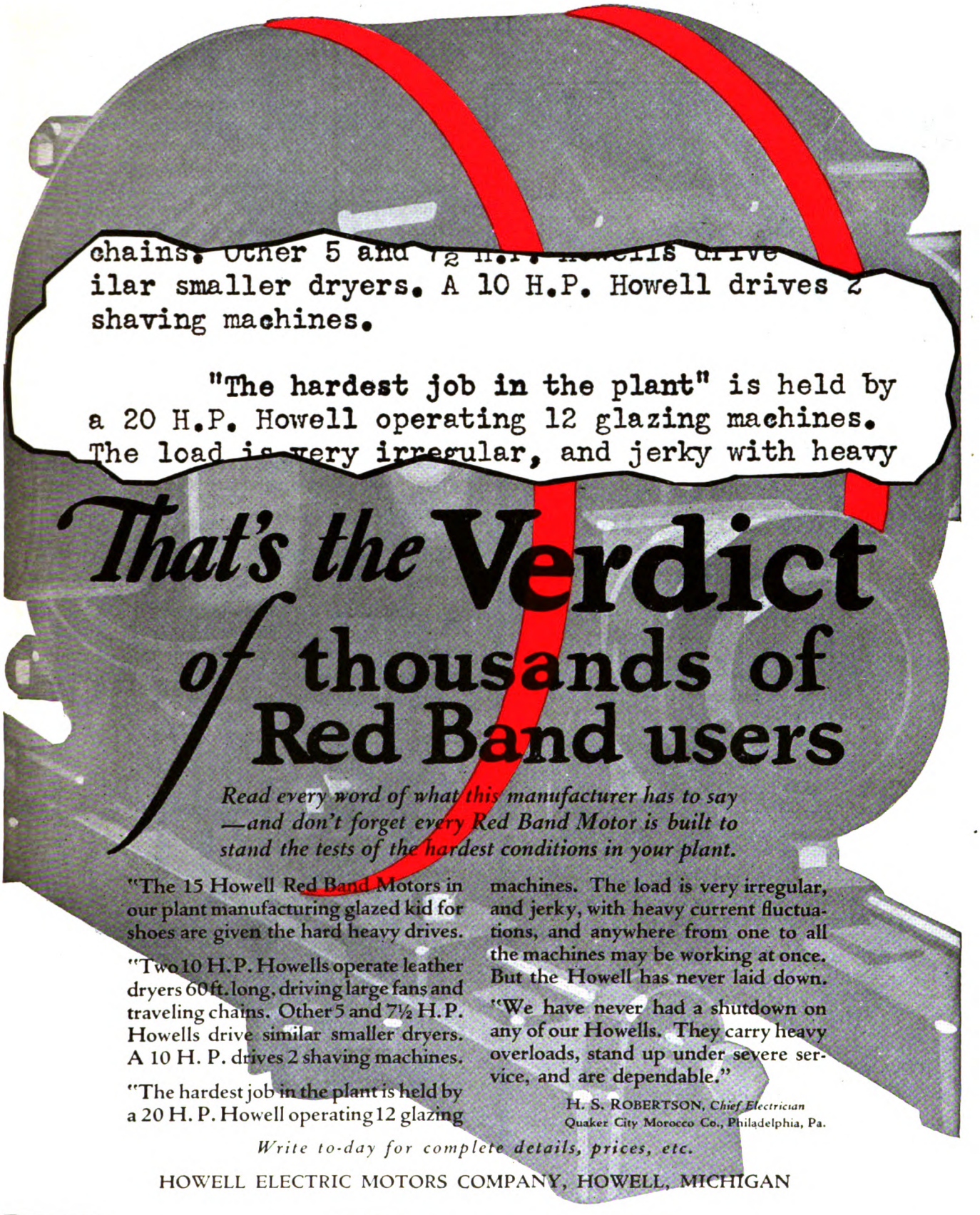
"Appellants contend that the property conditionally sold to the baking company remained personal property, not only as between the vendor and the vendee, but remained the personal property of the appellants as against the world, including appellee insurance company, and hence was not subject to appellee's real estate mortgage, but we do not understand this to be the law.

"It may be conceded that it is the law of this state that generally the title to property sold under conditional sale contract remains in the vendor until the terms of the contract are complied with, and that this is the law, as between the vendor and the vendee, although such property has been annexed to the soil.

"But with this concession it does not follow that appellant can recover as against appellee insurance company, where, as here, the property was sold to be installed in the bakery plant that was a part of the real estate, and where it was actually installed therein and used as a part thereof, unless appellee had notice of such conditional sale contracts, for appelants thereby aided in clothing the mortgagor with apparent title . . .

"And this principle of law also applies to such parts of the property sold on conditional sale contracts as are not physically annexed to the real estate, but which are necessary to the operation of the machinery and equipment which are physically attached . . . Whether appel-

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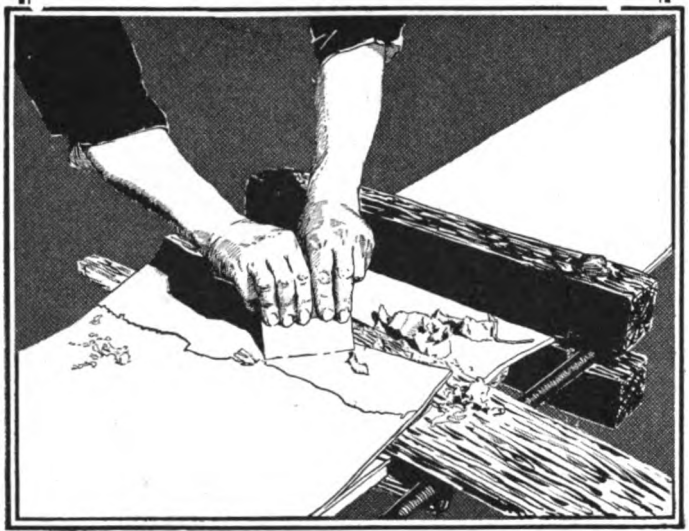
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lee had knowledge of the conditional sale contracts was a question of fact for the court, which on contradictory evidence, was found against appellants . . ."

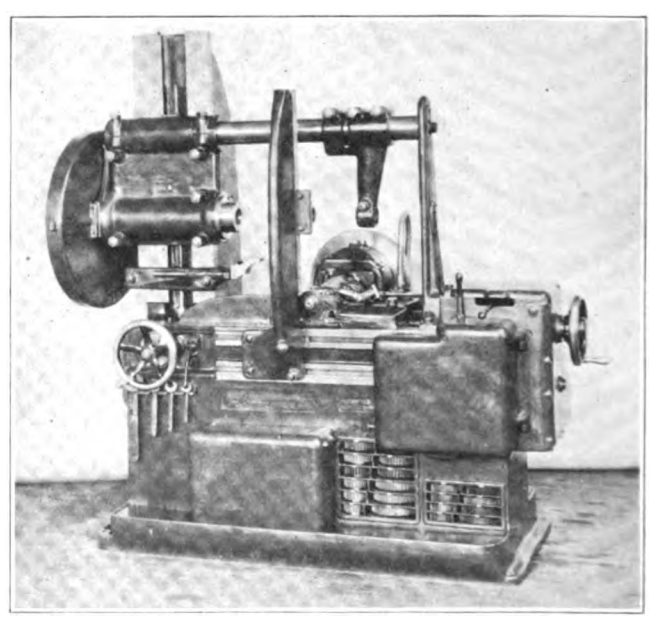
Summary

In conclusion the court, after passing upon other points not material here, affirmed the judgment in favor of the insurance company rendered by the lower court. Holding, as outlined in the opinion, that upon the facts of record the insurance company was entitled to claim the machinery along with the real estate as security for its loan, in view of the fact that the machinery had become a part of the plant mortgaged, and since the mortgage had been taken without knowledge that the machinery had been sold on conditional sale contracts.

The foregoing case is obviously one of force and value on the question decided. And, in view of the facts and holding, this decision illustrates in a striking manner how, under certain circumstances, a title retention contract may fail to protect the seller where the article sold consists of heavy industrial equipment, and becomes a part of the real estate of the buyer. Truly this case is one that sellers of equipment of this kind may well have in mind, when operating under a sales policy based on conditional sales contracts.

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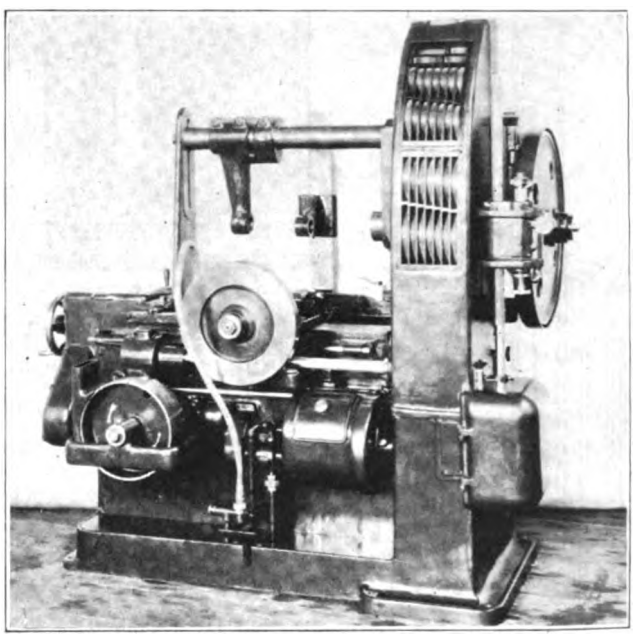
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is securely fastened to the bed of the machine and to the feed case. An upright support, sliding on ways on the front of the bed, takes all work up to the full capacity of the machine.

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The feed screw which operates the cutter slide has been increased in diameter to give greater durability. The index worm shaft has also been increased in size



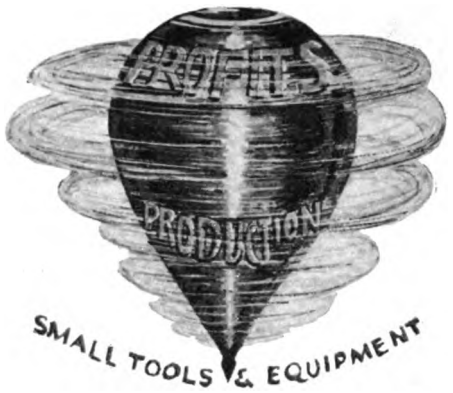
and provided with a heavier index work bracket. To provide a means of compensation for wear, the outer bearing of the cutter spindle has been provided with a tapered bronze bushing.

These improvements, the manufacturers claim, have aided in increasing the general productivity of the machine and greatly added to its ability to handle heavy work with accuracy.

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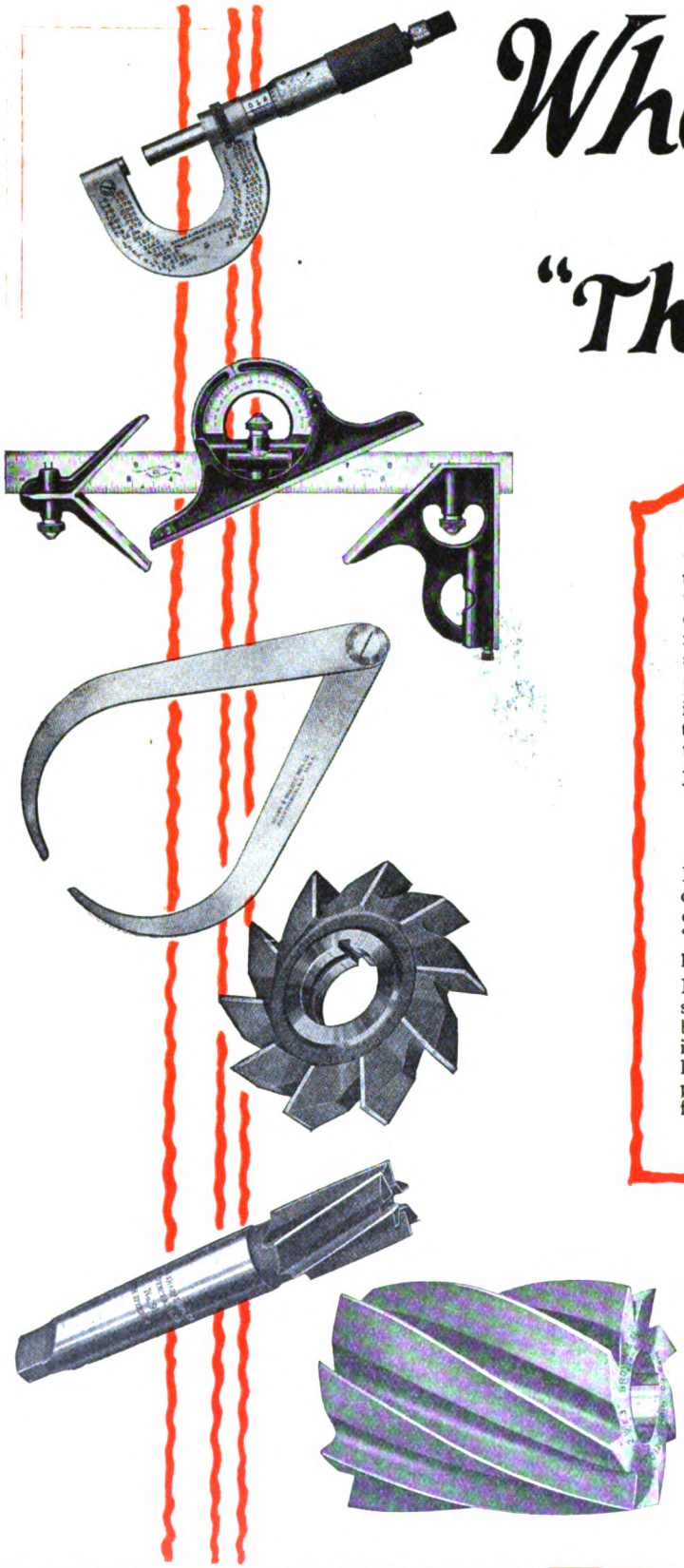
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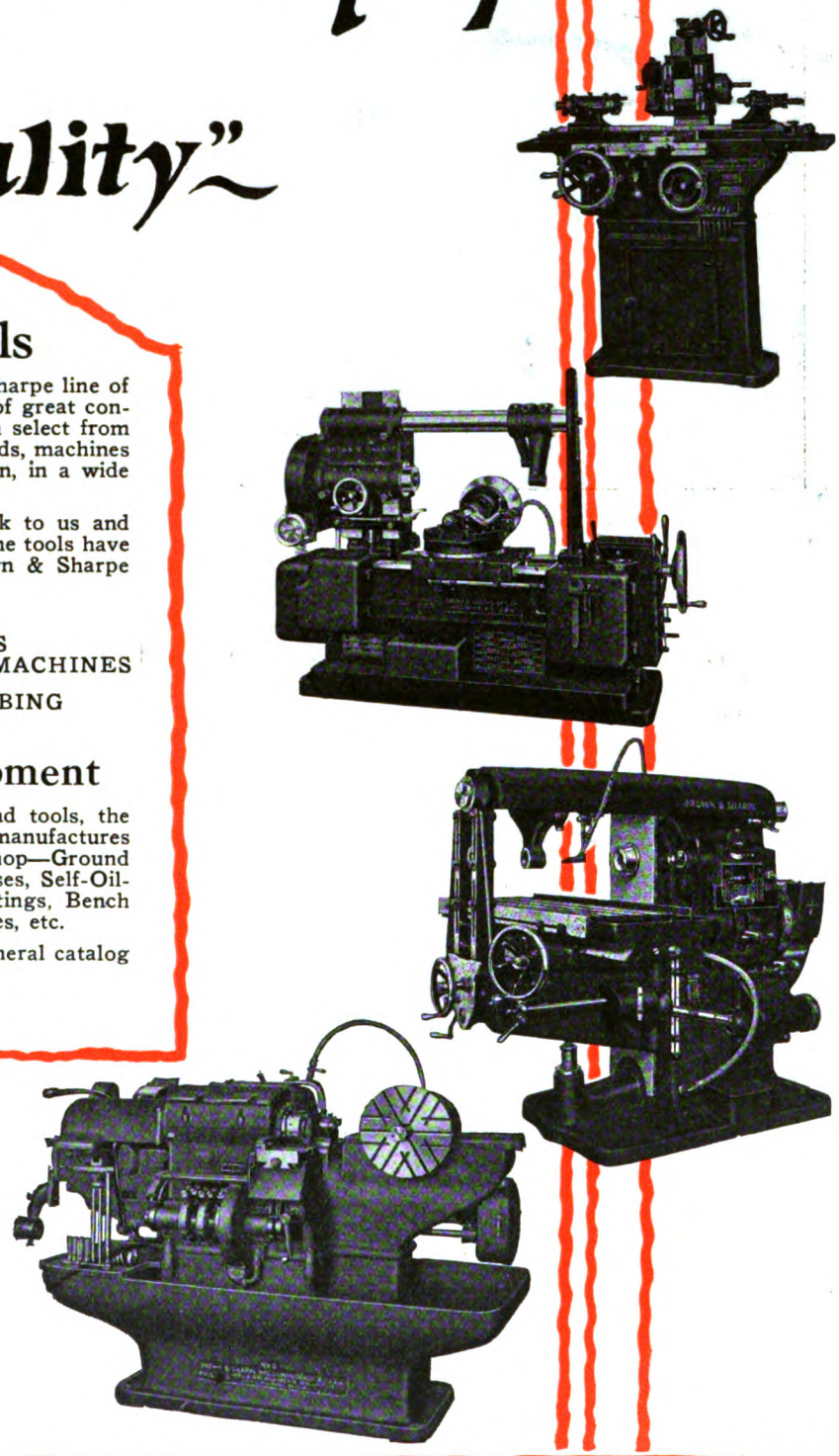
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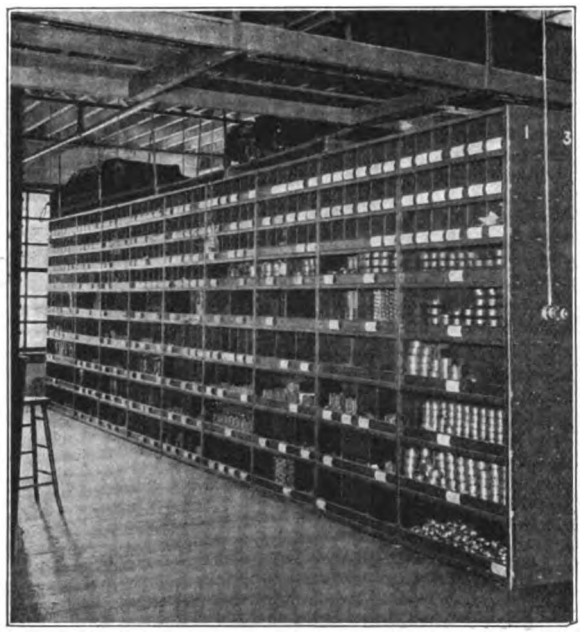
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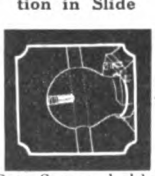
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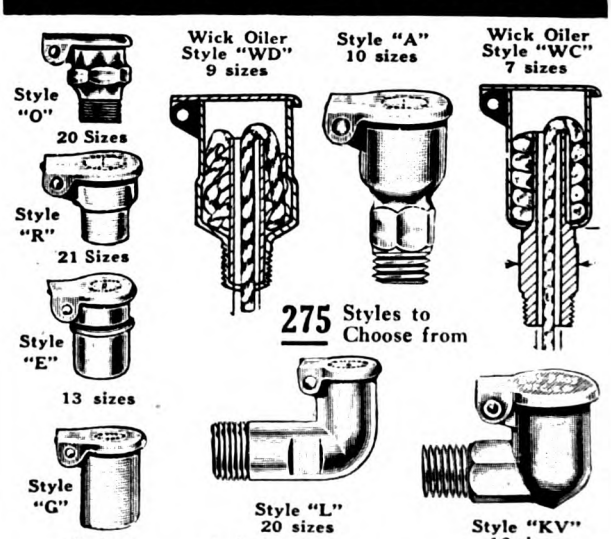
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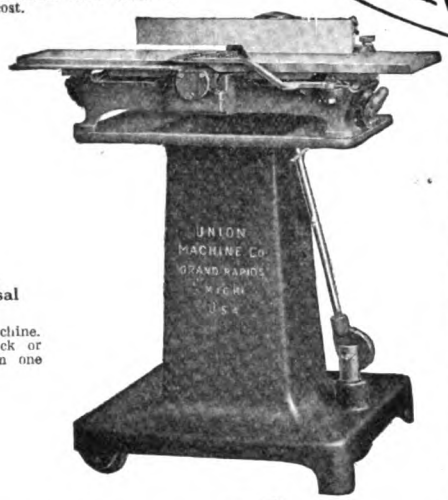
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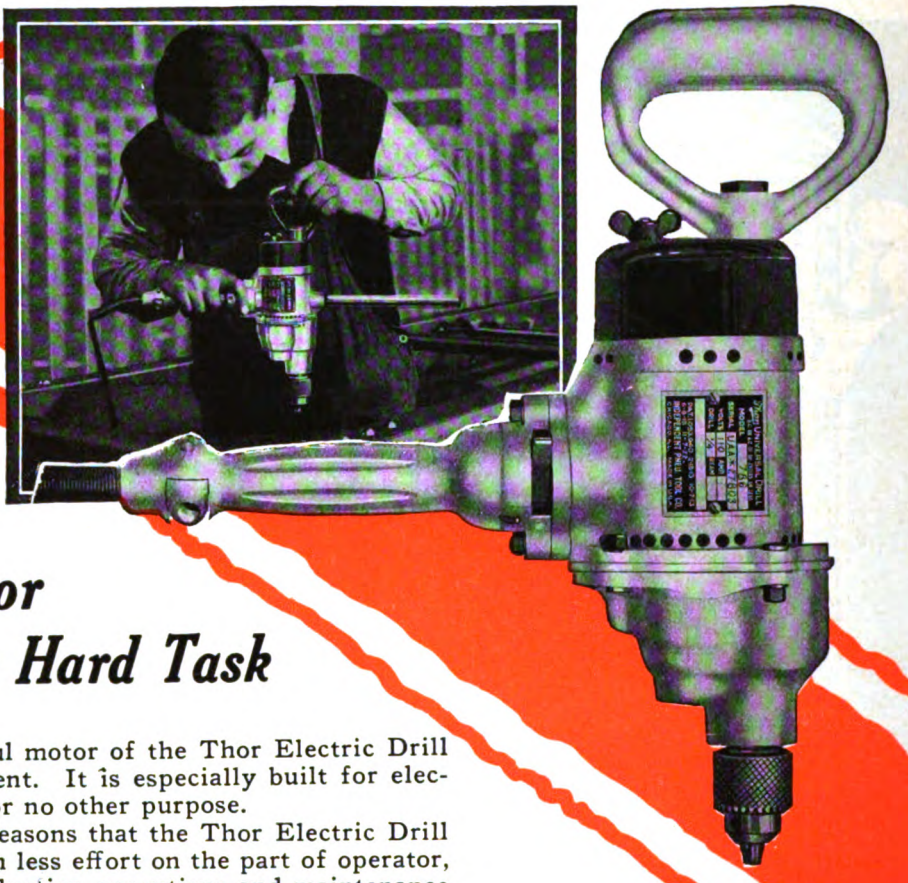
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ELECTRIC DRILLS

with the Motor Built for any Hard Task

The sturdy, powerful motor of the Thor Electric Drill is a bear for punishment. It is especially built for electric drill duty—and for no other purpose.

That is one of the reasons that the Thor Electric Drill can do more work with less effort on the part of operator, and why so many production executives and maintenance men insist on the Thor.

Thor Drills are exceptionally safe. There is a ground wire which prevents shocks, and besides there are no exposed wires.

Write for complete details and circulars which illustrate and describe the features which cut drilling costs.

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ELECTRIC DRILLS

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For SPEED EASE and DEPTH of CUTTING

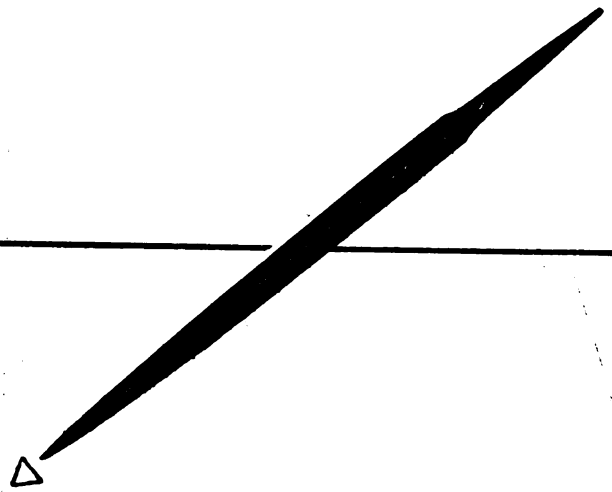


USE SIMONDS FILES

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The Results of a

Century's Experience



THE Grobet Swiss File was first manufactured in Vallorbe, Switzerland, 112 years ago.

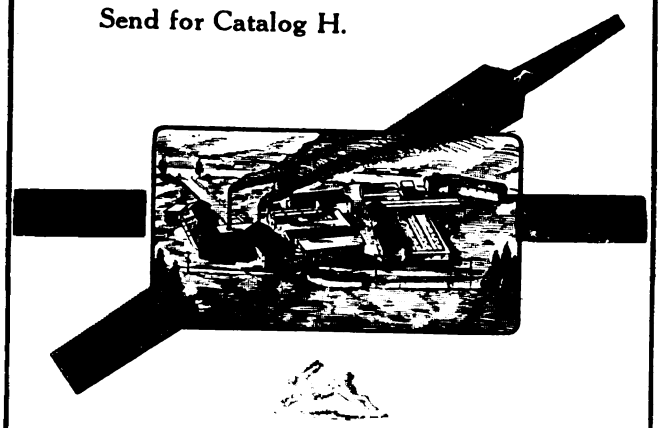
They were about the only file manufacturers in the World at that time, and it has been their object through the Century to make the best possible file.

Master craftsmen in the early days recognized Grobet as the only real file maker, and today the skilled workmen still use Grobet Files where accuracy and precision is vital.

The Grobet File today is still a real Swiss tool and will outlast three ordinary files.

We have a complete stock on hand to meet any requirement.

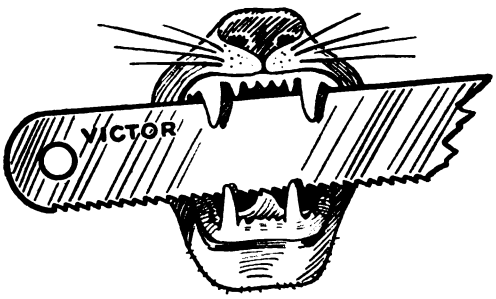
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Teeth that Bite



TEETH that bite without breaking, even when they cut time and time again, through the toughest metal—that is why so many are insisting on Victor Blades.

If you have been in the habit of merely asking for any blade, insist on Victor the next time you order hack saw blades. You will see the difference immediately. Try them out on the toughest jobs and you will realize why they call them the Wonder Blades.

Let us send you free samples of this Wonder Blade.

VICTOR

SAW WORKS, Inc.

Middletown, N. Y.

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—and Now
The Spindle Book

Presenting in compact, concise form our knowledge — acquired through many years of solving chucking problems—of equipment on which drill chucks are used.

Practically every drilling machine is listed here, classified according to style and size, with type, capacity and spindle specifications given for each machine.

Equally complete lists and information about each class of machines on which drill chucks may be used makes our new Spindle Book invaluable to engineer, manufacturer and mechanic.

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Fill In
Cut Out
And Mail

COUPON

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Please send me a copy of your New Spindle Book.

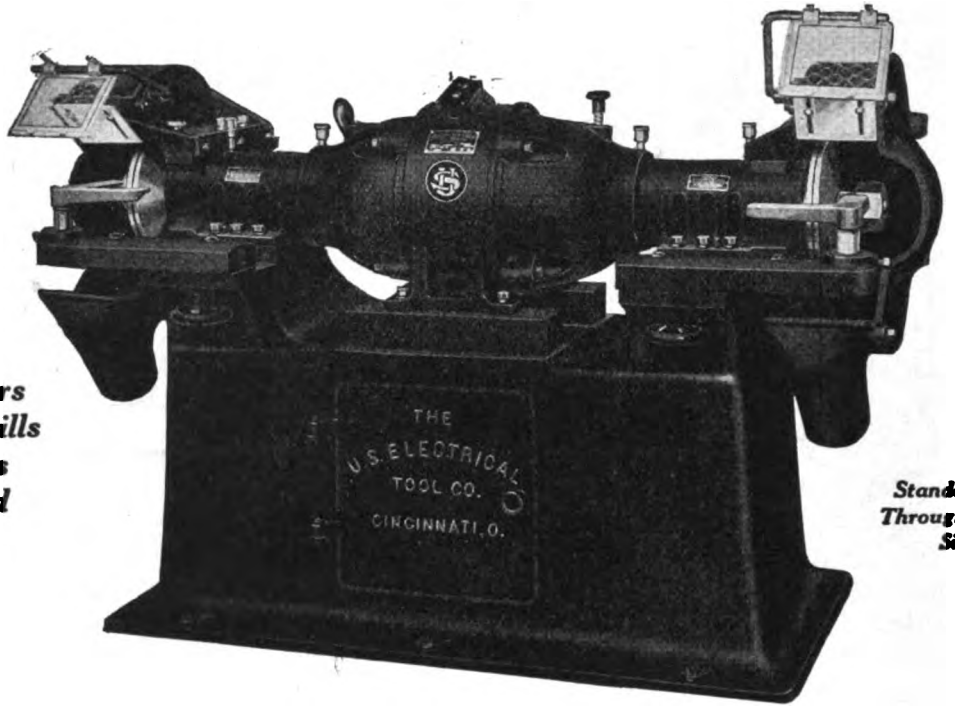
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Made by Oldest Builders of Electric Drills and Grinders in the World



Standard of Quality Throughout the World Since 1897

Fruit of the Most Experience

THE WORLD'S first electric grinder was a U. S.—only one of the electric tools invented and developed by this company. Refinements and improvements in electric tools have always appeared first under the U. S. brand—and the U. S. line still leads.

Take, for example, the U. S. Adjustable Speed Grinder that maintains a constant peripheral speed of 5,500 feet per minute regardless of wheel diameter. Wheels can be used down to the flange without the slightest variation in production or in the quality of work done. There is no grinder made that gives this tremendous advantage because this feature is patented.



If you desire the right tools for the job, built on the best approved design—and in addition, long, unfailing service—equip your plant with U. S. Grinders, Polishers, Buffers, Drills and other tools of this brand, because they are the fruit of the most experience.

Write for Catalog "F"

The United States Electrical Tool Company

Cincinnati, Ohio, U.S.A.



Export Sales Representatives—WESTINGHOUSE ELECTRIC INTERNATIONAL CO.—150 Broadway, New York, N. Y.

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Not Just Tools —*but Service*

A tool may be made of just a piece of hardened steel; it will look quite all right, and will stand up for a certain time. But the real test of metal working equipment lies in its ability to turn out the day's run of hard work, and to continue to turn it out accurately indefinitely.

That is the kind of tool that carries the name "Morse." Its quality is built into it for maximum service.



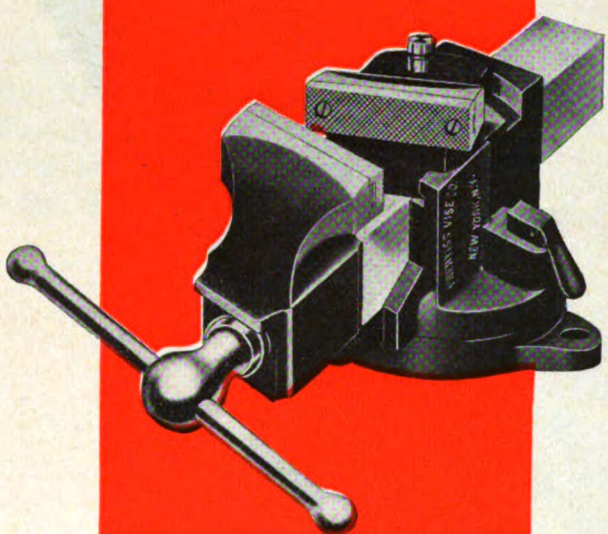
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MORSE

TWIST DRILL & MACHINE CO., NEW BEDFORD, MASS.

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The Prentiss -a man's vise



THERE'S nothing frail or weak about a Prentiss Vise. It's built to stand plenty of rough stuff. In short, it's just the vise to resist all the mauling that goes with good hard work.

A Prentiss is distinguished by its castellated collar fastening which replaces the usual set screw arrangement. It positively prevents the front jaw from working loose, and can be found on no vise but a Prentiss. Besides this, there's the drop-forged lever with ball ends an integral part of it; and the sliding bar machined on all four sides to .002" tolerance — every single feature a boost for greater strength and longer life.

A man is bound to like a Prentiss Vise — it's just his idea of all a good vise ought to be.

PRENTISS VISES

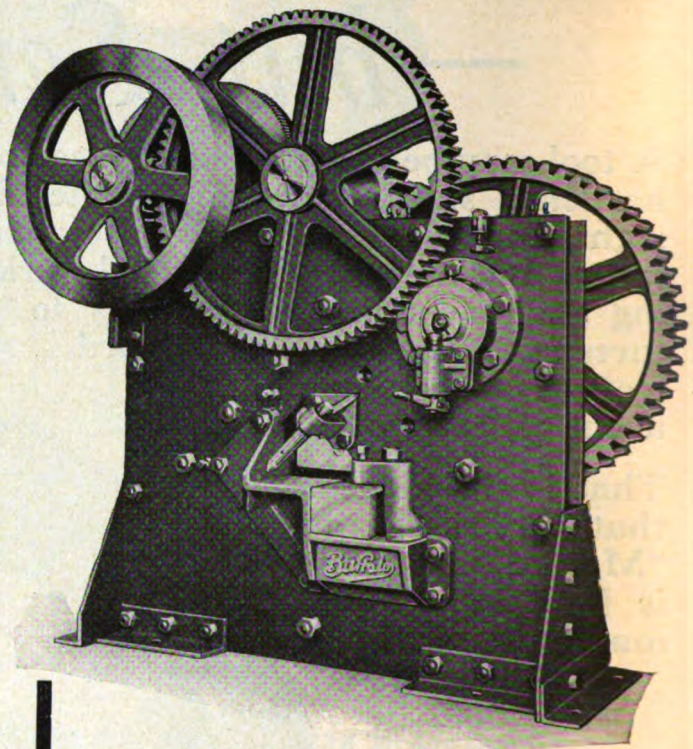
PRENTISS VISE CO.

106-110 LAFAYETTE ST. NEW YORK CITY

CHENEY HAMMERS

115

FOR SALE



"Buffalo" 8" Single End Angle Shear

We have in stock at our factory at Buffalo a new 8" Armor Plate Single End Angle Shear. This machine is equipped with knives for cutting angles up to 8" and may be equipped with knives for cutting beams, channels, tees, and other sections, at slight cost.

A Bargain

For the concern requiring a machine of this type, this Buffalo Bar Cutter will be a bargain. Write or wire for complete data and prices.

Also several other types of machines ready to ship—

Various other New Machines can also be shipped from stock—bar cutters, shears, punches and combination machines, bending rolls.

Wire or write for details

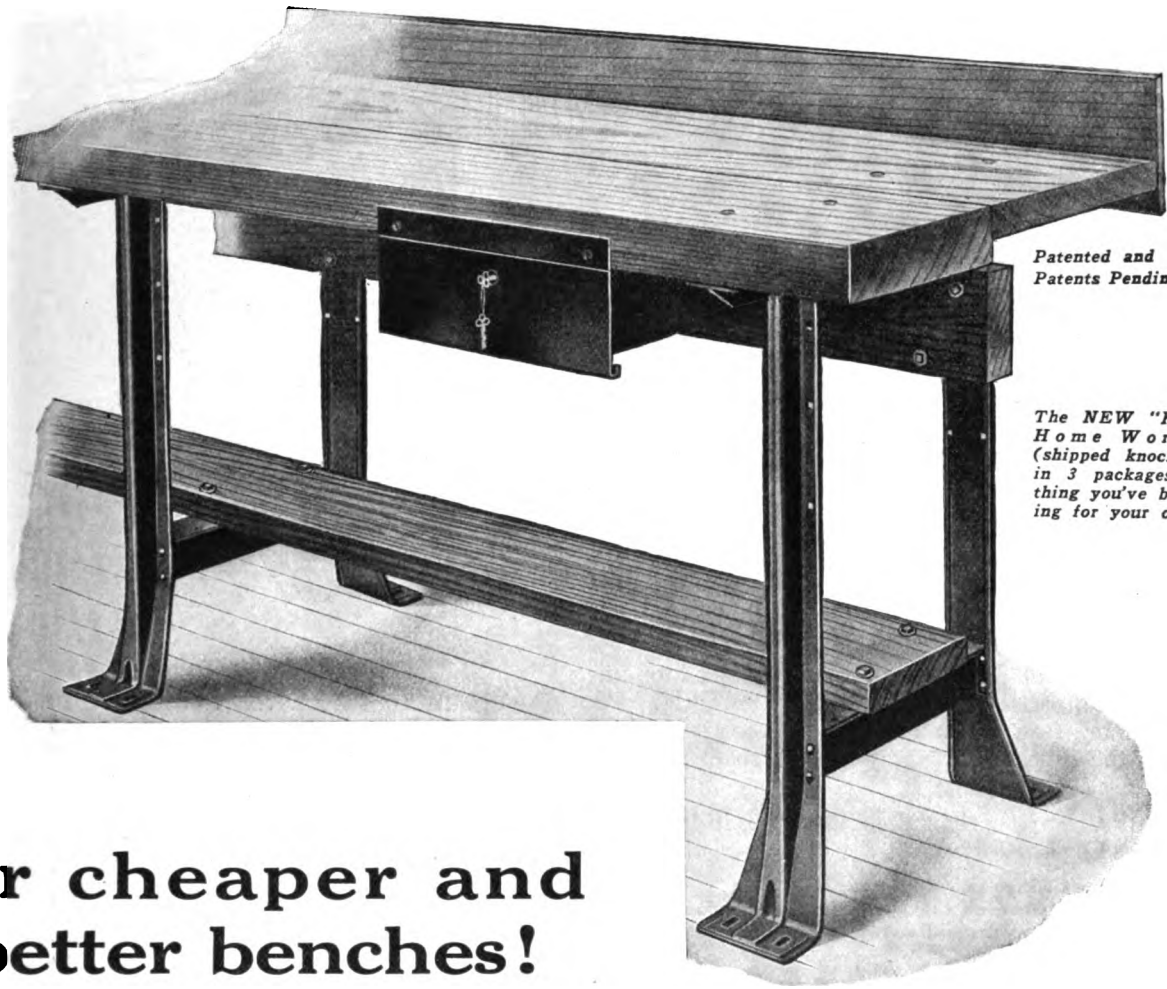
Buffalo Forge Company

440 Broadway, Buffalo, N. Y.

In Canada: Canadian Blower and Forge Company, Ltd., Kitchener, Ontario

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"HALLOWELL" Steel Bench Legs



Patented and Patents Pending

The NEW "Hallowell" Home Work Bench (shipped knocked down in 3 packages) is the thing you've been wanting for your own home.

for cheaper and better benches!

Build your benches with "Hallowell" Steel Legs and then equip them with "Hallowell" Steel Bench Drawers. That's the one sure way to have strong and rugged benches that will really last—and at a price that shows an immediate saving, too.

"Hallowell" steel-legged Benches actually cost less to build than wooden benches and last much longer—besides, they are easily moved and never come apart.

Another great feature about "Hallowell" Steel Bench Legs is that you can pick them up from stock—exactly as wanted and just when needed. That's service!

Every bench should be equipped with a "Hallowell" Steel Bench Drawer. They're strong, fire and dust-proof and may be equipped with a sliding tray that is most convenient for smaller tools.

Standard Pressed Steel Co.

Box 8 Jenkintown, Pennsylvania

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The New

Ettco

Keyless, Ball Bearing
DRILL CHUCK



In the New Ettco Keyless Self-Tightening Drill Chuck *all parts are now hardened.* This chuck has a continuous grip—does not depend upon the operator to tighten sufficiently to hold the drill. Close the chuck by hand, the chuck takes its grip after the work is started.

As the drill point goes deeper, the load on the chuck increases and so does the Ettco grip. Put on more feed, strike a hard spot, increase the load on the chuck in any way and the Ettco grip increases.

No matter how tight the Ettco grip, it can be released by hand—just a twist of the wrist.

1. **Less slippage.**
2. **Less wear on the Drill Shanks and Jaws.**
3. **Reduces the maintenance cost and no keys to buy.**

Features of the New Ettco Chuck:

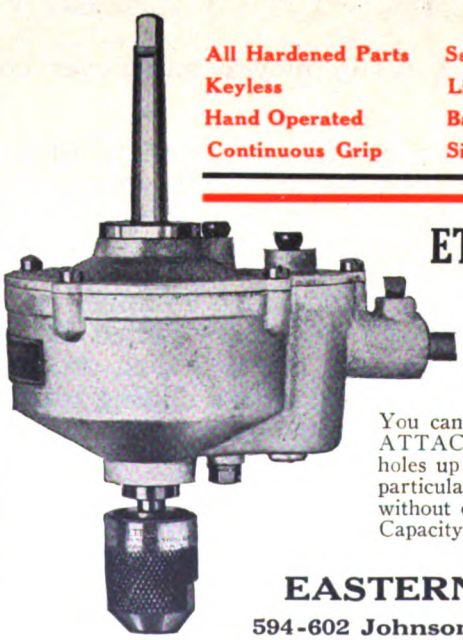
All Hardened Parts	Self-Centering
Keyless	Lighter Weight
Hand Operated	Ball Bearing
Continuous Grip	Simple Construction

Prices:

No. 1A Ettco.....0 to ¼-in.	$5.50
No. 1½A Ettco (New Size), 0 to 5/16	6.00
No. 2A Ettco.....0 to ⅜	6.50
No. 3A Ettco.....0 to ½-in.	9.00
No. 3½A Ettco.....⅛ to ⅝-in.	11.00
No. 1 Morse Taper Shank.....	$ .75
No. 2 Morse Taper Shank.....	.75
No. 3 Morse Taper Shank.....	1.00
No. 4 Morse Taper Shank.....	1.50
½-in. and 41/64-in. Straight Shank....	1.00

All Ettco Drill Chucks take drill 1/64—in. over capacity of chucks. Use Ettcos on Electric Drills.

Information required to equip Electric Drills—Size of Electric Drill and manufacturer's name.



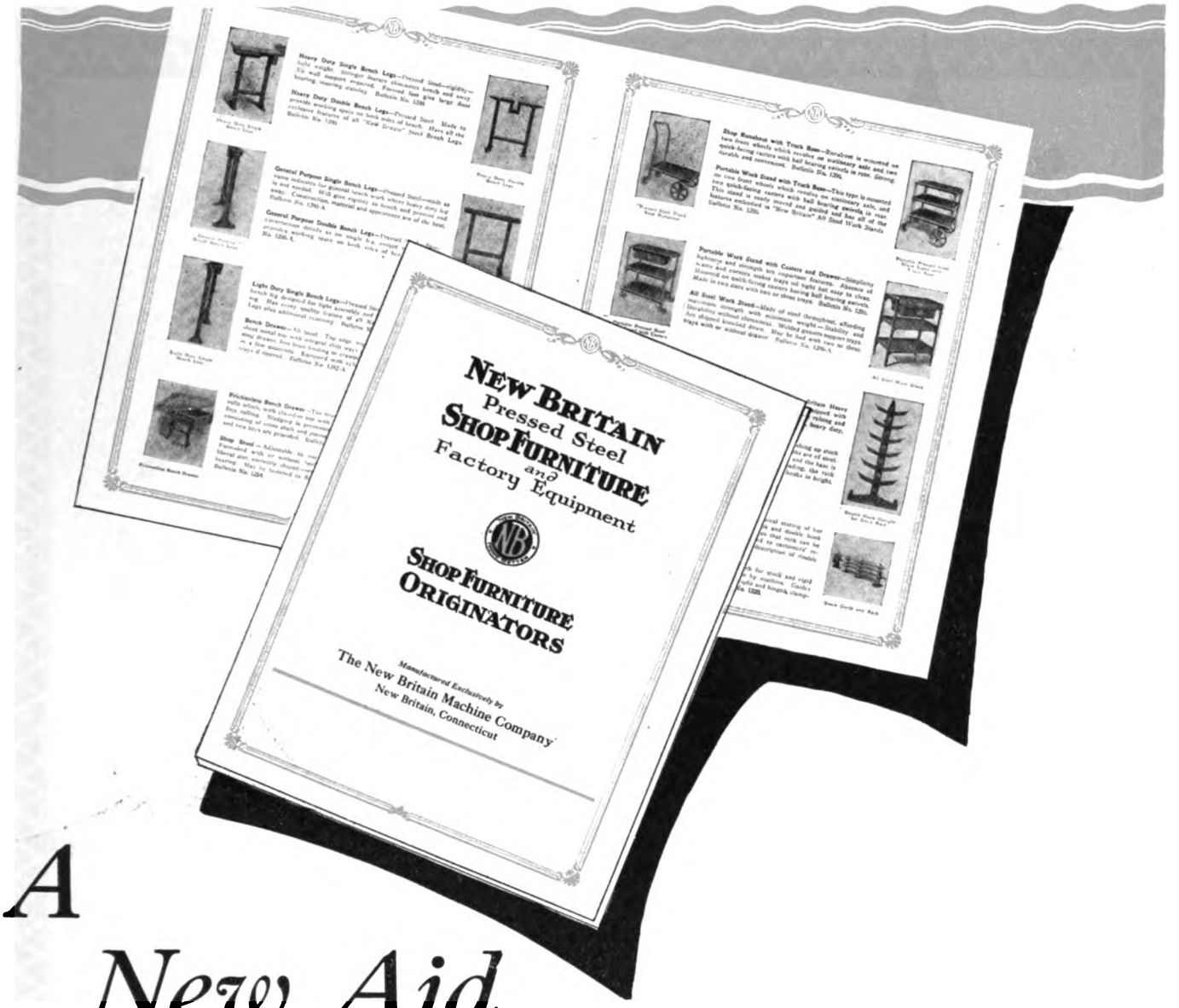
ETTCO High Speed Tapping Attachments

Tap Small Holes as easily as you drill them.
Tap Small Holes 2 or 3 times faster than usual.
Wear Out those Small Taps you are now breaking.

You can do all these things with the ETTCO HIGH SPEED TAPPING ATTACHMENT. Cased in Aluminum it is especially designed for tapping holes up to 1/4" diameter. ETTCO Tappers increase production enormously, particularly where used with "gun" taps. Put one on your work for ten days—without obligation. Then, if you can spare the ETTCO, it may be returned. Capacity to 3/16" in steel, 1/4" in cast iron or brass. Price, $35.00.

EASTERN TUBE & TOOL COMPANY, Inc.
594-602 Johnson Avenue **Brooklyn, N. Y.**

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A New Aid to Increase Production

THIS booklet, just off the press, will give you some practical advice in the selection of up-to-the-minute shop furniture.

It will show you why the proper benching produces maximum production and lessens fatigue—it will tell you why special conditions call for special furniture, etc.

The coupon will bring you one of the booklets immediately. Send it in today.

THE NEW BRITAIN MACHINE COMPANY
New Britain, Conn.
U. S. A.

"Shop Furniture Originators"

Tear off This Corner

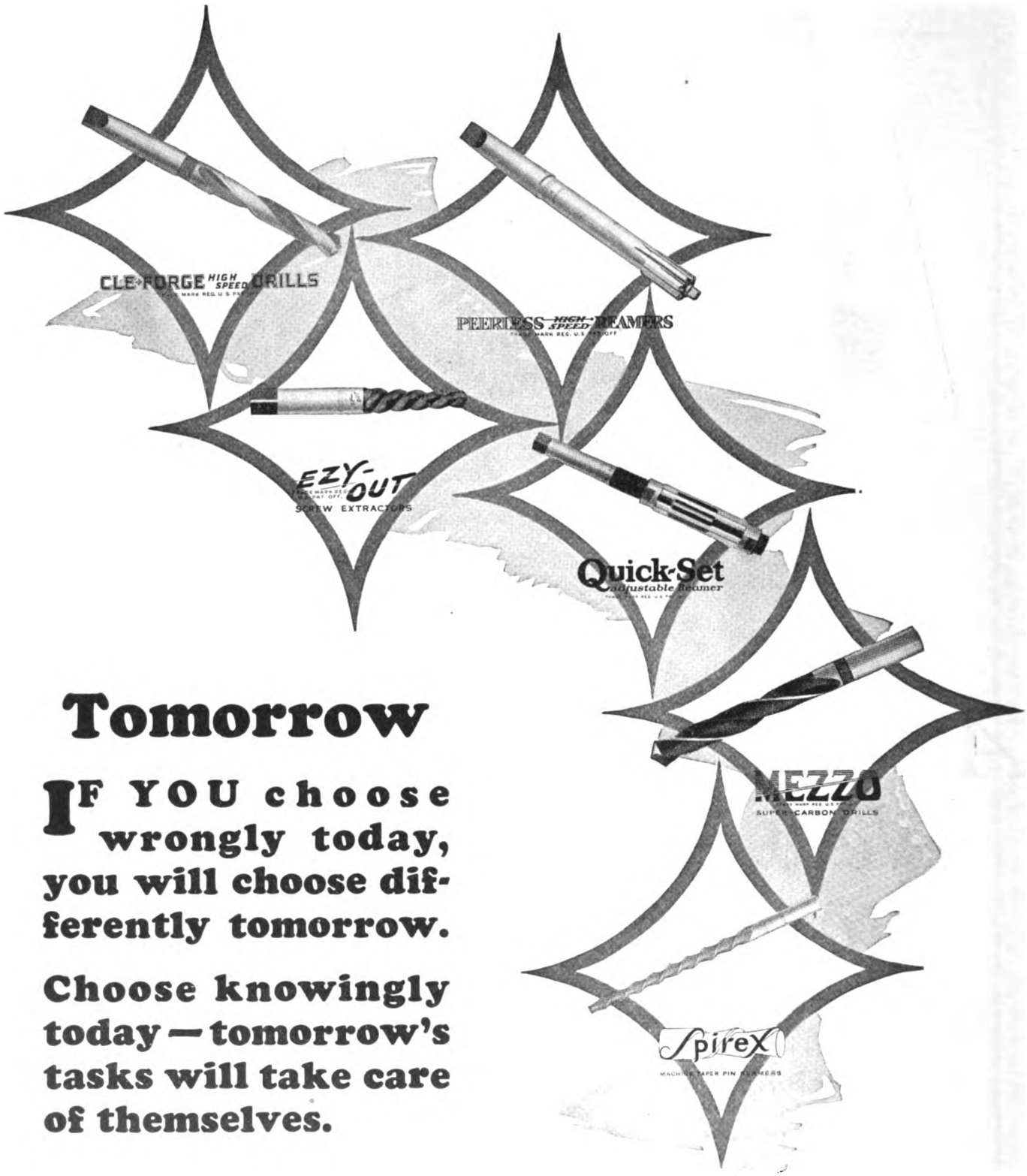
THE NEW BRITAIN MACHINE COMPANY,
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IF YOU choose wrongly today, you will choose differently tomorrow.

Choose knowingly today—tomorrow's tasks will take care of themselves.

The CLEVELAND TWIST DRILL COMPANY
CLEVELAND
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TRADE MARK REG. U.S. PAT. OFF. AND FOREIGN COUNTRIES

Manufacturers of **Carbon and Cle-Forge High Speed Drills for every purpose; "Mezzo" Super-Carbon Drills; Hand, Jobbers' and Shell Reamers; "Peerless" High Speed Reamers; "Paradox" Adjustable Reamers; "Quick-Set" Reamers; "Spirex" Machine Taper Pin Reamers; Chucking Reamers for Turret Lathes; Counterbores; Countersinks; Sockets; End Mills; and the "Ezy-Out" Screw Extractor.**

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For Easier, Better, Simpler Pipe Threading



THERE are "Chevrolet" stocks and "Dodge" stocks and "Hudson" stocks, but here's a stock that's in the class with Packard and Pierce Arrow and other cars that head the quality list. That is, it's in this class in everything but price.

Priced for the man who needs to economize, yet designed to satisfy the man who takes pride in his work, the better built, better finished, easier cutting Oster Receder in both plain and ratchet models, is guaranteed to outlast *two* ordinary tools.

The greater rake and sharper cutting angle of its dies put accurate, leak-proof threads on the toughest kind of pipe with half the pull required by old fashioned die stocks. Try one at your supply house, or mail the coupon below for complete information.

OSTER

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Manufacturers of the most complete line of pipe threading equipment in the world

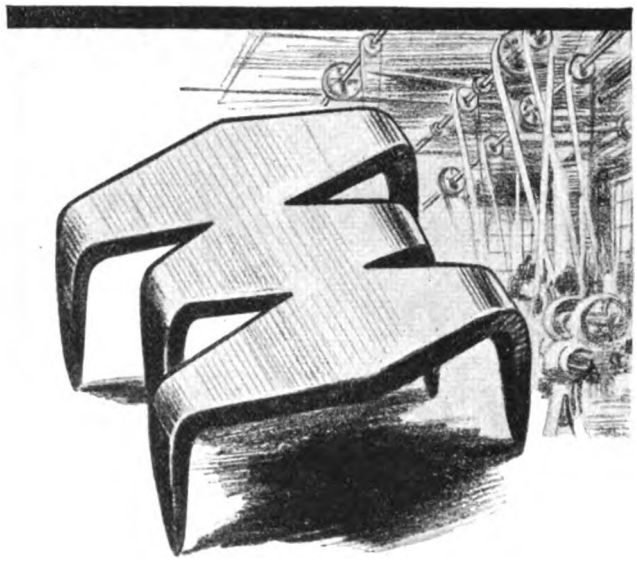
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Please send me List No. 47 showing prices and full details of this easy cutting die stock.

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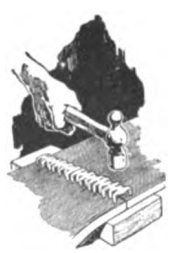
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Broken belts cause but little delay in shops where Bristol's steel belt lacing is used.

Joining belts with Bristol's is simple and quick. There is no time wasted looking for a lacing machine or for an expert lacer. A few fasteners and a hammer are all that's necessary, and these can always be kept handy.

The Bristol way is ideal in emergencies, for there is no sacrifice of quality or strength for speed. Without experience, anybody can make a strong smooth joint. Bristol's are made of cold rolled steel and will hold as long as the belt lasts.

Send for Folder



A hammer is all you need

Bristol's fasteners (name stamped on each) are a staple article at most mill supply houses. Write for Folder CE-719 about the Bristol method and prices; samples, too, if you wish. The Bristol Co., Waterbury, Conn.

"We will exhibit, at the sixth annual New Haven Machine Tool Exhibition, September 7, 8, 9 and 10th."

BRISTOL'S STEEL BELT LACING
PATENTED

for every Woodworking Requirement These Handy Portable Units are more Economical than massive machines—

H & A

Portable Electric

Saws and Jointers



No. 5 Swing Saw

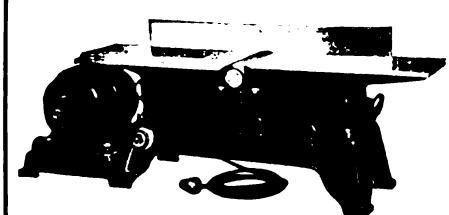


No. 1 Band Saw

These portable tools will do the same work as the big floor machines and yet they cost one-third to one-quarter the price of a big machine.

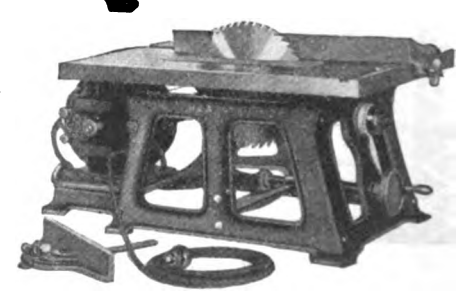
For the busy plant that has many woodworking jobs, the H & A Machines are worth while investigating. Each machine is well built, light in weight and is a self contained unit. They can be moved from one part of the plant to another in a moment's time. It has all the important features of the big machines and will do the work as efficiently.

Write for complete details and prices.



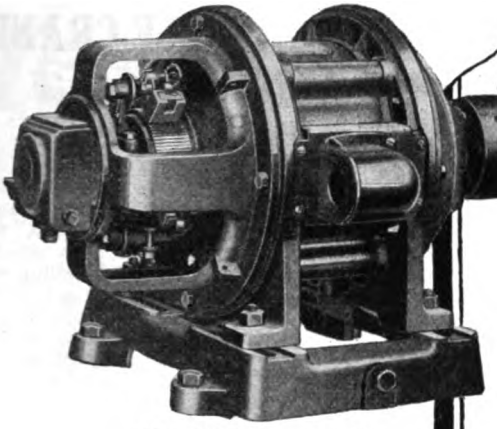
No. 6 Jointer
6" Knives
½ H.P. Motor
Ball Bearing

No. 8 Rip Saw
8" Saw
½ H.P. Motor
2½" Capacity



HESTON & ANDERSON
613 W. Depot Ave.
Fairfield, Iowa

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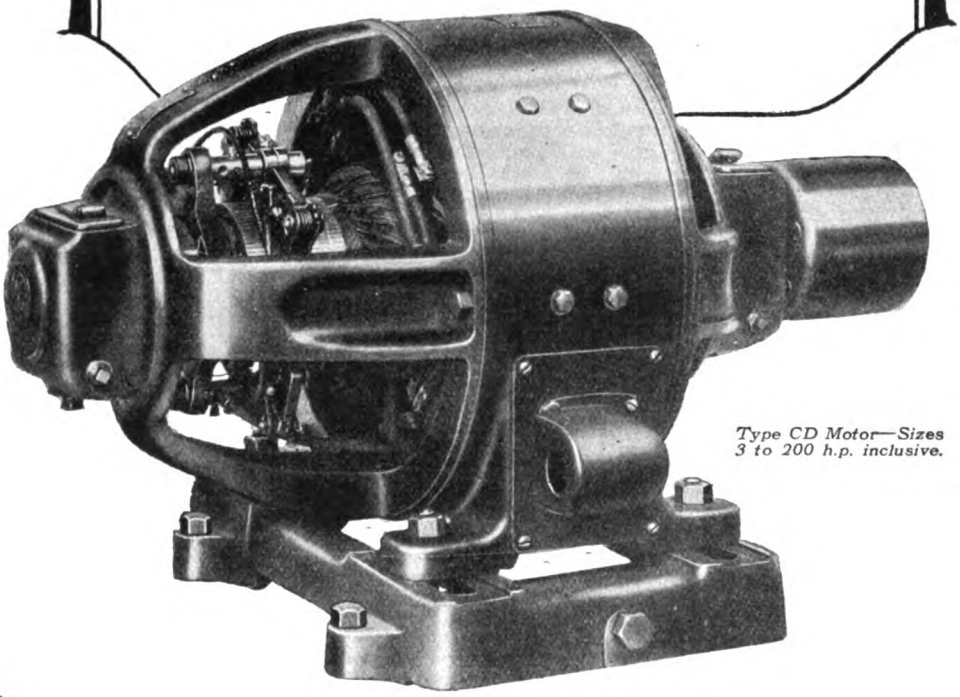
Type BD Motor—Sizes ½ to 3 h.p. inclusive.

Two good factors in your factory

Types BD and CD Motors are the embodiment of forty years' experience in the design, manufacture, and application of direct-current motors. This experience results in multiple refinements of detail, and guarantees a product of balanced excellence.

New features combined with the best characteristics of previous designs give the Type BD and Type CD Motors enduring mechanical and electrical fitness to withstand heavy duty.

Nation-wide stock, warehousing, repair, and service facilities make it easy for you to obtain full value from your investments in direct-current motors. Ask your nearest G-E office—or G-E Motor Dealer.



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Apply the proper G-E Motor and the correct G-E Controller to a specific task, following the recommendations of G-E specialists in electric drive, and you have G-E Motorized Power. "Built in" or connected to all types of industrial machines, G-E Motorized Power provides lasting assurance that you have purchased the best.

MOTORIZED POWER
-fitted to every need

8B-4

GENERAL ELECTRIC

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Teeth that Rip, Slash and Tear

LENOX WOLVES

ALONG the Southern shores of Loch Lommond, where the lowland pastures meet the first sweeping hills of the Highlands, countless sheep bones bearing the marks of strong, savage, ruthless teeth lie mouldering under the dust of several centuries.

The teeth that were responsible, . . . that became in their time the scourge of the shepherd's existence, were the teeth of the old "Wolves of Lenox."

The modern "Wolves of Lenox" also tear and slash and rip their way, . . . but they are welcomed by factory managers. Their task is to rip their way through the toughest jobs.

Perfectly fashioned for all sorts of work,—built of carefully selected steel,—each one thoroughly inspected before being packed,—Lenox blades are absolutely reliable for uniform performance.

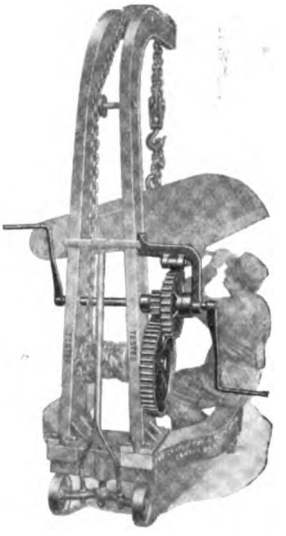
You can get them almost anywhere and they are easy to identify; for these "Wolves of Lenox" ask for the "Blades in the Plaid Box."

AMERICAN SAW & MFG. CO.
Springfield, Mass.



The "CANTON" PORTABLE CRANE

Does the work of six men, and in less time, too



The "Canton" Portable Crane, known as the "Handiest Tool in the Shop," is indispensable for the quick and economical handling of those heavy and awkward loads. It's an easily handled Hoist that goes quickly to parts of your shop where nothing else can reach.

Those who are using it tell us this "Handy Tool" does away with the six and eight man job—it saves them no end of time and labor—and that they wouldn't be without it for many times the cost.

These Cranes are made in various sizes and capacities and when desired, can now be furnished with the NEW SAFETY FRICTION LOAD BRAKE shown on illustration.

Shipped on thirty days' trial.
All good jobbers handle them.
Write for price and descriptive catalog IN.

THE CANTON FOUNDRY & MACHINE CO.
CANTON, OHIO
New York Office, 203 E. 15th Street

ALL STEEL Schick FIRE-PROOF **Balers**

Hand or Power Types

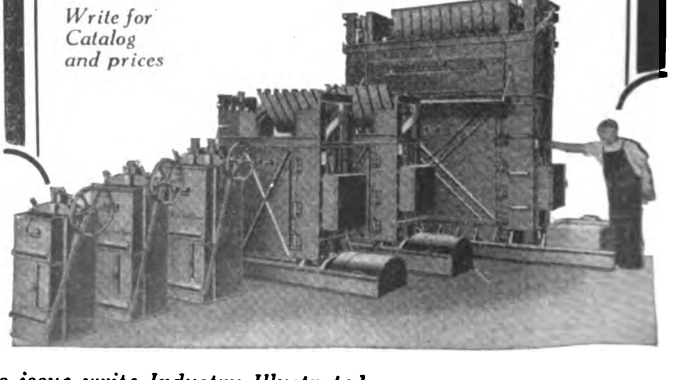
An economic necessity in every business with a daily accumulation of waste paper or other scrap material, or whose product involves a problem of baling to prepare it for marketing.

A size for every need

Regardless of requirements, there are Schick Balers to exactly meet the needs. Indispensable for handling waste paper, rags, cloth clippings, excelsior, wood or steel shavings, clothing, overalls, blankets, etc. All steel construction; fireproof and fool-proof; indestructible and positive in operation. Power balers 350 to 1,500 pounds capacity; hand balers 125 to 375 pounds.

DAVENPORT MFG. CO., Inc.
Dept. R DAVENPORT, IOWA

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"Yes—We can Build it for you!"





CUSTOMERS of the Domestic Electric Company buy not a product, but an engineering service of which the product is only a part.

Before an order for Domestic fractional horsepower motors is placed, before a penny is spent, our engineers study the appliance or machine for which it is to be built; investigate the market it is to serve; determine the conditions under which it must operate; take into account every special requirement of current, starting torque, operating load, temperatures and speeds.

These same engineers supervise, in our own laboratories, development of the special Domestic motor that exactly meets every requirement. Personally, they supervise its construction, and test it under practical operating conditions. They lay down the specifications by which it is manufactured.

And after a motor is in production, these same men, serving as our field engineers, are in contact with the manufacturer to fit the application into his production plan—to assure perfect installation and trouble-free service.

Scores of new and improved applications for electric motors have been developed in the past few years by Domestic Electric research engineers. Their time and energy are at your disposal. A line of inquiry will call them into your factory for a frank discussion of motor applications to your specific production and selling problems.

THE DOMESTIC ELECTRIC COMPANY
7209-25 St. Clair Ave. CLEVELAND, OHIO

Manufacturers of fractional horsepower motors exclusively

Domestic Electric Motors

CLIP THIS COUPON AND SEND IT

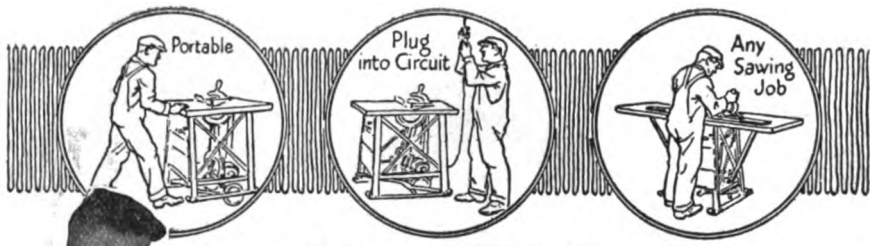
NAME _____

STREET _____

CITY _____

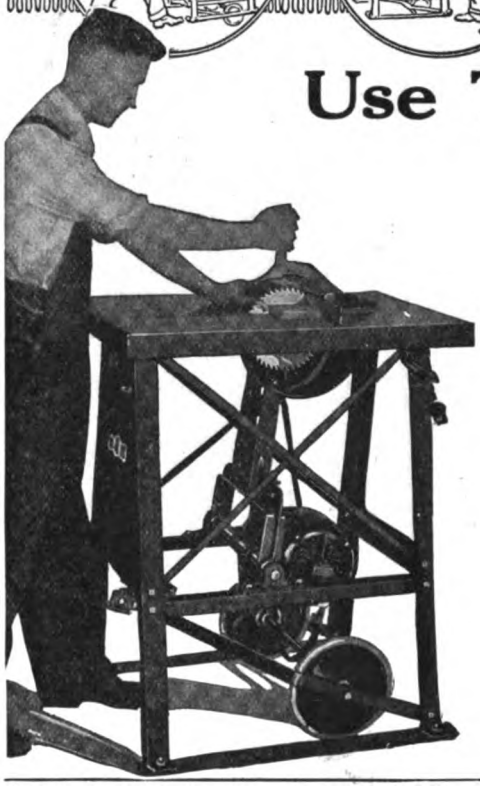
The Domestic Electric Co.
7209-25St. Clair Ave.
Cleveland, O.
(78-I)

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"It Is Portable"

Use This Saw Anywhere



Take It Right to the Job

One of the big advantages of the **Onan "Safty Saw"** is that you can take it anywhere in the plant. Just plug in on the lighting circuit and the saw is ready for immediate use. No delays. No installation charges are necessary.

The **Onan "Safty Saw"** is a compact, complete, all-steel unit run by an electric motor. Easily moved. Nothing to break or get out of order. Use this saw for cutting lumber for crates, packing, rebuilding boxes, shelves, bins, repairing, general carpentry work—any sawing job. With extension leaves, it makes a work bench eight feet long. Works so fast and economically that it soon pays for itself. One man with an **Onan "Safty Saw"** can do the work of 10 men sawing by hand. This is a saving in labor alone of 90%. And you get better work, too. G. Bettner's Sons, Louisville, Ky., say: "Our crates look much better than when we sawed by other methods."

Try at Our Risk!

Get the full facts about the **Onan "Safty Saw."** Read the letters of satisfied users. See how handy and convenient this saw really is. To prove to you the savings you can make, we will send the saw on trial. Write today for descriptive circulars and Trial Offer. No obligations now or later.

D. W. ONAN & SONS
201 Royalston Avenue, Minneapolis, Minnesota

ONAN "SAFTY SAW"

HIGH SPEED
TOOL STEEL

Being the pioneers in this grade of steel we have a grade that will best meet your requirements.



Send for our book on High Speed Steel.

Type MP 5
¼ H. P. Motor



Strand

Flexible Shafts and Equipments

for the

Tool Room
Machine Shop
Pattern Shop
and
Foundry

1/10 to 2 H. P.

Several Types and Sizes

Grinding—Polishing—Drilling—Rotary Filing—Scratch Brushing—Power Screw Driving—Nut Setting and many other operations performed with these machines.

Catalog Upon Request.

Manufactured by

N. A. Strand & Co.

5001 NO. LINCOLN STREET CHICAGO

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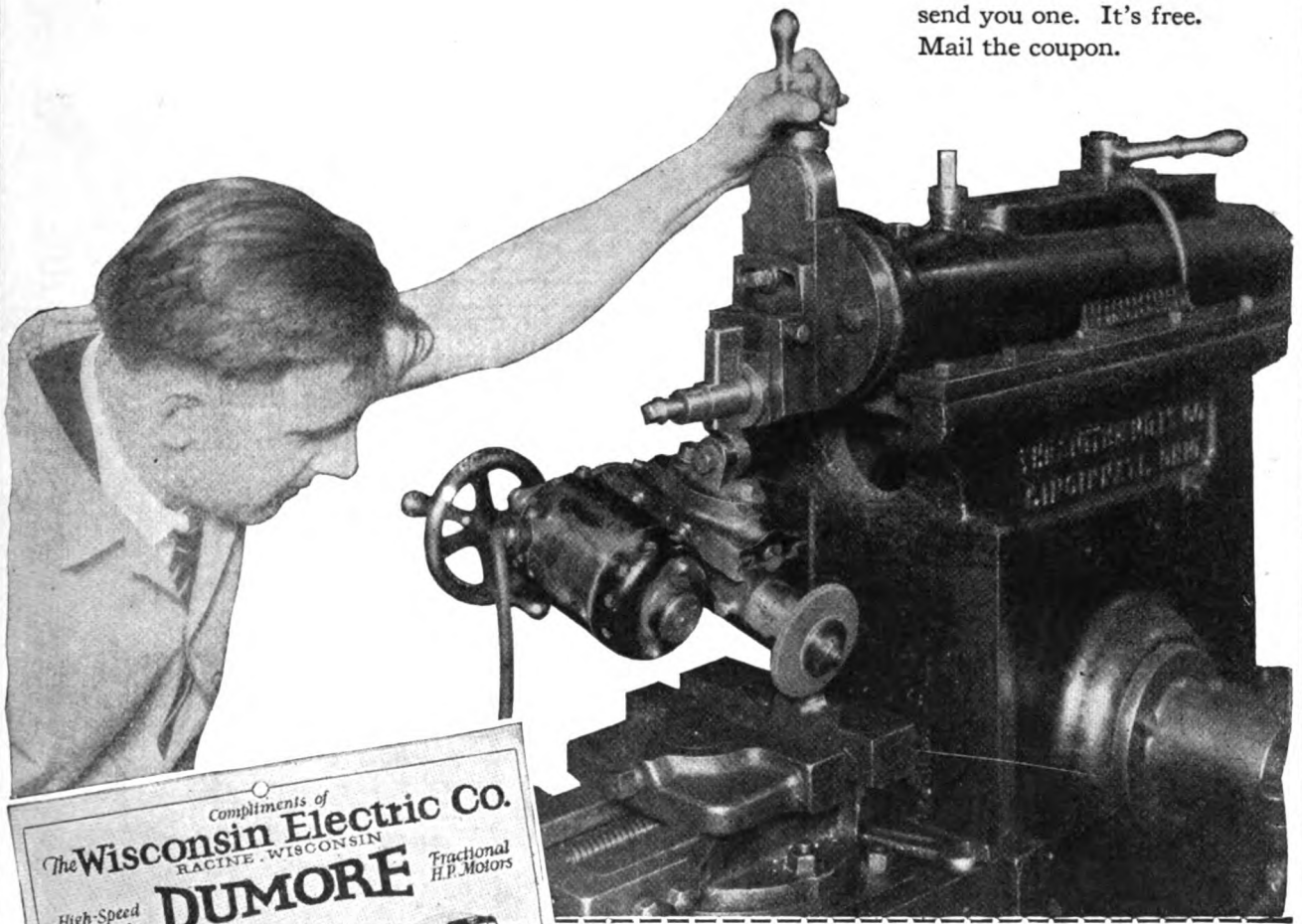
ACCURACY---

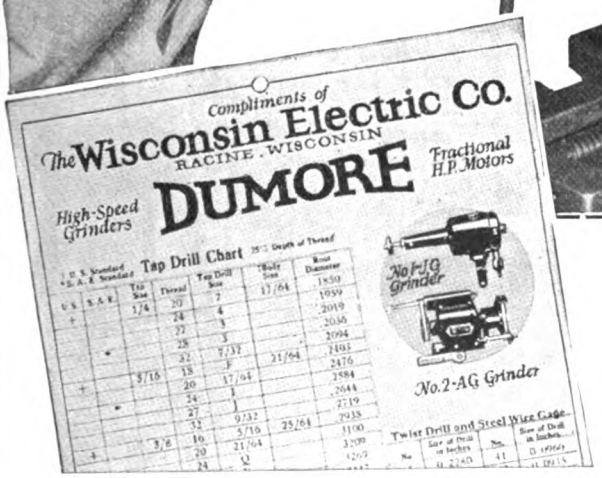
ANY machine shop not equipped to finish almost any kind of a job by grinding to close tolerance limits, is working under an expensive and unnecessary handicap.

Dumore Grinders are adapted for use on any machine tool. They run from any electric connection. They insure the absolute accuracy your most profitable customers demand. Let us give you a demonstration.

Six styles, all vibrationless, cover all requirements for fine external and internal grinding, at prices ranging from $50 to $180. Write for our new exchange offer.

If you have not yet received your Dumore Tap Drill Chart, let us send you one. It's free. Mail the coupon.





Wisconsin Electric Company,
70 Sixteenth St., Racine, Wis.

Please send me, free of charge, one of your Tap Drill Charts, a catalogue of Dumore Grinders, and details of your new exchange offer.

NAME .....

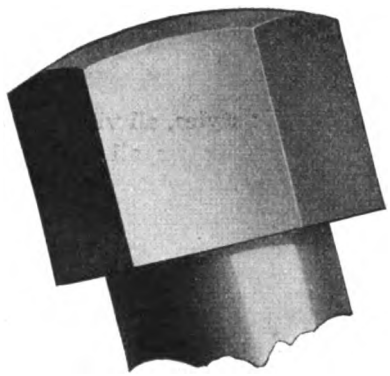
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CITY .....STATE .....

Wisconsin Electric Company 70 Sixteenth St., Racine, Wis.

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Ferry Hexagon Head Cap Screws



"If it's upset— it must be heat-treated"

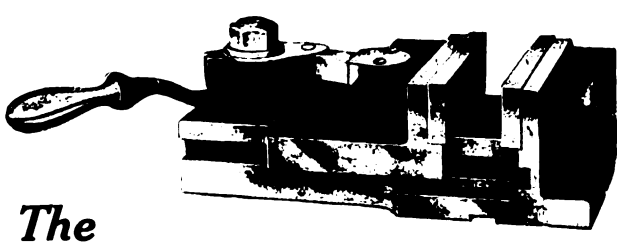
with heads that are clean cut, smooth and true have won an enviable reputation in the automobile and industrial fields.

You can buy these same cap screws from your local hardware dealer. They cost no more than ordinary screws. Ask for them by name.

THE FERRY CAP & SET SCREW CO.
Cleveland, Ohio

FERRY
PROCESS SCREWS

Wherever a Quantity Must be Quickly Handled



The

"PRONTO"

Quick Operating and Wide Opening Lever Vises

Made in Three Sizes

No. 1—6¼" long—8 lbs.....$50.00
No 1½—8⅛" long—17 lbs..$60.00
No. 2—9¼" long—33 lbs....$70.00

Prices Subject to a Discount of 45%

A slight movement of the lever and the jaws close with a grip of steel. This is just what you need where a great many pieces must be handled and handled quickly.

Designed for Milling and Drilling Machines

"PRONTO" Quick Operating and Wide Opening Lever Vises are made in the sizes shown. Write for descriptive circulars.

Manufactured by
EDW. PURVIS & SON
Successors to Carter & Hakes
110 YORK STREET BROOKLYN, N. Y.

WILL YOU TRY IT

at our expense?

When 10% of your workers' energy is lost every day through uncomfortable and wobbly chairs of the wrong height, you should try out "Royal" chairs, adjustable to height, of steel construction and correctly designed to eliminate fatigue.

By diverting otherwise lost energy to increasing production, the chairs pay for themselves and further save money because their strength does away with costly and constant repairs and replacements.



Over 75,000 "Royal" chairs in the largest factories of the country are saving their owners money every day.

Write for catalog of chairs and stools and free samples.

2000 chairs and stools in stocks at all times

ROYAL METAL MFG. COMPANY
2316-22 S. Western Ave.
Chicago, Ill.
Let your local supply house quote you!

For products not advertised in this issue write Industry Illustrated

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SIMPLICITY ADDED TO STRENGTH

UNION
RENEWABLE FUSES

Because they are worth more they really cost less



The strength and simplicity of Union Renewable Fuses enable them to stay in service longer.

EXTRA heavy construction that withstands more "blowouts"—a substantial, rigid knife-blade member that always keeps its alignment—cap threads and fuse element stud threads protected from molten fuse metal—these features insure long dependable fuse service at low cost which is the real reason for the use of renewable fuses.

Simplicity added to strength by sound engineering design and construction evident even at the most casual inspection.

Specify "Union Renewables" on your next order and note the difference.



An extra heavy casing with large openings at ends to facilitate cleaning and inspection.

No small parts to get lost or misplaced.

Unscrew caps, withdraw the knife-blade member, renew the fuse link, insert the knife-blade member, screw down the caps and a "Union Renewable" is again ready for service. It takes but a few seconds.

CHICAGO FUSE MFG. CO.

INCORPORATED 1889

Manufacturers of Electrical Protecting Materials and Conduit Fittings

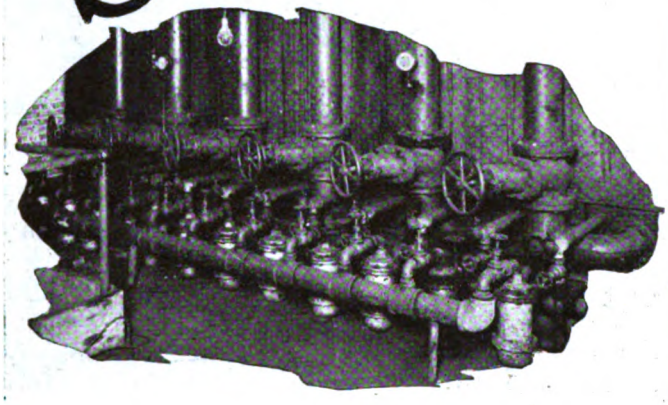
Laflin and 15th Street

CHICAGO

UNION FUSES

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Save! -with Armstrongs



ARMSTRONGS pay their way —they pay by eliminating the weaknesses of ordinary steam traps. And it's the patented, inverted submerged bucket principle that does it.

No scoring—no clogging—no air-binding—no excessive weight—no steam waste! That's what you get when you install these dependable long-lived traps. Install these —then forget them. Isn't there a big saving where you can do that?

You ought to know the Armstrong. Send in the coupon for the 90-day test.

Please ship prepaid an Armstrong for 90-day test. It is understood that when test is completed the trap is to be returned collect.

Trap capacity ..... Size of pipe connections .....

Steam pressure ..... (Do not neglect to state maximum)

Firm .....

Address .....

.....

Signed ..... Position .....

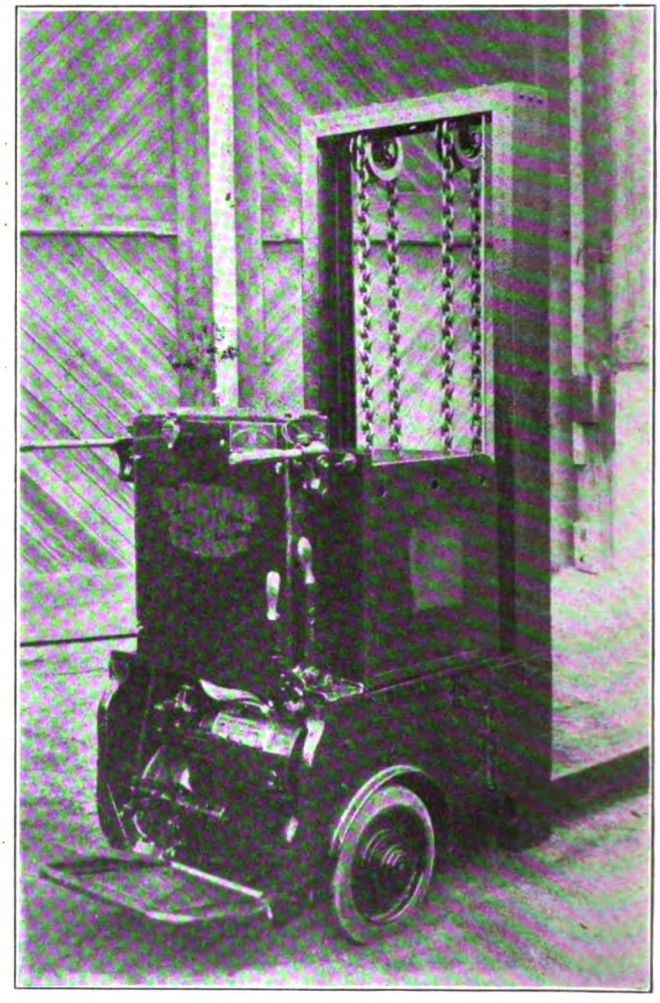
☐ Send the catalog only; send no trap

Mail to ARMSTRONG MACHINE WORKS
326 Maple Street, Three Rivers, Michigan
District Representatives in 36 Cities

119-Gray

A New Tier-Lift Truck

THE Wright-Hibbard Industrial Electric Truck Company, of Phelps, N. Y., have recently developed a tier-lift truck, two views of which are shown here. The manufacturers point out that the use of a single motor for both driving and lifting, operating by a simple gear shift, eliminates an extra motor and extra battery capacity, resulting in a saving in both space and weight. The new design is said to be interchangeable with the company's R-11 and R-12 elevating platform truck; permitting purchasers of these models to convert them at minimum expense into a tiering machine, and permitting

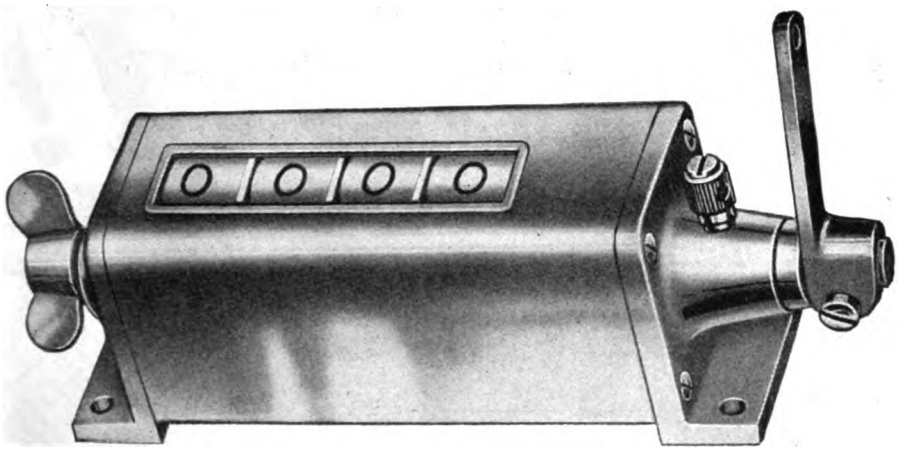


the new model to be converted into an elevating platform truck by a few simple changes. The lightness and compactness of design are especially stressed.

The following dimensions and specifications are furnished by the manufacturers:

Length of truck is 87" with operator's footboard down, and 79" with footboard up, equipped with platform 18" x 42", and 6½" high, in the lowered position. It can be supplied with a platform 24" x 53", and 9" high. The overall width of truck is 27½ inches. It is made in lifts of 3 ft., 4 ft., 5 ft., and 6 ft., and the overall height in each case is 18½ inches more than the lift height. Lifting speeds are 27 ft. per minute without load, and 7½ ft. per minute with full load of two tons; rated capacity being 4,000 pounds.

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Veeder

Set-Back Counter

Registers reciprocating movements of the lever, as required in counting the product of punch presses. Sets back to zero from any figure by turning knob once 'round. Price, with four figure-wheels, as illustrated, $11.50 (subject to discount). *Cut full size.*

Point to this dial—when you ask a workman for more production from his machine. Point to the dial, and the *task* you expect it to register. Ask for a definite, measured increase and see it straightway recorded on the Counter! You can fit this method to any machine, because Veeder Counters fit *all* machines, as you'll see in the Veeder booklet. Write for copy.

THE VEEDER MFG. CO., 31 Sargeant Street HARTFORD, CONN.



Safe Drinking Water

Safe-guard the Health of Your Workers—Install Century Sanitary Fountains

For real economy the Century line will meet your most exacting requirements. The low first cost is made possible by our unexcelled manufacturing facilities.

The low operating expense is due to the Century Patented Bubbler Head with the concealed regulator. The stream can be regulated to give any desired volume of water without splashing or squirting—it saves water.

The self closing stop cock is Century built and positive in action. Every operation is carefully inspected—all materials are fully tested and all must conform to the rigid Century standards—it insures long life.

The group fountain shown here is our No. A-63. It is equipped with four Bubbler Heads. It can also be furnished in smaller sizes with two and three Bubbler Heads. The basin is white porcelain enameled—the fixtures are brass, heavily nickel plated.

Send for our new complete catalogue that fully describes this fountain and other popular Century Fountains.

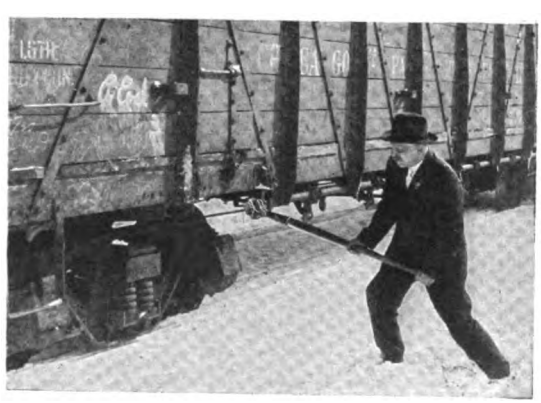
CENTURY BRASS WORKS, Inc.
406 N. ILLINOIS ST. BELLEVILLE, ILL.



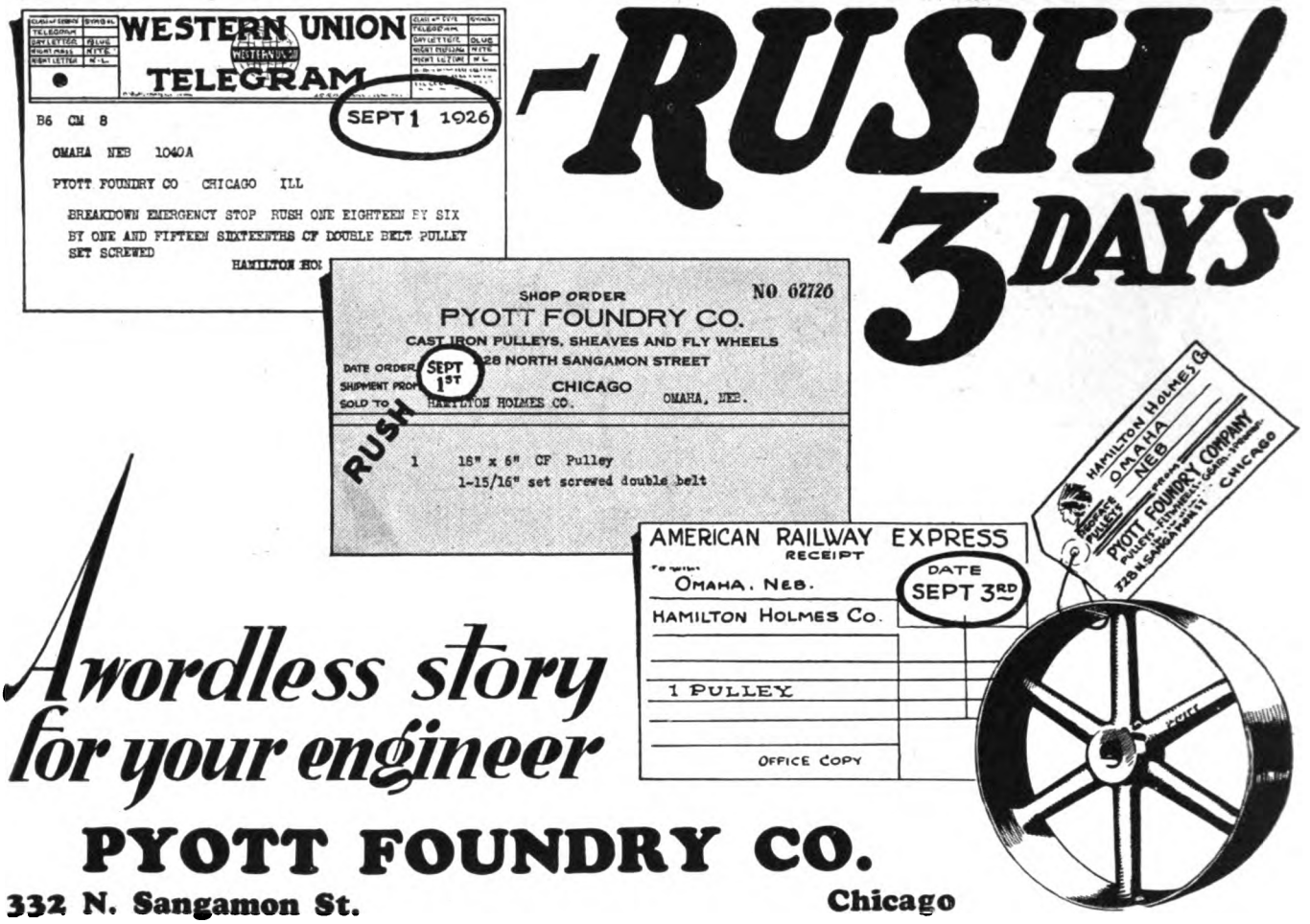
SAFE!

Instant release! Self adjusting! Just toss the Advance Car Wrench on and it automatically grips any size winding tap. A quick jerk and it's off again, allowing the tap to spin freely. No chance for accidents, the wrench cannot be thrown against the operator. *Your jobber has them.*

Advance Car Mover Company, Appleton, Wis.



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beware!

are your belts robbing you of power?

Cling-Surface Preservative absolutely stops this burglary. It is a belt treatment that keeps belt healthy and pliable thereby increasing the arcs of contact, preventing hot-boxes and often quadrupling the life of your belts. Costly shut-downs due to belt trouble are reduced to a minimum with Cling-Surface.

The coupon is a real opportunity to save power, fuel, belts, machinery and power. If these things mean anything to you, mail it *today*.



Cling-Surface Preserver of belts—has been made for thirty years by the only company whose sole product is belt treatment. It is used in every country of industrial importance in the world. It saves belts and machinery. It increases transmission efficiency and prevents all loss due to slipping.

CLING-SURFACE COMPANY
PRESERVES BELTS—ELIMINATES BELT SLIP

FREE 60 Day Return Privilege COUPON

Conditions in our plant are about as checked:

☐ cold ☐ hot
☐ damp ☐ dry
☐ dusty ☐ clean
☐ 3 gal. Tin at $3.40 gal.
☐ 6 gal. Tin at $3.25 gal. F.O.B. nearest Warehouse.

Cling-Surface Co., 1056 Niagara St., Buffalo, N. Y.

Gentlemen: I am always willing to give a belt-saving, money-saving proposition a trial on its own merits. Send tin to fit conditions noted and of the size checked. If need be, I shall use the entire contents. If satisfactory I shall pay in 60 days. Otherwise no pay.

Company ..... Attention .....

Address II-9-26

"I'll Start you more than a Million Times"!



"Yes, sir, I'm the Patented Automatic, Fool-Proof Starting Device found on MASTER GUARANTEED MOTORS. *I guarantee more than one million starts.* This is equivalent to *one hundred years of uninterrupted service* at an average of twenty-seven starts per day."

THE MASTER ELECTRIC COMPANY
Linden & Master Aves. Dayton, Ohio

STOCKS CARRIED IN PRINCIPAL CITIES

MASTER GUARANTEED MOTORS

⅛ TO 7½ H.P. Dayton THE MASTER ELECTRIC CO. Ohio Less than 40°

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"The Toledo Scale has saved us from 20 to 30 seconds on the weighing of each package"

—Spencer Kellogg & Sons Inc.



THE statement above is quoted from a letter from the Cincinnati branch of Spencer Kellogg & Sons Inc., manufacturers and national distributors of linseed oil.

This is one specific case out of many in all lines of industry in which savings are accomplished by the use of Toledo automatic scales.

Material usually is weighed or parts counted:

When received.
When issued to production departments.
In transit between departments.
During manufacturing processes.
For cost records or inventory.
To determine the pay for piece work.
To determine freight or express charges or postage.
To determine the amount of invoice for the product itself.
For special purposes.

Time is wasted and mistakes made in these frequent operations, when workmen have to put on and take off loose counterbalance weights, move a poise on a weigh beam, judge when the beam is in balance, read the weight indicated in small figures and markings on a beam from 12 to 24 inches, and add to this the values of the loose weights.

With Toledos the operator has only to put on the load and read the weight in plain figures on a dial from 5 to 7 feet in circumference. Toledos save thousands of half-minutes and stop thousands of small losses.

A check by a Toledo scale man will show whether losses occur in the weighing or counting operations in your plant. This check will cost you nothing. It may save you much. Write us for particulars. Kindly address Industrial Sales Department, Section U.

Scales For Every Industry

There are Toledo Automatic Scales especially adapted for:

Every form of general purpose weighing
Indicating the horsepower of motors
Determining the weight per yard of textiles in the bolt
Determining the uniformity of continuous sheet products
Testing the tension of springs
Balancing connecting rods and pistons
Counting parts
Indicating gross, tare and net weight of packages
Computing postage
And for many other special purposes

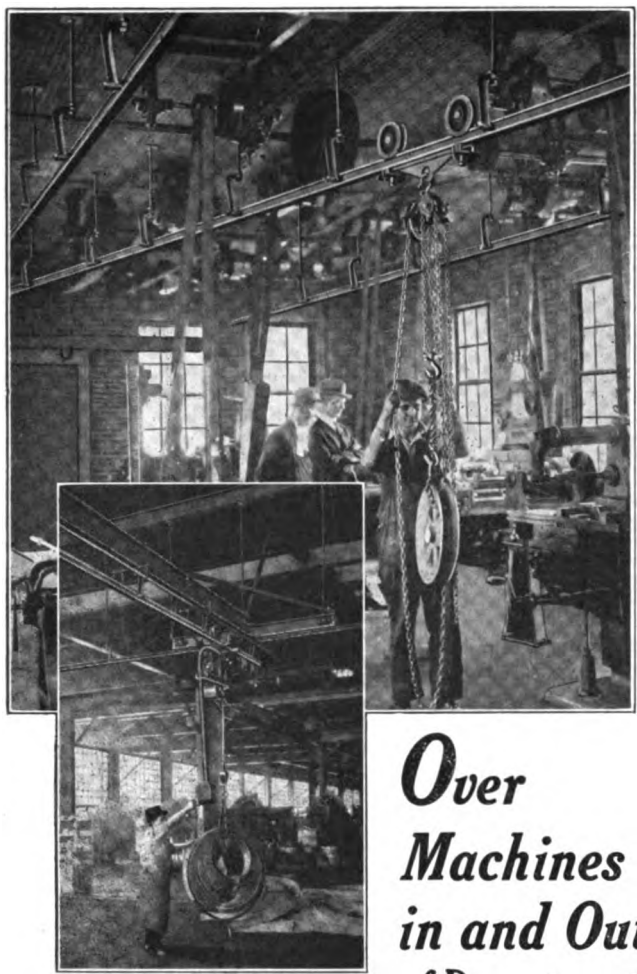
Toledo Scale Company, Toledo, Ohio
Canadian Toledo Scale Co., Limited, Windsor, Ont.
Manufacturers of Automatic Scales for Every Purpose
Offices and Service Stations in 106 Cities in the United States and Canada

TOLEDO SCALES

NO SPRINGS HONEST WEIGHT

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Over Machines in and Out of Departments

Saving Costs
in Moving Parts and Products

Improved methods of handling and moving materials has resulted in the improved Armington T-Rail Carriers.

The ordinary I-Beam is not always efficient. With the Armington, you can be sure that it is especially built for handling purposes. It is sturdily built and noted for its great strength and wearing qualities under the most severe conditions.

T-Rail track is standard steel warehouse stock. It can be obtained quickly at low cost. Remember this next time you order. They will save money for you in handling products over machines and interdepartment.

A book showing how handling costs have been lowered in many industrials will be mailed to you on request. Write for a copy.

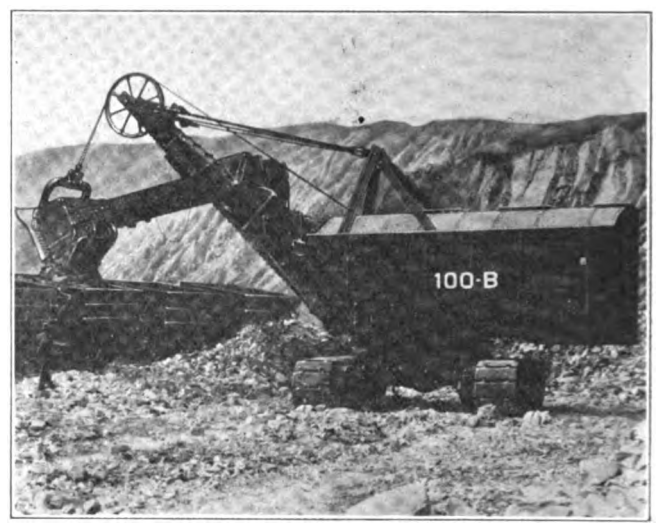
THE ARMINGTON ENGINEERING CO.
EUCLID, OHIO
Hand Cranes—Overhead Trolly Systems

ARMINGTON T-RAIL CARRIER

A Recent Addition to the Bucyrus Line

A 3-yard revolving shovel for general use was announced recently by the Bucyrus Company of South Milwaukee.

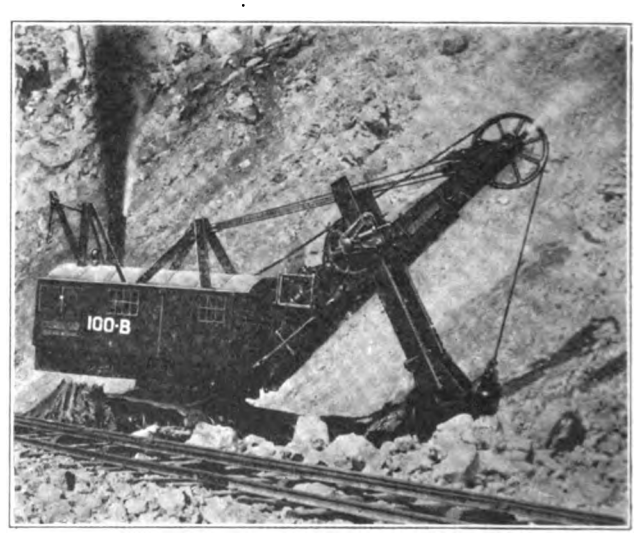
This shovel is built particularly for the contractor and the general user of excavating machinery. It represents a new departure in shovels in that it is said to be built



along lines never before used in shovels for general utility.

In design it follows the basic plan developed by the Bucyrus Company in building the 120-B a 4-yard mine and quarry full-revolving shovel announced last year.

The manufacturers say that in principle it is a machine that offers to the contractor and engineer engaged in excavation a machine that combines the advantages of

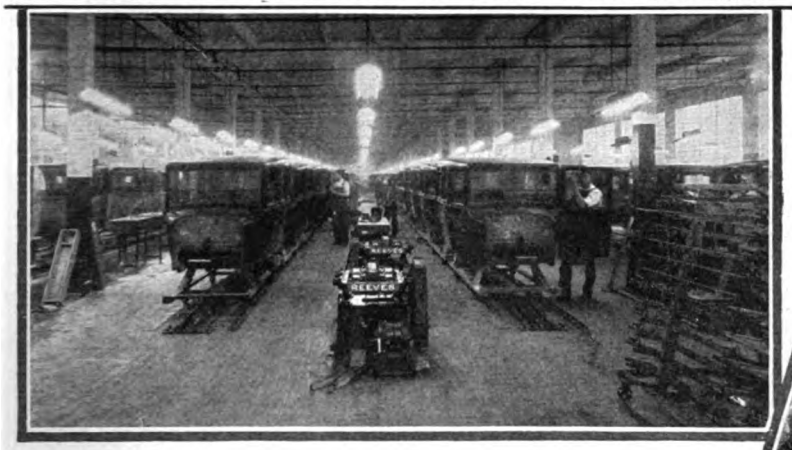


a small revolving shovel with those offered by the railroad-type shovel, but has a working range considerably greater than either.

The machine is claimed to have the speed of action, big dipper capacity, ruggedness and power of the railroad-type shovel with the mobility, the full revolving swing and the maneuvering ability of the small revolving shovel. The boom length is only 29 feet 6 inches and the rear end radius 16 feet.

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INDUSTRY COMES TO REEVES FOR ACCURATE SPEED CONTROL

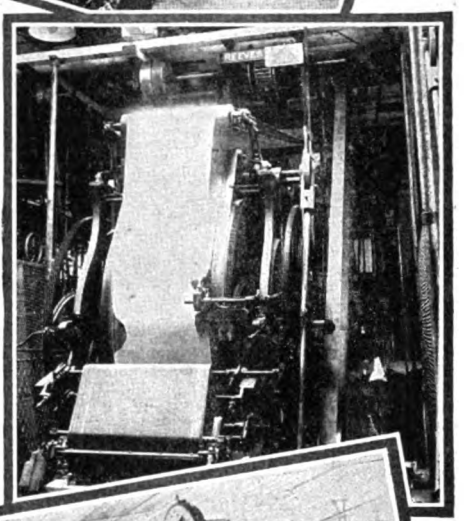


REEVES-*controlled body conveyors at the Studebaker Corporation*

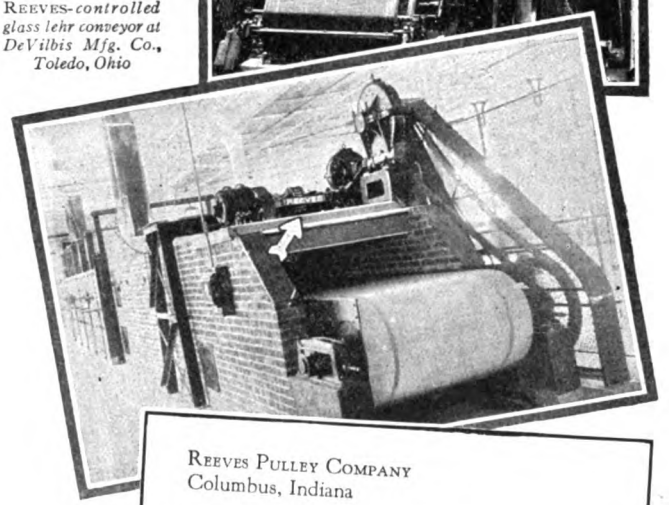


REEVES-*equipped Baker-Perkins traveling bread oven*

Speed Flexibility IS a Most Vital Production Factor!



REEVES-*regulated wall-paper printing machine*



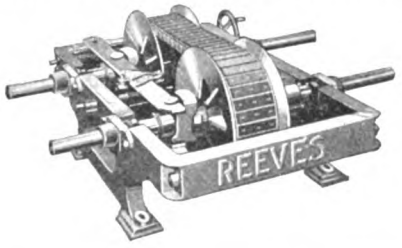
REEVES-*controlled glass lehr conveyor at DeVilbis Mfg. Co., Toledo, Ohio*

THERE are any number of machines and conveyors in your plant which should be absolutely *flexible*—able to run at any speed between fastest and slowest. And with the REEVES Transmission you can secure this vital flexibility.

Speed flexibility IS vital. You can schedule your production more closely. You can adjust the speeds of your machines and conveyors to meet any different operating condition and you can keep them running at their most efficient speeds every hour in the day. The coupon below will bring you detailed information about speed flexibility and the money-saving advantages of the REEVES Transmission.

REEVES PULLEY COMPANY
Established 1887
COLUMBUS, INDIANA

REEVES
Variable Speed Transmission



The REEVES Transmission is a simple, compact, mechanical device which receives power at a constant speed and delivers it at any speed desired to any machine or group. It will maintain one set speed indefinitely, or may be changed instantly to any speed you desire.

REEVES PULLEY COMPANY
Columbus, Indiana

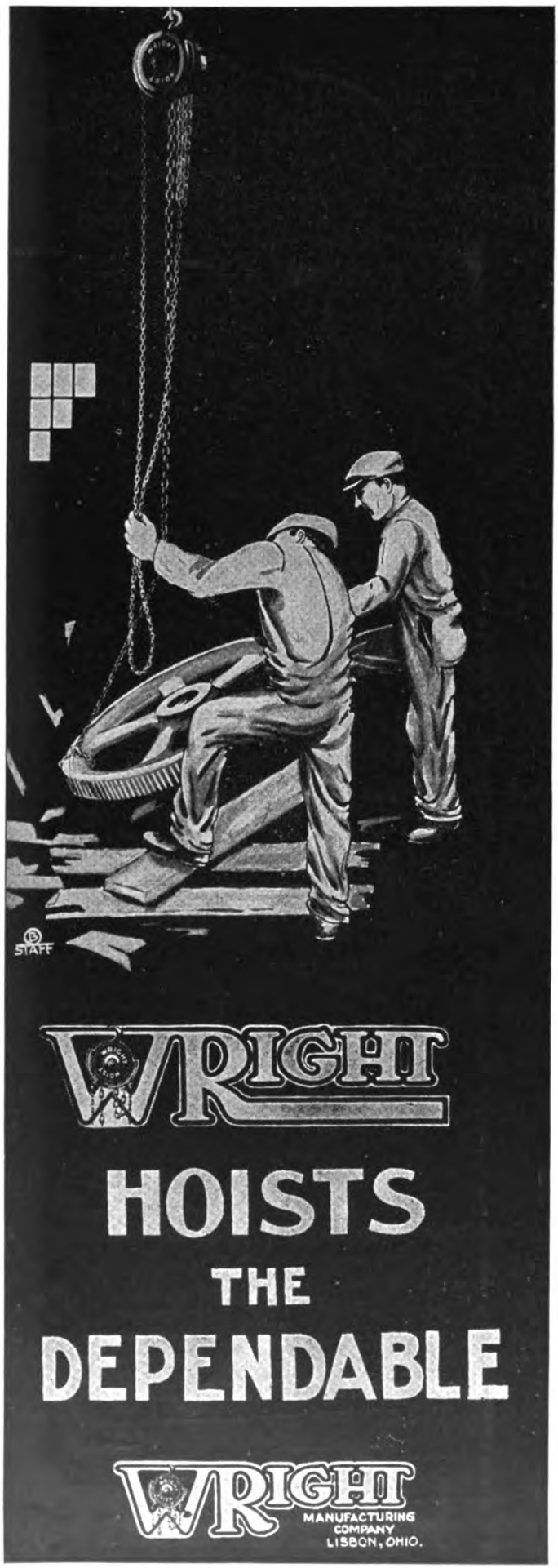
- ☐ Send me detailed information about the REEVES in the.....industry.
- ☐ Send me your new catalog L-66, the authority on speed flexibility.
- ☐ Tell me the economical advantages of the REEVES over a variable speed motor.

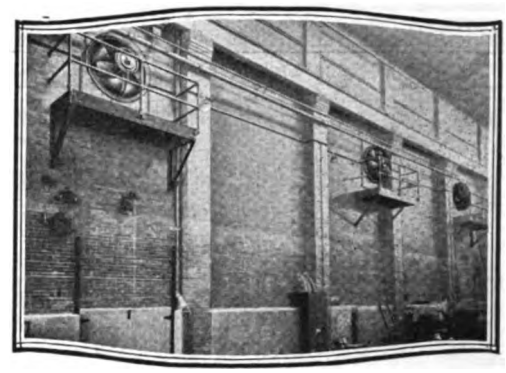
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Address_____

City_____

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Diehl 42-inch exhaust fans in transformer room of substation, Brooklyn Edison Co., Brooklyn, N. Y.

DIEHL EXHAUST FANS

The Brooklyn Edison Co. is using three 42 inch Diehl exhaust fans in their Kingshighway substation. The fans are installed in the wall of the transformer room, which, at times, becomes excessively warm on account of the heat generated by the transformers. The heated air is conducted by these exhaust fans from the transformer room to the substation building proper. The result has been a substantial saving in the cost of heating.

The purpose served by this installation will, no doubt, suggest to you profitable uses of Diehl exhaust fans in your factory, store or office. Ample stocks are carried in Diehl warehouses and by authorized sales agents throughout the country.

Write for descriptive bulletins—now

DIEHL MANUFACTURING CO.

ELIZABETH, N. J.

Atlanta Boston Chicago Detroit New York Philadelphia

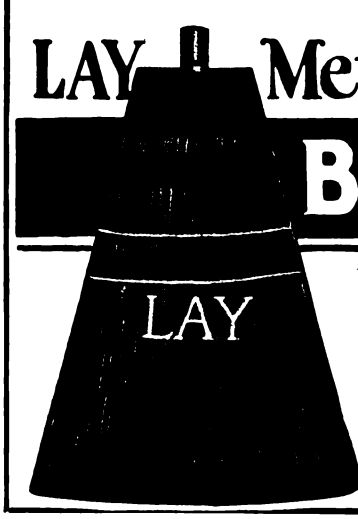
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Clear down to the last "stub" your brooms will give efficient service if they're Lay Brooms! The secret is in the metal case that holds the straws as in a vise—and in the high quality of materials and workmanship that have characterized Lay Brooms for more than fifty years. Think of the saving in time and money they will effect for you!

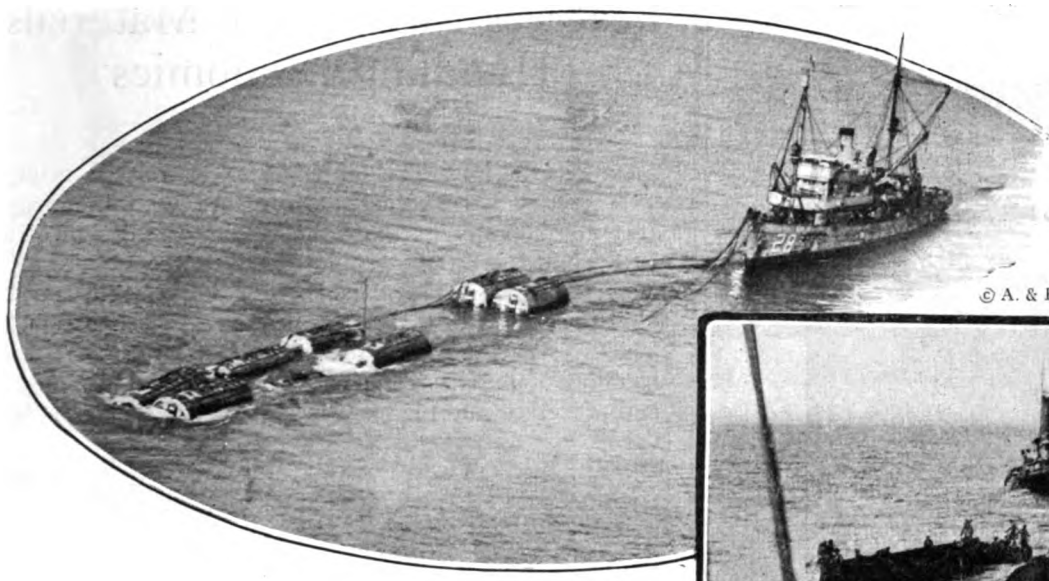
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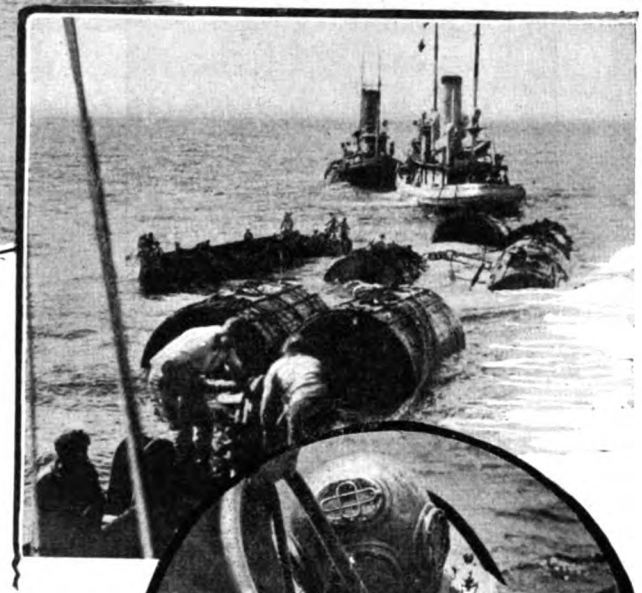
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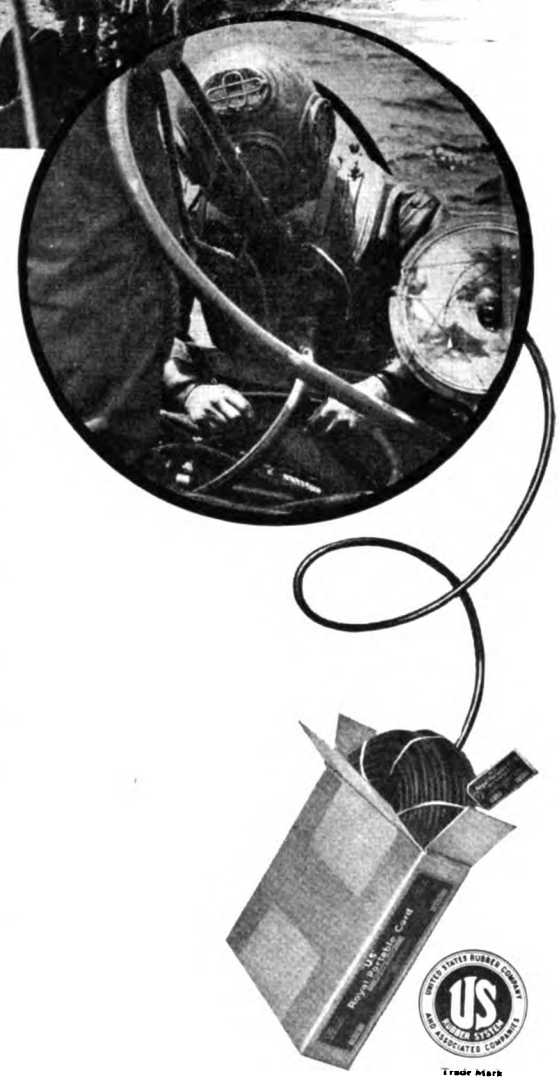
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Carrying Light to the S-51



In placing the lifting slings under the submarine S-51, Navy divers were greatly aided by specially designed deep sea diving lamps. The power to these lamps was carried through "U.S." Royal Portable Cord.

These lamps, weighing 35 pounds, one of which is illustrated at the right, were designed by the Westinghouse Lamp Company. "U.S." Royal Portable Cord was selected to conduct power to these lamps because of its exceptional durability and remarkable record for dependability.

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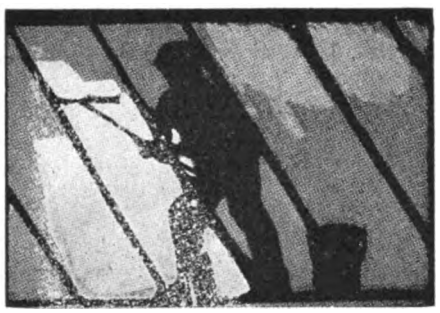
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Features that Affect Materials Handling Economics

By T. C. Flinn

A PROMINENT chief engineer in a large manufacturing concern, in conference with the manager and superintendents, in discussing the design of a new product, was asked to cut down on the amount and quality of material involved in his product. He stated, "There is no overhead or burden on material bought." The overhead or burden is all in the processing and handling of purchased material which is to be developed and processed into the manufacture of the finished product.

Many methods and ways have been developed to take this material in its purchased state and process and handle it most economically so as to minimize the cost of the finished product. It makes no difference in accounting methods whether certain operations are chargeable directly or whether they are distributed in overhead or burden costs, the total cost is there just the same and this is reflected greatly by the method of handling materials.

In foundries and machine shops where the metals and other materials are received into the foundry storage and processed through the various operations of melting, molding, casting, cleaning, machining, assembling, and shipping the finished product, an astonishing amount of materials handling is involved.

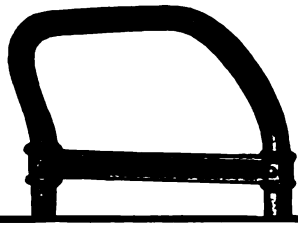
In many designs of product, using castings as an example, the reduction of materials handling is not often considered by the designer or management from the standpoint that when patterns are made with excessive finish, which is afterwards removed in process of machining. We have here the unnecessary handling of excess material in metals, the melting of the same, the cleaning, the machining, and the disposing of the excess metal in form of chips and borings.

In an analysis of certain patterns this was found to be as high as nearly 50% of the total material handled. In other words, castings, when machined and finished, weighed one half what they did before machining.

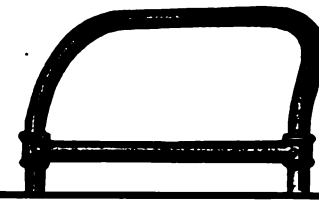
Another feature in foundries affecting the reduction of materials handling costs is the reclamation of old foundry sand and the elimination of new molding sand by the application of a clay bonding material to the old molding sand. Only 1 to 5% of this clay bonding material would be used in place of new molding sand, and therefore instead of handling one hundred tons of new sand in a given period there would be handled at the most five tons of clay bonding material, and every time this material is handled in the process of manufacturing 95% of materials handling is saved, both in the way of time, in the amount of material handled, and in the corresponding cost, by the use of clay bonding material, over that of new molding sand, the cost of which is an important factor in the cost of castings.

These illustrations of features such as excessive finish on product in process of manufacturing, and reclamation methods, so as to use over and over again material required for manufacturing process, are applicable to all lines of industries. They are important factors in the reduction of materials handling, thereby reducing costs, and a step towards the elimination of waste, which is the effort of all progressive industries of today.

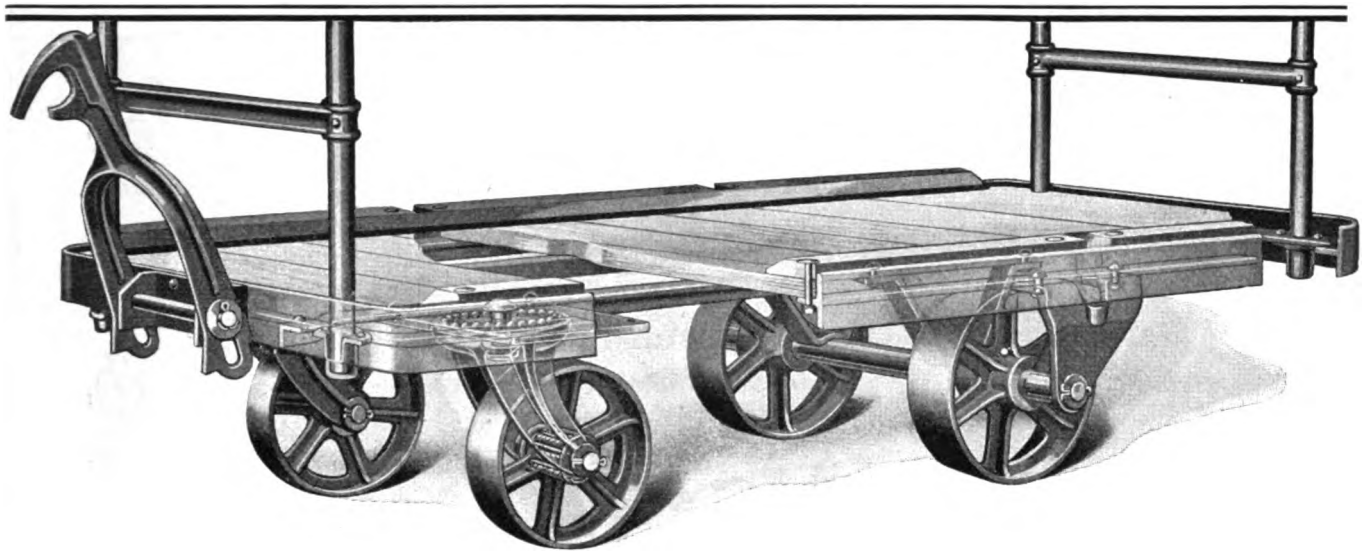
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Cut-out view to show important constructional features—for more details ask for Bulletin A-100



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—To serve you best—

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A product that is right. Built by the pioneer, with a background of more than twelve years experience. Carefully engineered—perfected in each last detail—the recognized "standard of merit" wherever trailers are bought and used. (Note—more than 20,000 of the Mercury "A-310" now in service).

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—and the Mercury Tractor is in every respect the equal of the trailer. Request Bulletin No. 106



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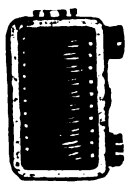
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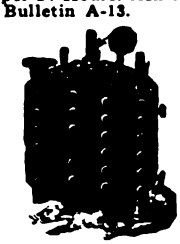
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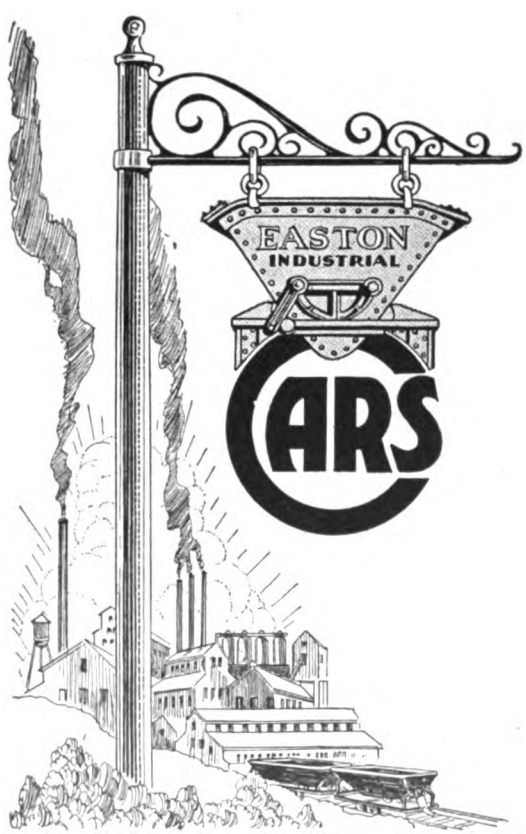
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—steel-bound to protect all wood surfaces from wear. The selected wood stock itself is plenty strong enough to carry the weight any giant might handle.

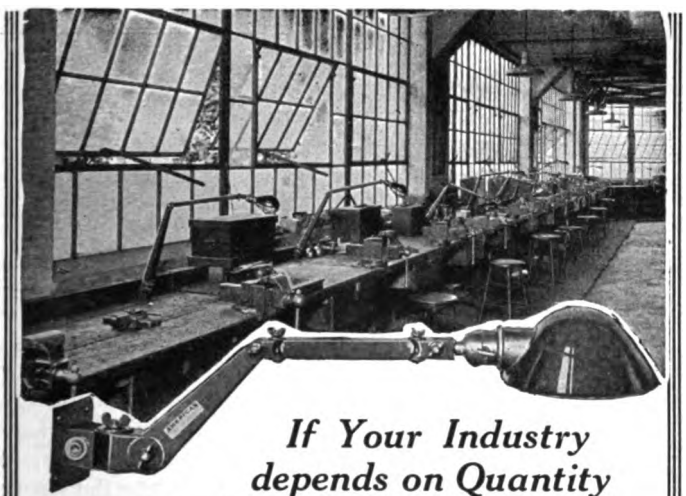
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Quickfix
Concrete Floor Patcher

The *Master Builders Method* of laying *patches that last.* Stop making temporary repairs. Relay that heavy-duty area for the last time with *Quickfix* concrete.

Will mend a hole like this Saturday, ready for use Monday

Use Quickfix Concrete for emergency jobs like Machine Foundations, Platforms, Driveways, Stairs, etc. Gives the ideal wearproof, dustproof, waterproof surface, ready for use in 48 hours.

QUICKFIX makes a permanent concrete patch of flint-like hardness in only 48 hours. Ordinary concrete patches block traffic and delay production for ten to twenty days while they harden. With Quickfix you can Patch the Floor Saturday and Open it Up to Traffic Monday. No costly delays or interference with plant's operation.

Use Quickfix and eliminate those danger spots in your floors. It is quick-acting, permanent, inexpensive. Any handy man can use it. Send for our Quickfix Booklet with full details—order ten gallons today on our positive money-back guarantee.

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Factories:
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Sales Offices in 100 Cities

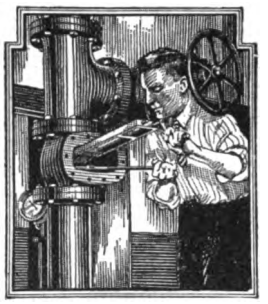


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Gentlemen: Send us complete information about:
QUICKFIX—for making permanent, wear-proof concrete patches in 48 hours.
We have _____ sq. ft. to repair. It is understood there will be no charge if Quickfix does not perform as represented.

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Dexter
Gate Valve
Reseating Machine

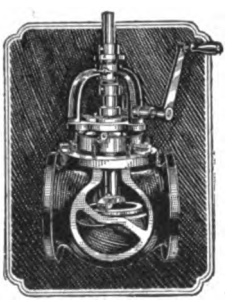
Is Your Engineer or Master Mechanic Getting a Square Deal?

The man responsible for keeping operating and maintenance costs down is probably doing the best he can with what he has to work with.

Leakage losses due to worn valves contribute heavily to operating expense. On the other hand frequent valve replacements and removals from the line for repairs make maintenance costs excessive.

A Dexter Valve Reseating Outfit eliminates leakage losses and reduces valve upkeep 90% or more. Valves are quickly and easily made leak tight without removal from the line.

Catalog 23 tells all about Dexter Outfits for globe valves, gate valves and pump valves. If you're interested in saving money, write for it.



Dexter
Globe Valve
Reseating Machine



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Pump Valve
Reseating Machine

THE LEAVITT MACHINE CO.
27 East River Street, Orange, Mass., U. S. A.
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Valve Reseating Dexter Machines

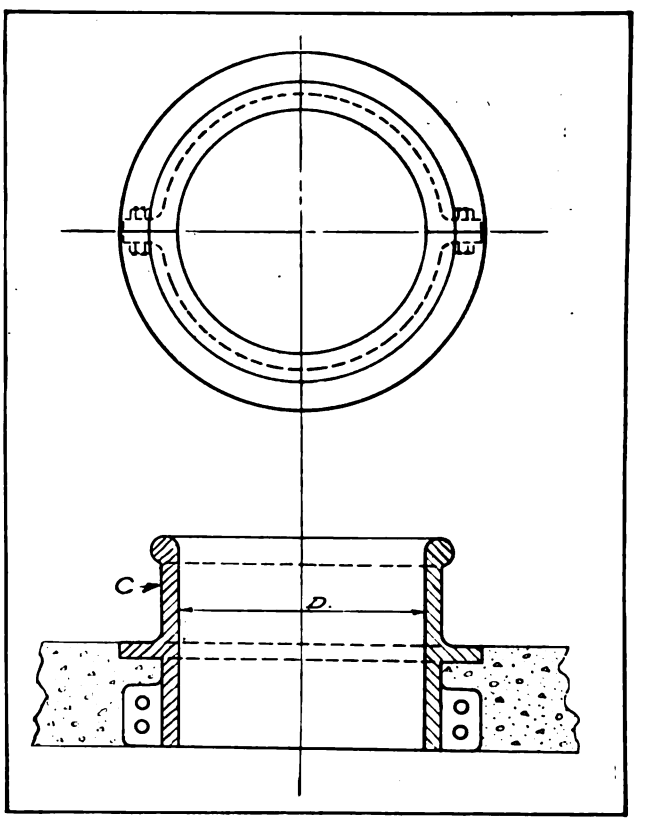
A Handy Floor Sleeve

By W. F. Schaphorst

A PROMINENT engineering concern in the East uses a sleeve made along the lines shown in the accompanying sketch for pipes passing through all kinds of floors.

The curb "C" is intended to protect the pipes as well as to form a neat appearance around the pipe opening. It is also to prevent the sweepers from pushing dirt from the floor down through the hole and possibly upon workers beneath or onto machinery or other equipment located on the floor below.

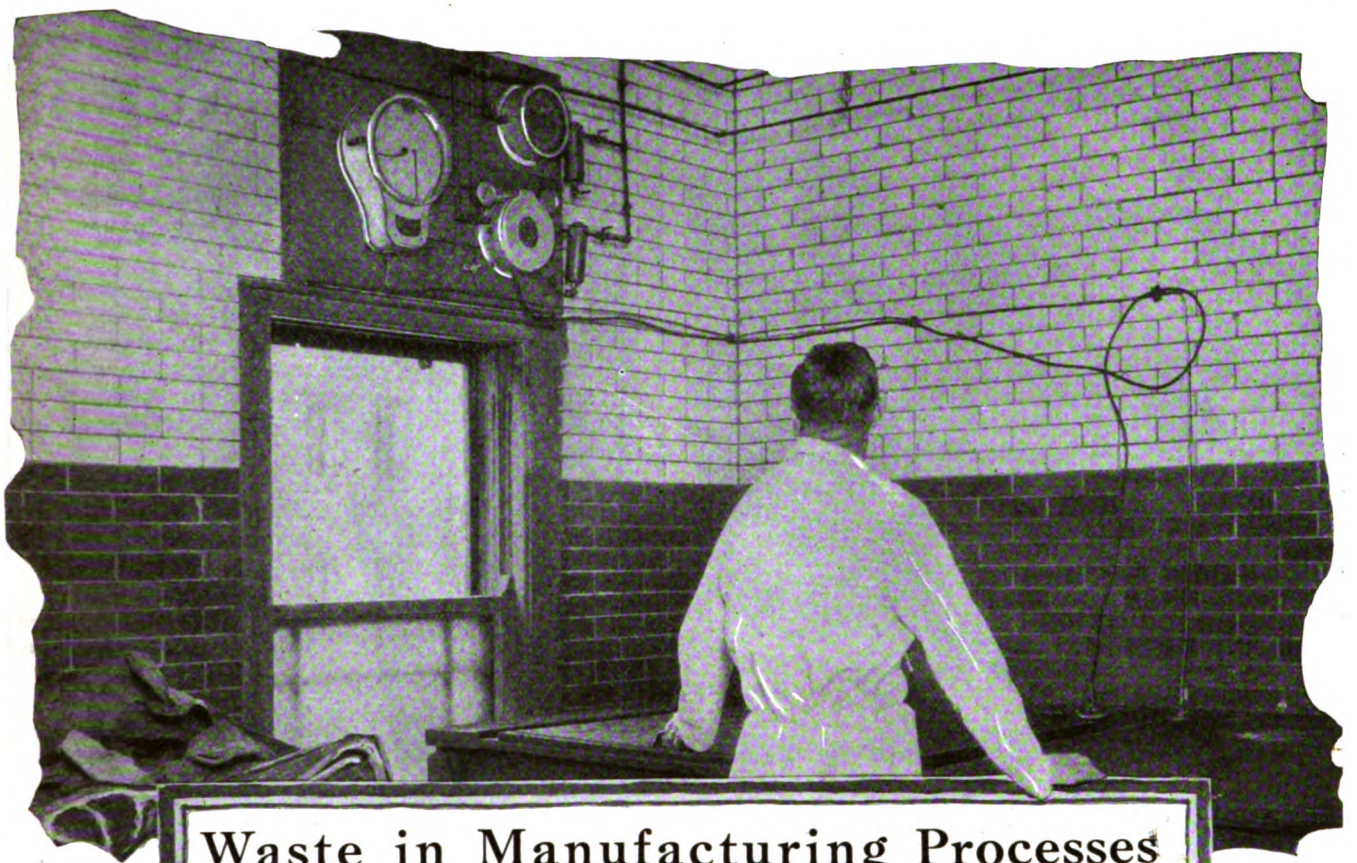
This floor sleeve is made of cast iron and in all sizes. It is also made with split lugs for bolts on the sides for



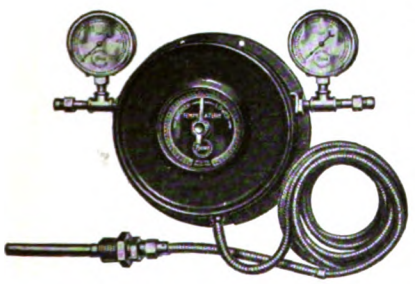
the larger sizes or for placing around pipes which are already in position. In order to assure concentric alignment of the sleeves with pipes it is advisable to leave holes in the floors larger than the actual requirements and to put the pipes in place and then locate the sleeves and grout them into position with cement.

The inside diameter of the pipe sleeves should be large enough to allow passing the flange or coupling of the pipe through same. For larger sizes, for instance, "D" may be made two inches larger in diameter than the diameter of the pipe flange. This allows for easy working and avoids trouble if at any time changes in piping are necessary.

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One of the results of accurate temperature control has been the elimination of spoilage of products and its wastes. Thousands of plants in every industry now safeguard their products with *Tycos* Pressure and Temperature Control Instruments.

For instance: at the Chicago Sausage Company where meat products are prepared, *Tycos* Instruments are used to insure proper temperature control. These instruments are used in connection with the boiling vats where approximately 100 hams are cooked at one time. The *Tycos* Instruments have entirely eliminated dependence on the human element and have reduced to a minimum all possible losses.

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We have issued a series of bulletins covering every phase of temperature control. Tell us what your temperature difficulty is and we will send a bulletin covering your particular problems. No obligations.

Taylor Instrument Companies

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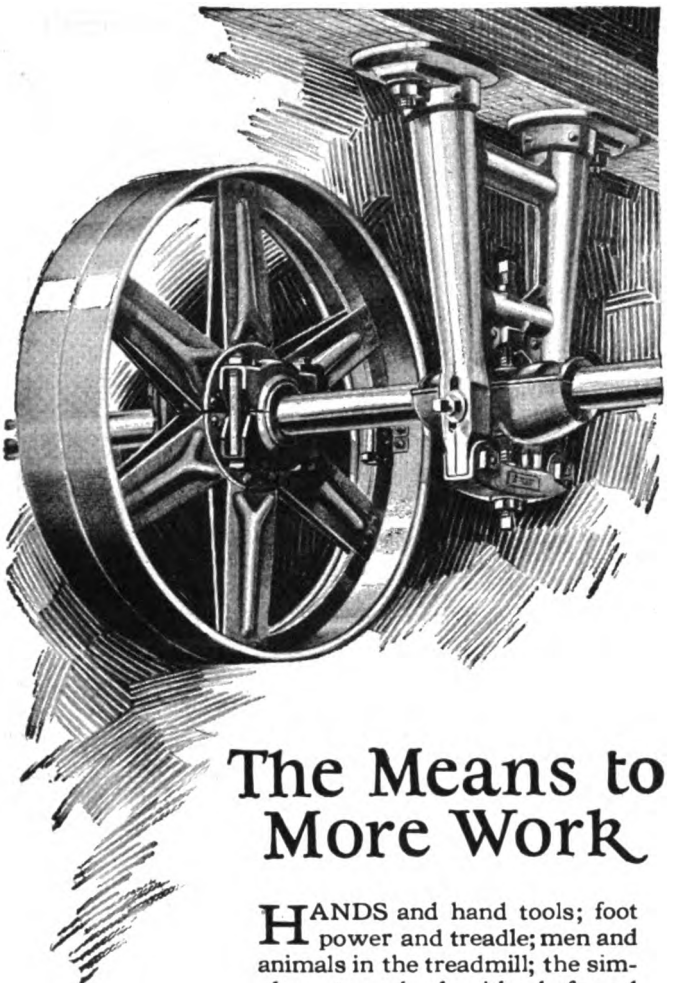
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Pulleys and hangers are the result of this evolution of machine improvement because they have kept step in this march of progress. The economies of power and labor brought about by the design and construction of "American" Pulleys and Hangers have been one of the most noteworthy contributions, in their almost unlimited field, to "the means to more work".

The American Pulley Co.

Manufacturers of Steel Split Transmission Pulleys, Pressed Steel Shaft Hangers, Pressed Steel Hand Trucks and Pressed Steel Shapes

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For nearest distributor, see MacRae's Blue Book

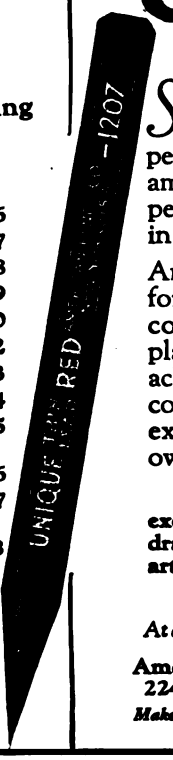
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SOMETHING wanted for years! A colored pencil with the same diameter lead as in writing pencils; can be sharpened in a pencil sharpener.

An absolute necessity for making fine lines in color on charts and plans—something never achieved before. The 12 colors also enable each executive to have his own color symbol.

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Makers of the famous Venus Pencils

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TAKE any piece of rusty metal—dip it in water just as it is—give it a coat of Nitrose—then to make the test still harder, hold it under the faucet. Nitrose isn't affected by water at all. It penetrates rust and moisture alike. It gets right down to the surface and sticks.

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Nitrose comes in 5, 10, 30 and 55 gallon drums —Give it a trial—Apply the most severe tests. The results will surprise you.

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Peoria Life Building
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See Booth No. 744, the New York Power Show

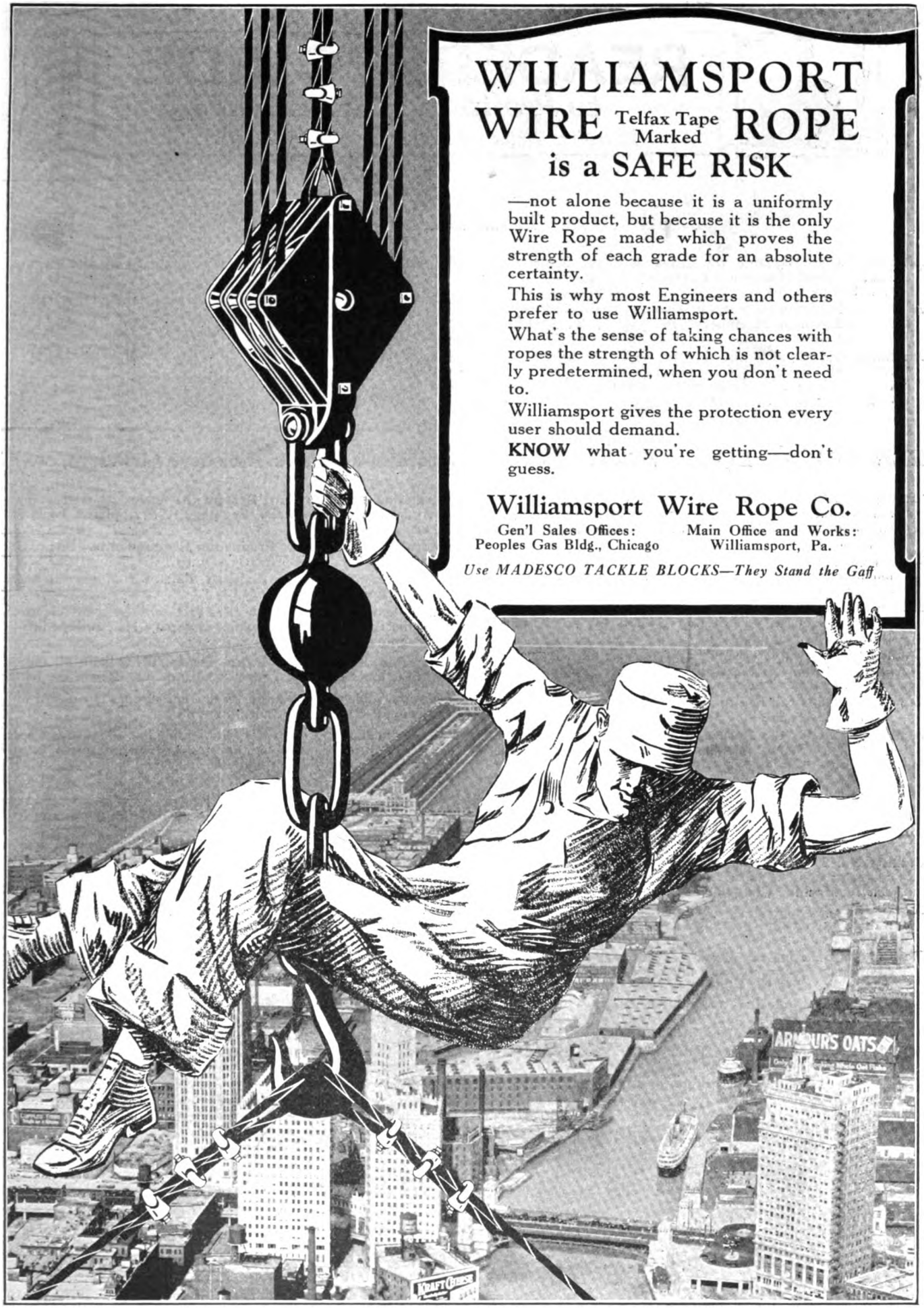


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BEARINGS. Transmission and Line Shaft

Literature that Explains the Advantages of Pulleys and Pressed Steel Hangers is offered by the American Pulley Co. See page 104.

A Factor in Preventing Shut Downs, Depreciations, and Power Losses in Machinery. See page 5. Timken Roller Bearing Co.

An Illustrated Catalog showing list prices, dimensions and load tables, which aids in the selection of roller bearings for every use can be obtained by writing Bond Foundry & Machine Co. See page 12.

An Oilless Bearing is described on page 53 by the Arguto Oilless Bearing Co.

An Average Power Saving of 15 per cent. is shown on page 6 by Hyatt Roller Bearing Co.

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Ball Bearings that have eliminated bearing failures. See page 4. SKF Industries, Incorporated.

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"Industry's Electrical Progress" is a story of savings through modern motor control of machinery and equipment, and can be obtained from The Cutler-Hammer Mfg. Co. See pages 36-37.

Tap Drill Chart Cards useful for designers and builders of machinery are being issued by Wisconsin Electric Co. See page 87.

Information on Lighting Fixtures, adjustable for any operation, is given in the catalog offered by the American Fixture Co. See page 101.

Catalog "E" very interestingly describes an adjustable speed grinder that saves its cost in one year. See page 74. The U. S. Electrical Tool Co.

Complete Details can be obtained on a Motor that gives long service. See page 92. Master Electric Company.

A Motor Built for the Hardest Jobs in the Plant. Complete details, prices, etc., can be obtained from Howell Electric Motors Co. See page 61.

Information on Drop Cord System that saves its cost many times in lamp renewals. See page 107. Appleton Electric Co.

Motors Built for Specific Production Requirements. See page 85. The Domestic Electric Company.

Descriptive Bulletins on Exhaust Fans for industrial use. See page 96. Diehl Mfg. Co.

Details and Circulars which illustrate and describe electric drills that cut drilling costs. See page 70. Independent Pneumatic Tool Co.

Renewable Fuses Made Extra Heavy to withstand more "blow outs." See page 89. Chicago Fuse Mfg. Co.

A Nation-Wide Service in direct current motors is offered by General Electric Co. See page 83.

Full Particulars about a tough, flexible, non-kinking Cord that assures dependable lighting are offered by United States Rubber Co. on page 97.

MAINTENANCE

Catalog No. 23 contains information on valve reseating machines, useful in any power plant and factory. The Leavitt Machine Co., page 102.

Metal Case Brooms for every industrial purpose. For illustrated booklet and price list see Joseph Lay Co. advertisement on page 96.

Descriptive Bulletins on Metal Coating that can be applied right over wet, rusty, oily and hot surfaces. For information see page 104. The Nitrose Company.

A Painting Method that makes the painting of industrial plants an economical and low cost labor saving method. See page 63. The Vortex Manufacturing Co.

A Quick, Permanent Way of Repairing Floors, see page 101. The Master Builders Company.

The Proper Handling and Storage of Lubricating Oils. See page 14. S. F. Browser & Co., Inc.

An Oily Waste Can that outwears 3 to 5 of the ordinary kind is described on page 64 by The Witt Cornice Company.

A New Chart and a Folder which aid in the selection of the exact liquid window cleaner for every purpose are offered by The Gerson-Stewart Corp. Mfrs. See page 98.

An Interesting Booklet on a Waterproof, Acid, Alkali, and Brine resisting Paint. American Asphalt Paint Co. See page 45.

An Illustrated Booklet, "More Light" on the use of factory paint is offered by the U. S. Gutta Percha Paint Co. See page 9.

Information on Scientifically Prepared Coatings for all industrial purpose are described on page 15. The Osborn Mfg. Co.

Coatings that Cut Down Upkeep on Roofs, Floors and Walls. Choice of samples offered by L. Sonneborn Sons, Inc. See page 119.

Information on Scientifically prepared Coatings for all industrial purposes can be obtained from The Goheen Corporation. See Inside Back Cover.

MATERIALS HANDLING EQUIPMENT

Factory Certified Wire Rope for use as crane cable. See page 105. Williamsport Wire Rope Co.

Description of the Link-Belt Portable Loader is shown on page 120 by the Link-Belt Co.

A Tier-Lift Truck with more than a hundred uses is described by the Lakewood Engineering Co. See page 112.

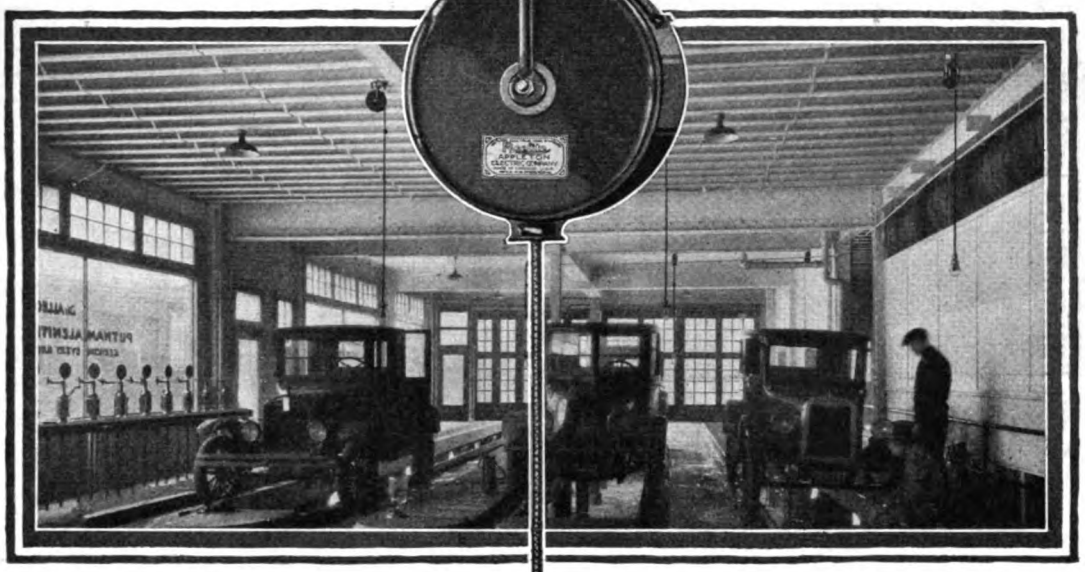
Information on the Dodge-Timken Conveyor Idler. See page 55. Dodge Manufacturing Corporation.

Equipment that Minimizes the Handling of Products. The Powell Pressed Steel Co. Page 116.

Catalogs No. 12 and 19-C describe concrete mixers, hoists, wheelbarrows, warehouse trucks and other handling

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OUT OF THE WAY WHEN NOT IN USE



Faster Alemite Service with Reelites

THESE days people buy not only quality but *speed.*

The shop that turns out a good job fastest is the shop that gets the business.

That's one reason why the Putnam-Alemite Service station at Canton, Ohio, like thousands of similar stations, is equipped throughout with Reelites.

Reelites speed up work enormously by keeping good light always handy—anywhere. They're so convenient to use that hustling workmen *use* them.

No more valuable minutes wasted hunting the old style portable light, untangling the dirty, twisted cord, perhaps finding it broken or injured by sharp heels or tools.

Reelites save their cost in cord renewals alone; they speed up work; they get more business for you. Let us send an expert to give you the whole story. There's absolutely no obligation on your part. Drop us a postal today.

APPLETON ELECTRIC COMPANY
1716 *Wellington Avenue* *Chicago, U. S. A.*
New York—150 Varick Street Los Angeles—340 Azusa Street

Reelite

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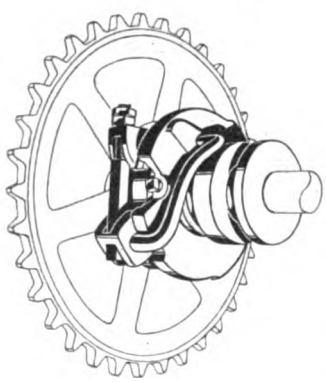
The Handy Light on a Reel



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Behemothic Gopher



Each move of a Barber Greene (Aurora, Ill.) trench digger cuts a gash in mother earth's strata one yard down, one across and one headlong, leaving in one day, a rectangular ditch, one mile in length. And be rock, pipe or gravel encountered, the speed and the cut vary little.

Conway Clutches

control every impulse of this modern mechanical dinosaur.

Let us tell why YOU should put dependable starting and stopping into your machine.

Bulletins 26 and 35 should be on hand always.

The Conway Clutch Co.
Storrs Station
Cincinnati, Ohio

equipment. These can be obtained from Lansing Company. Page 117.

A Book Showing How Handling Costs Have Been Lowered in many plants can be obtained from the Armington Engineering Co. See page 94.

An Illustrated Catalog on Hand Trucks that are steel-bound wherever wooden surfaces must be protected can be obtained from The Fairbanks Company. See page 101.

An Electric Hoist and I-Beam Trolley System that sells at a very low cost. See page 49. The Yale & Towne Manufacturing Co.

Catalogue L-66 gives Useful Information on an inexpensive device that enables you to run your conveyors at any speed desired. See page 95. Reeves Pulley Company.

Any Type of Truck or Caster can be equipped with the new Floor Saving Wood Wheels made by the Metzger Company, Inc. See page 48. Booklet offered.

A Complete Engineering Service that solves elevating, conveying, crushing and screening problems is offered by The Jeffrey Manufacturing Co. See page 13.

A Handy Tool for Moving the Heaviest of Railroad Cars. For information see page 91. The Advance Car Mover Company.

Bulletins No. 26 and 35 describe a Clutch particularly adapted to portable loaders, conveying equipment and other types of machinery. See page 108. The Conway Clutch.

Information on a High Speed Hoisting and Conveying Outfit that has 21 points of superiority, can be obtained from the Wright Manufacturing Company. See page 96.

A Catalog on Alloy Steel Platforms and Boxes, that speed materials handling. See page 3. Truscon Steel Company.

A Stock Dump Body that can be Installed on a motor truck can be obtained at an exceptionally low cost from Easton Car & Construction Co. See page 100.

A sixty-eight page "Book of Illustrated Economies," giving figures and actual photographic illustrations and a sixty page, "Floor Operated Hoist Catalog" are offered by the Shepard Electric Crane & Hoist Co., Back Cover.

The "Merrick Catalog" shows how bulk materials can be weighed while conveyor handled. The Merrick-Scale Co. See page 117.

Information on Equipment that lowers handling costs in the yard or plant is contained in the booklet, "Mr. Barber's Scrapbook." See page 29, Barber-Green Co.

Catalog showing Trucks, Barrels, Boxes and Trays for transporting and storage of packages, parts, raw material, trimmings, etc. See page 2. Rogers Fibre Co.

Industrial Tractors, Trucks and Cranes that save enough on handling costs to charge off the purchase price in six months. See page 115. The Baker-Raulang Co.

A Booklet "Facts for Consideration in Selecting a Storage Battery" is offered by the Electric Storage Battery Co. See page 8.

A New Track Unloader that fits right on to the coal car is described on page 114 by the Chicago Automatic Conveyor Company.

A Thirty Day Trial Offer on a Portable Crane that is known as the handiest tool in the shop. For information see page 84. Canton Foundry and Machine Co.

Another Engineering Study of a crane installation is shown on page 111 by Whiting Corp.

Information on Canvas Cushion Wheels for every type of factory truck, that eliminates tire replacement. See page 59. Divine Brothers Company.

Four Different Types and Fifteen Different Models of Tractors are described in Bulletin 106. Other bulletins are offered: A100 showing all purpose Industrial Trailers, A125 and A120 also give complete description of their line of trailers for every industrial requirement. See page 99. Mercury Manufacturing Company.

Fifty Years of Conveyor Service, the record of the Logan Company. Details on page 1.

An Overhead Monorail System that can be applied to every industry is shown on page 41 by The Louden Machinery Company.

POWER PLANT EQUIPMENT AND AUXILIARIES

Very Interesting Bulletins on Boiler Room Economies are offered by the Wickes Boiler Co. See page 114.

Bulletins on Jennings Heating Pumps, containing valuable

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"Load and Look" with KRON SCALES

The modern way of weighing requires no extra labor—no added expense. KRON SCALES will weigh any material on the move. They embody all the elements of safety, speed, accuracy, durability and economy.

There's a Kron Scale designed especially for the kind of material you handle.

Let us send you a description and photographs.

AMERICAN KRON SCALE CO.,

430 East 53rd St. New York, N. Y.

CANADIAN KRON SCALE CO., MONTREAL, CANADA

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Whenever you see a cloud of steam or hear hissing steam lines, it is a danger signal to your bank roll.

Every day our Engineers go into plants thought to be efficiently operated and find them losing $2,000.00 to $10,000.00, or more, yearly because of improper trapping. Why not write us to look over your steam lines and report our findings? There's no obligation.

Sarco Steam Traps cost only a *third* the price of most traps, so can be installed at *every* point where condensation collects without much expense.

They don't even require a support or pit, for you screw them right into the pipe line.

And no adjustments or follow-ups are needed. The Sarco No. 9 is *self-adjusting* for all pressures from 0 to 100 lbs.

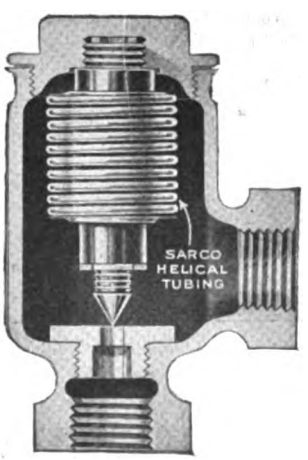
FREE TRIAL

Try the Sarco at *our* expense. We'll ship one on 30 days' free trial. Write today; also ask for Booklet R-276.

SARCO CO., Inc.
183 Madison Ave.
New York

Boston Chicago Detroit
Buffalo Cleveland Philadelphia

Peacock Bros. Ltd.
Montreal



SARCO Steam Trap

information on heating system installations. Nash Engineering Co. on page 16.

A Steam Trap on a 90 Day Trial also catalog. Offered by the Armstrong Machine Wks. See page 90.

A Booklet Covering a Line of Auxiliary Apparatus for the power plant. See page 100. Davis Engineering Corp.

Catalog on Boiler Feed Water Regulators can be obtained from the Chaplin-Fulton Mfg. Co. See page 115.

Free Trial Offer of a Steam Trap that spells fuel economy can be obtained from the Sarco Co., Inc. Also write for booklet R-276. See page 110.

Catalog and Price Lists on Steam Unions that prevent loss of steam, can be obtained from the E. M. Dart Mfg. Company. See page 116.

TOOLS. Shop Tools, Saws, Files, Chucks, etc.

Complete Information on Small Portable Saws and Jointers, self contained units, electrically driven. Page 82. Heston & Anderson.

Information on Portable and Bench Type Woodworking Machines is offered by Gallmeyer & Livingston Co., page 69.

Tools That are Built for Maximum Service are shown by Morse Twist Drill & Machine Co. See page 75.

Hack Saw Blades that rip and tear right through metal. See page 84. American Saw & Mfg. Co.

A Special Offer on an 8-inch Single End Angle Shear. For details see page 76. Buffalo Forge Co.

Catalog No. 30 on Small Tools and Catalog No. 138 on the complete line of machine tools can be obtained from Brown & Sharpe Mfg. Co. See pages 66-67.

Sample Blades are Offered by Victor Saw Works. See page 72.

Features of the New Keyless, Ball Bearing Drill Chuck are described on page 78 by Eastern Tube & Tool Co.

The Cap Screw with the perfect hexagon head. See page 88. Ferry Cap & Set Screw Co.

The Spindle Book, now ready, shows a complete list and information about different classes of machines and their spindle specifications. For a copy see page 73. Jacobs Mfg. Co.

Chrome Vanadium Wrench Kits for Millwrights, Loom-fixers and other Shop Mechanics. See Inside Front Cover. Bonney Forge and Tool Works.

Descriptive Circulars on Quick Operating and Wide Opening Lever Vises. Page 88. Edw. Purvis & Son.

Vises With Seven Distinct and Exclusive Features of Construction. See page 68. The Charles Parker Company.

A Description of a Vise Built to stand plenty of rough stuff. See page 76. Prentiss Vise Co.

High Speed Drills for high speed production. See page 80. The Cleveland Twist Drill Co.

List No. 47 shows easier, better, simpler pipe threading equipment. See page 81. The Oster Manufacturing Co.

Files for Speed, Ease and Depth of Cutting. See page 71. Simonds Saw & Steel Co.

A Free Trial Offer on an exceptionally efficient Portable Saw for various purposes. For complete information see page 86. D. W. Onan & Sons.

Special Analysis Steel can be obtained from Ludlum Steel Co. Page 86.

TRANSMISSION EQUIPMENT. Including Belting

Hangers, Pillow Blocks, Friction Clutches, etc., that offer definite savings in power transmission. See page 58. T. B. Wood Sons Co.

Medart Catalog No. 43 and Discount Sheet cover dimensions, details and list prices of the entire range of power trans-

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WHITING

Electric Crane

for a factory warehouse

Client
Problem— Design of paper warehouse.

The existing warehouse of a large manufacturer of paper products is located on valuable real estate. It contains no facilities for piling the heavy paper rolls. Additional capacity is badly needed. To provide this capacity by extending the existing building means a practically prohibitive cost for ground

By the construction of a new building of much smaller ground plan with a 4-ton electric travelling crane which will pile 6 to 8 rolls high, ample additional capacity can be secured and the saving in land value will cover a large part of the cost of the improvement.

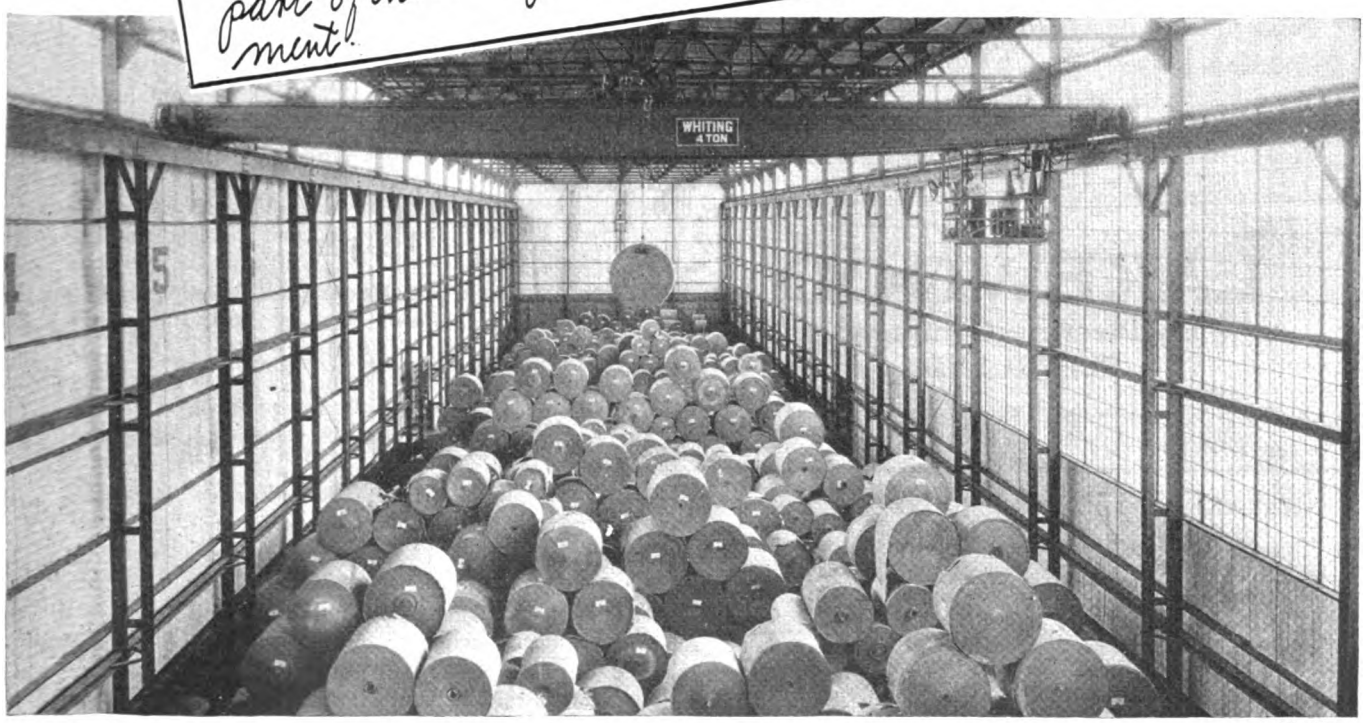
Leaves from an Engineers Note Book

The "cost" of warehouse space is greatly underrated in many plants. The real estate was cheap when the old warehouse building was put up. It's very valuable today. Any proper charge against the warehouse for the value of land occupied would change its present low "cost" to a very high one.

A Whiting Electric Traveling Crane in a smaller building is the logical way to cut high warehouse costs. It effects an immediate economy and its built-in quality keeps it performing dependably for years and years. A Whiting Crane keeps right on piling up economy.

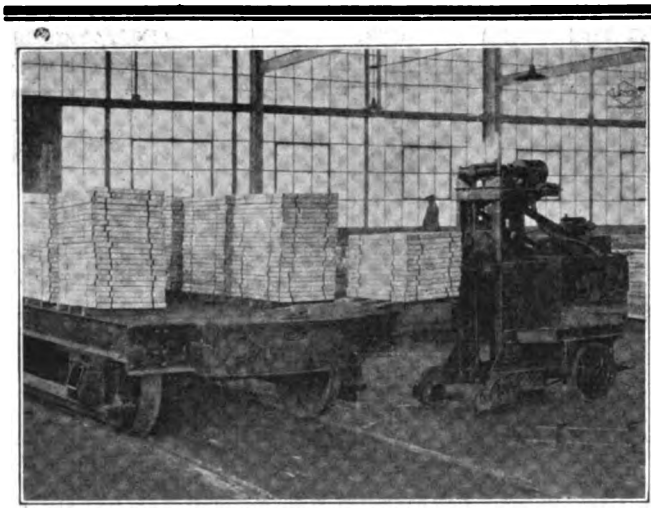
Why not have an engineering study made of your warehouse conditions? We will be glad to help you.

Whiting Corporation
15651 Lathrop Ave.
Harvey, Illinois
(Chicago Suburd)



119-Gray

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Slide Under the Load and Go!

Slide the fork under sheet metal, tin plate, boxes or barrels, and *travel.* You pick up the load quickly, get there fast and unload easily. No skids required. Just use small strips of wood to give clearance for the fork.

This model No. 706 truck saves a large investment in skids and has many various labor saving uses. It may be fitted with a crane or other attachments to lift special shapes of sizes. And, best of all, these special attachments are used with *standard* Tier-Lifts. You pay no premium for equipment designed for your peculiar needs.

Lakewood Tier-Lifts are made with lifts up to 8 ft. and capacities to 6,000 lbs.

The
LAKEWOOD
Engineering Company
CLEVELAND

THE LAKEWOOD ENGINEERING CO., Cleveland, O.
Please send specification sheet I.T.116.

Company .....

Individual .....

Address .....

mission equipment made by The Medart Co. See page 54.

A 60-Day Trial on a Belt Preservative. See page 92. Cling-Surface Company.

Booklet on Pulleys, Gears and Sheaves is being offered by the Pyott Foundry Company, makers of Pyott Red Face Pulleys. Look on page 92.

A Booklet, "There's Money in This for You," that answers questions on belt care and operation can be obtained from Chas. A. Schieren Co. Pages 62-116.

Bulletin No. CE719 Describes a Steel Belt Lacing that is quickly joined. See page 82. The Bristol Co.

Made of Selected Native, Packer Steer Hides, tanned by the long oak bark process and finished by experts. See page 7. I. B. Williams & Sons.

Belt Lacers that result in greater transmission efficiency. See pages 56-57. Clipper Belt Lacer Co.

A Catalog on Flexible Shafting for tool room, machine shop, pattern shop and foundry. See page 86. N. A. Strand & Co.

MISCELLANEOUS

A Booklet Describing Counters for rate setting and production work. See page 91. The Veeder Mfg. Co.

Blowers for Heating, Ventilating and Mechanical Draft. For information see page 113. American Blower Company.

Catalog No. 26 describes an improved oven for cores. See page 10. Young Brothers Company.

A Trial Offer on Factory Chairs, that eliminate fatigue. See page 88. Royal Metal Mfg. Co.

Information on Stopping the Losses Resulting from Human and Mechanical Errors in the measurement of material is offered by The Toledo Scale Co. See page 93.

Booklets Describing Temperature Control are offered by Taylor Instrument Companies. See page 103.

A Bulletin on a Complete Line of Shop Furniture is offered by the New Britain Machine Company. See page 79.

Literature Describing a Power Baler that saves waste storage space and is fire-proof is offered by Davenport Mfg. Co. See page 84.

Catalog on Automatic Fire Door Equipment is offered by Richards-Wilcox Mfg. Co. See page 25.

A New Catalog M-28 gives complete information and data on Blue Printing. C. F. Pease Co. See page 11.

Illustrated Folders on the Hallowell Pressed Steel Bench Legs and Workbenches should interest every industrial executive. See page 77. Standard Pressed Steel Company.

A Catalog No. 21, Showing some Valuable Suggestions for Steel Lockers, Bins, Racks and Shelving. See page 68. Durand Steel Locker Co.

Bulletin No. 85 on Unit Heaters and Bulletin No. 90 on Fan Furnaces are offered by New York Blower Co. See page 117.

Fabricated Sheet Metal Parts. An engineering service offered by The Breese Bros. Co. See page 115.

A New Catalog on sanitary ice cooled drinking fountains. See page 91. Century Brass Works.

Thin Lead Colored Pencils. See page 104. American Lead Pencil Co.

Catalog Describing 275 Styles and sizes of oilers for all types of machinery. Gits Bros. Mfg. Co. Page 68.

A Catalog describing Weighing Scales that show the weights of materials while on the move is offered by the American Kron Scale Co. Page 109.

An Economical Means of Cleaning Parts is shown on page 60. Oakite Products, Inc.

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The VENTURAFIN METHOD OF HEATING



-proves its efficiency in this Plant

Writes *J. Hall Taylor, President of the American Spiral Pipe Works, Chicago, Illinois*

"In planning to heat this building we figured on the ordinary steam radiation that we had always used; but when we took up the American Blower Venturafin Unit Heater Method with our heating engineer, he suggested that we install 4 No. 4 Venturafin units.

"He did not, however, believe that these 4 heaters would be quite sufficient, and recommended placing 5 additional heating coils along the west wall to give 890 ft. of additional radiation. But the Venturafins not only heated the addition to the machine shop, but also the machine shop itself, giving us an even, comfortable working condition in the most severe weather, and making it unnecessary to install the additional heating coils. And only during the coldest weather is it necessary to run the Venturafins through the night.

"The Venturafin Heaters have the big advantage of distributing an even heat throughout the building. Steam coils, on the other hand, do not radiate to any great distance from the coils, because the heat from the coils quickly rises to the ceiling.

"The Venturafins also occupy less space than steam coils, and can be placed anywhere, thereby saving needed space. Maintenance with them is negligible."

✓ HEAT WITH UNIT HEATERS

AMERICAN BLOWER CO., DETROIT, MICH.
BRANCH OFFICES IN ALL PRINCIPAL CITIES
Canadian Sirocco Company, Limited, Windsor, Ontario

(550-A)

American Blower

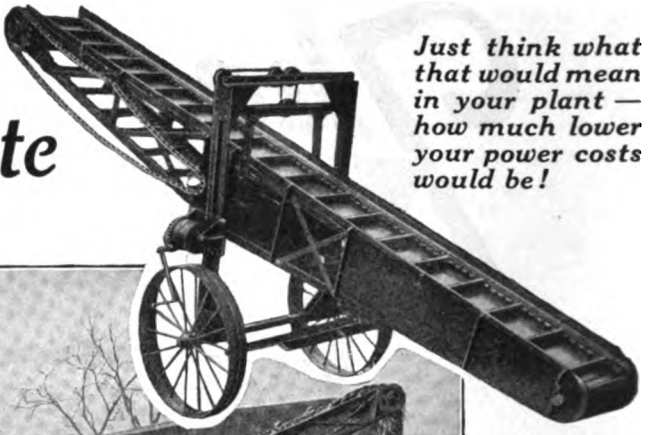
"Sirocco" VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT

MANUFACTURERS OF ALL TYPES OF AIR HANDLING EQUIPMENT SINCE 1881

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Unloads 2 Tons of Coal a Minute

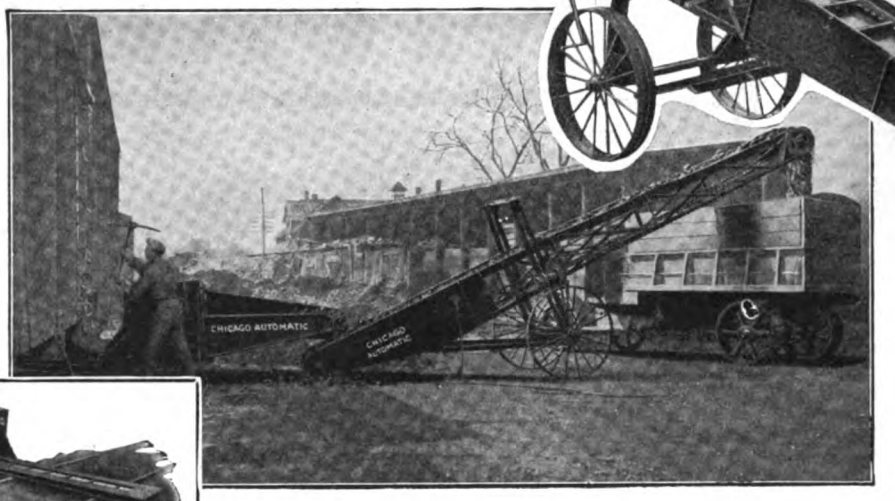
Just think what that would mean in your plant — how much lower your power costs would be!

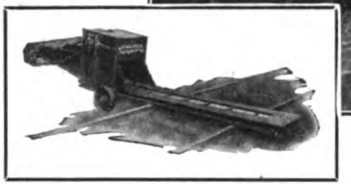


That is why you need the new Chicago Automatic Model T. V. Truck Unloader. No shoveling—unloads a whole car of coal in an hour—no pits necessary. Only three inches high on the rail — goes under any car.

Chicago Automatic Conveyors have for years reduced coal handling costs in hundreds of industrial plants in the United States and Canada.

There's a Chicago Automatic Conveyor right in your neighborhood handling coal more economically year after year. Let us tell you about it.





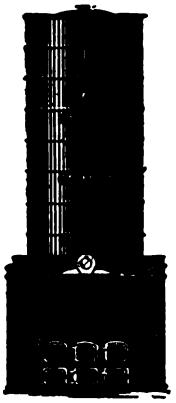
Branches in all principal cities

CHICAGO AUTOMATIC CONVEYOR CO.

Originators of the Portable Conveyor

982 Old Colony Building, CHICAGO, ILL.

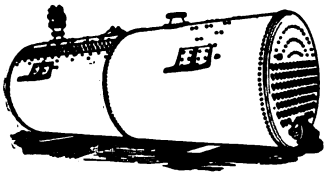
Vertical Water Tube



Steel Cased Setting Increases Efficiency

WICKES Steam Boilers

Ask for Bulletins describing in detail—sent free.



Horizontal Return Tubular

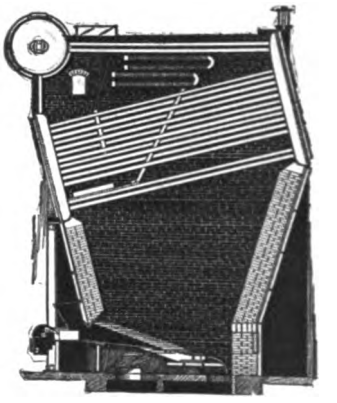
THE WICKES BOILER CO.

Saginaw, Michigan

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Horizontal Cross Drum Water Tube



The One Joint Header Boiler.

MEN WANTED

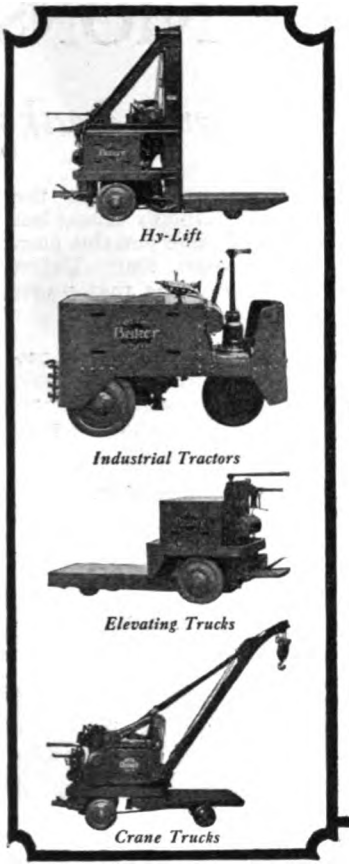
with an Acquaintance Among Industrial Executives

AN opportunity for men who have sold to industrial plants or for others with a knowledge of plant practices who are looking for the chance to become salesmen. Positions open in industrial centers and good territories will be assigned. Earnings are unlimited and good future for men who make good.

The work consists of selling subscriptions for one of the best known publications in the industrial field. A magazine published for 35 years with an enviable reputation for its service to industrial executives. Men who can give only a part of their time will also be considered. Write giving an outline of your experience. Address box 535, Care INDUSTRIAL MANAGEMENT, 120 West 32nd Street, New York.

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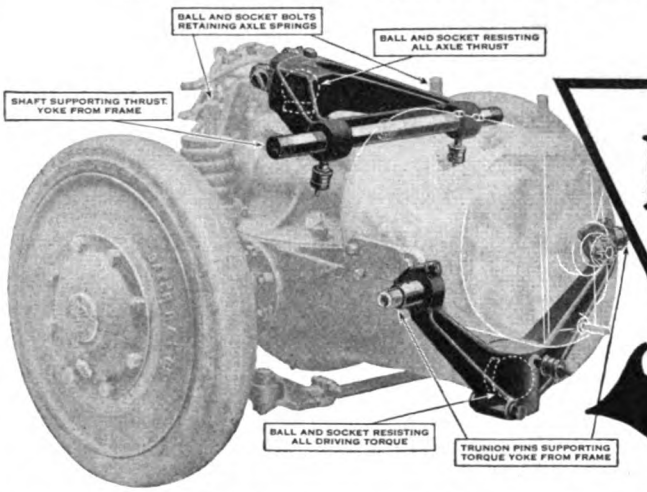
An Exclusive Baker Feature



THIS unique combination of ball and socket joints with driving and torque yokes maintains accurate alignment between axle and frame, relieves the springs and other working parts of all driving strain and guards against the wear and tear of hard service.

Among our standard or special models you will find some Baker equipment that will meet your needs satisfactorily and economically.

THE BAKER-RAULANG COMPANY, CLEVELAND, OHIO



THE ELECTRIC TRACTORS AND TRUCKS
Baker
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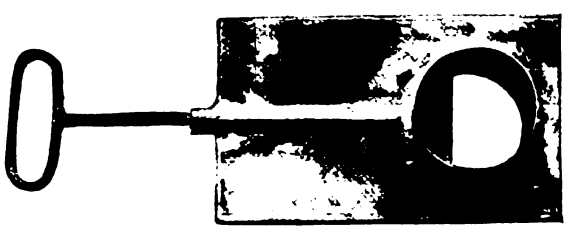
A Big Saving Can Be Made By Using

SHEET METAL PARTS

where you formerly used iron castings—They come to you smooth, perfect fitting and cost less than iron castings that Require Machining and are frequently imperfect.

SHEET METAL PARTS

weigh less which reduces freight bills—They are lighter in weight but stronger in tensile strength.



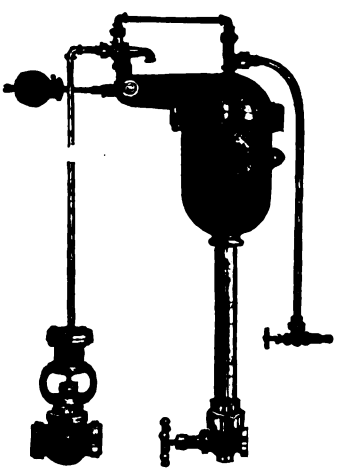
FREE SERVICE—Our engineering department is available without obligation on your part, to help you reduce your costs. Send us a blue print or pencil sketch.

STEEL—IRON—BRASS—COPPER—MONEL METAL
Requiring
Stamping—Forming—Drawing—Blanking—Punching

See Data A.S.M.E. Condensed Catalogue of Mechanical Equipment. Also Hendricks' Sweets Engineering, and Thomas Catalogues.

THE BREESE BROS. CO. Cincinnati, Ohio

FUEL ECONOMY



is secured when the water in boilers is maintained at a constant level. Careless hand feeding is being replaced in modern power plants by

VIGILANT
Feed Water
REGULATORS

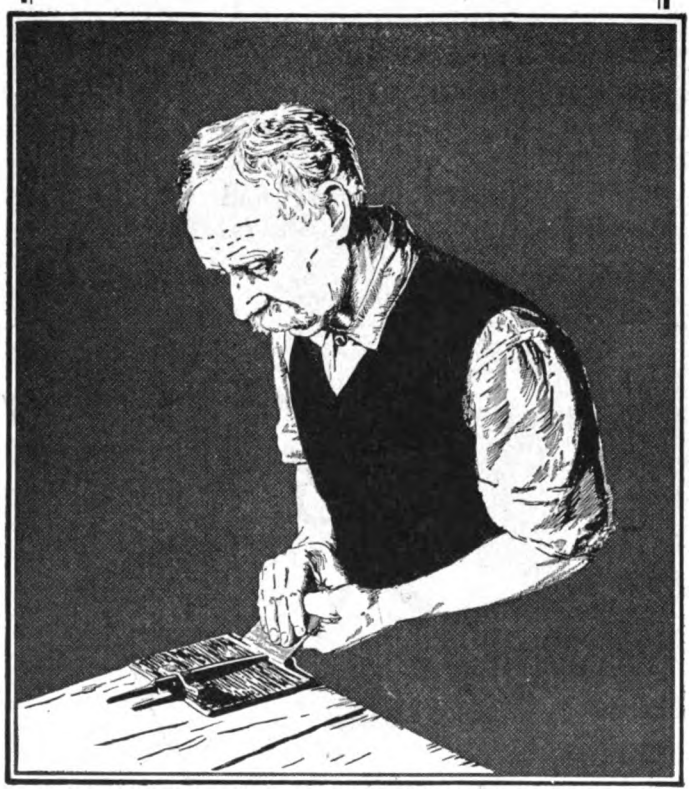
They are always on the job and insure a constant water level. Steam production is increased, boiler strain is relieved and real fuel economy is secured.

Send for catalogue

The Chaplin-Fulton Mfg. Co.
28-36 Penn Ave., Pittsburgh

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Care of Tools



There are no bargains

The purchasing agent thought he could judge belt quality at sight. Accordingly, he bought several belt bargains. When, a few months later, the shop foreman called him out to look at the last of his bargains he threw up his hands in disgust.

The name "Schieren," however, justifies you in expecting what your eyes cannot see—belt value.

Every penny of outlay made for a Duxbak Belt is returned to you in the extra months and years of service it renders.

Send for the free booklet, "There's money in this for You." It tells how to make all belts endless and how to renew old ones.

DUXBAK BELTING TRADE MARK

Chas. A. Schieren Company

Tanners
Belt Manufacturers
31 Ferry Street, New York

CHAS. A. SCHIEREN COMPANY,
31 Ferry Street, New York.

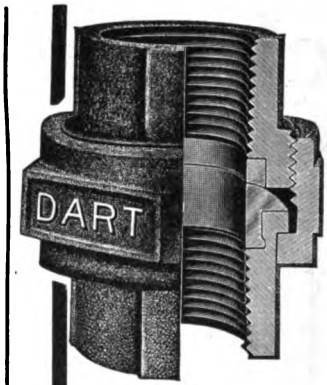
Gentlemen:—
Please send me one of your booklets, "There's Money in this for You."

Company Name .....

Address .....

Individual .....

"SCHIEREN BELTS DO LAST LONGER"



DART UNIONS

Cannot Leak!

We are so certain that DART Unions cannot leak that we give you this guarantee—two Dart Unions for every one that proves defective.

The Bronze to Bronze seats, ground to perfect ball and socket bearings prevent leakage. They require no packing. They are easy to fit. Adapted for high and low pressures.

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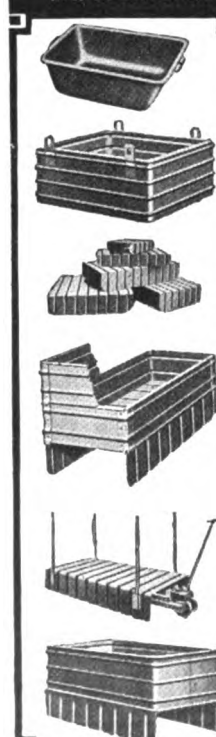
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DART UNIONS

POWELL
PRESSED STEEL
MATERIAL HANDLING EQUIPMENT



More Accurate Cost Determination

GREATER accuracy of production costs can be determined when factory operations are reduced and simplified by the economical use of material handling equipment.

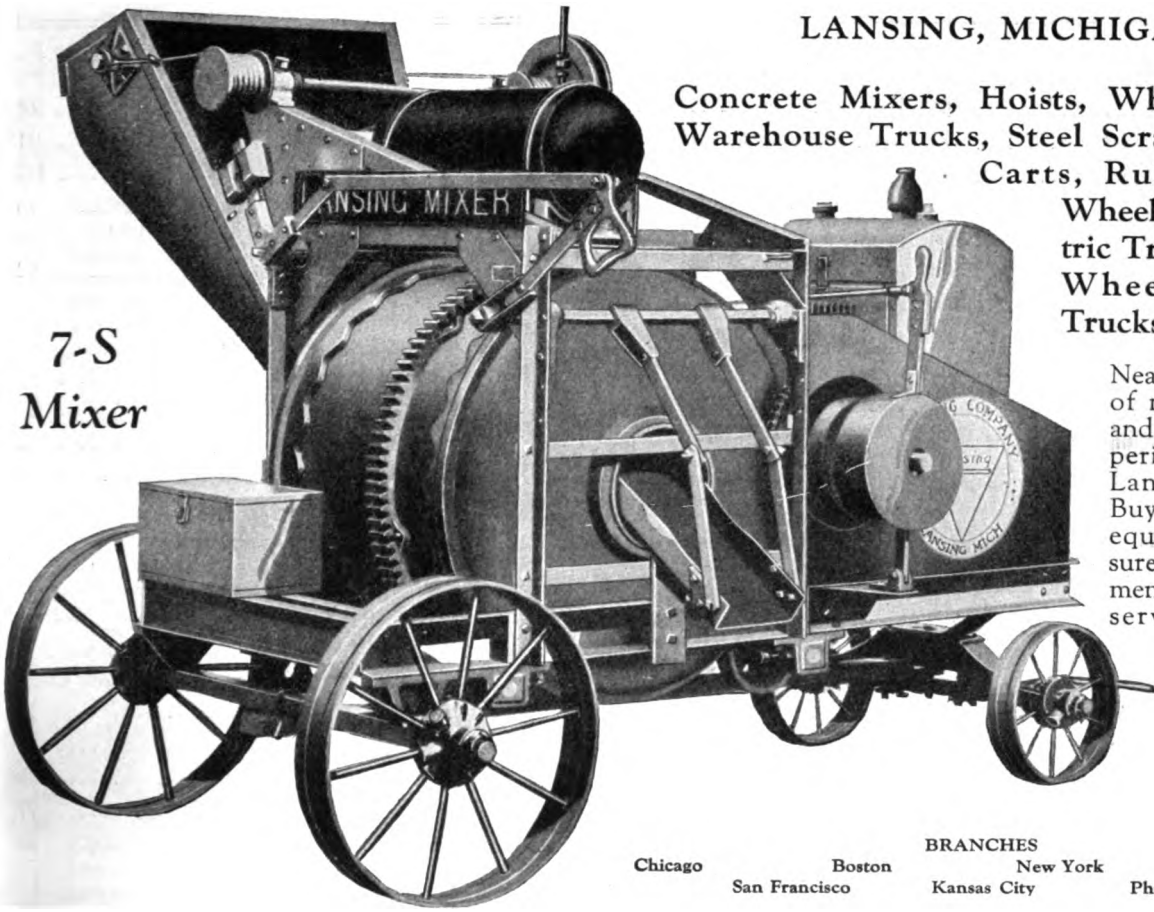
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The POWELL PRESSED STEEL CO.
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LANSING-COMPANY

LANSING, MICHIGAN



7-S Mixer

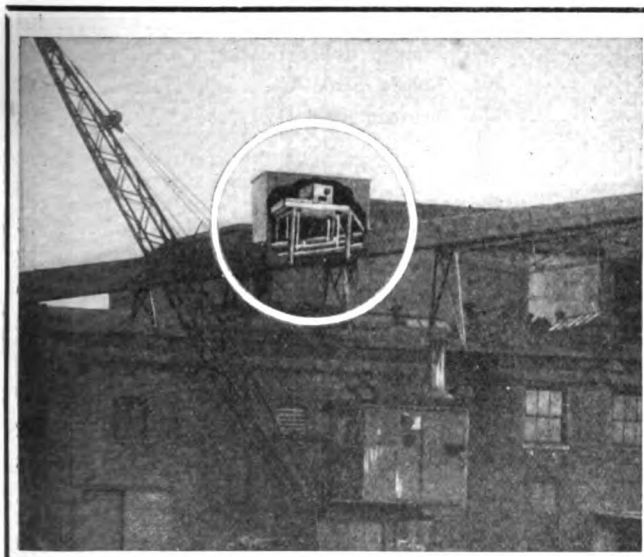
Concrete Mixers, Hoists, Wheelbarrows, Warehouse Trucks, Steel Scrapers, Hand Carts, Rubber Tired Wheels, Skids, Electric Tractors, Fibre Wheels, Trailer Trucks.

Nearly half a century of manufacturing and distributing experience is back of Lansing Products. Buyers of Lansing equipment are assured of prompt shipment, efficient repair service and low freight rates.

Send for Catalog No. 12 and No. 19-C.

BRANCHES

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San Francisco Kansas City Philadelphia



Weigh as You Convey and Eliminate Losses

What check have you on materials handled on conveyors? Your bills of lading are not always correct. The chance for error is always present.

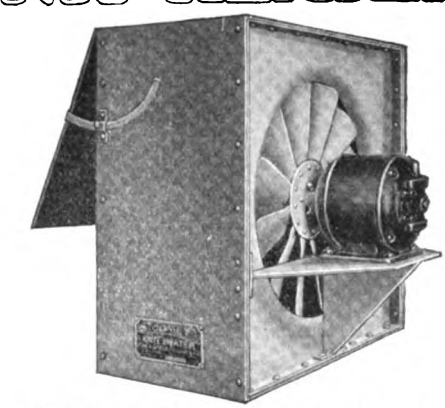
Conveyors equipped with Merrick Weightometers are assured of an accurate check on all conveyor handled materials—99% accuracy guaranteed—ore, sand, stone, gravel, coal, coke, finished cement, etc. The weighing is done while the materials move along and the weights recorded. It is ideal for checking receipts, shipments and interplant movements.

Write for the "Merrick Catalog." It explains how it works.

MERRICK SCALE MFG. CO.

180 Autumn St. Passaic, N. J.

COMET UNIT-HEATERS



More Heat—One Fifth the Weight

For efficient and economical heating in buildings where steam is used; easily and quickly installed. Motor driven disc fan forces the cold air through heating coil, raising the temperature and distributing it into the room. The warm air leaving the Unit Heater at high velocity gives even distribution. Quantity of air and direction of flow adjustable. Even temperature can be maintained in all parts of the building.

Write for bulletin 85 which describes fully

If you have no steam plant, see our Bulletin 90 on Fan Furnaces for your heating problem.

Fans
Unit Heaters
Air Washers
Blowers
Furnaces

NEW YORK BLOWER COMPANY

General Offices
2244 So. Halsted
Chicago

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LAPIDOLITH is the original concrete floor hardener. It will add years of wear to even an old concrete floor. It is a liquid, chemical compound that penetrates the porous cement, binds the loose particles together, and fills up the voids. It will make your concrete floors almost as hard as flint, and make concrete dust a thing of the past. Lapidolith is as easy to apply as water, and dries overnight.



LIGNOPHOL will add years of wear to apparently worn-out wood floors. It is a preservative dressing that penetrates the wood fibres, and restores the natural gum and oils. It does away with the use of floor oils. It will give you smooth, hard, dustless wood floors. One treatment will last for years.



STORMTIGHT stops leaks instantly. If it is applied to the entire roof it will add years of wear to even an apparently worn-out roof. Stormtight is a thick, adhesive, rubber-like substance. It may be applied by anyone to any roofing material. Stormtight has often saved manufacturers the cost of a new roof. It can be secured in either the semi-liquid or plastic form in practically any quantity.

Wasteful Costly Repairs

This is how leading industrial plants have reduced them

1. They protect their concrete floors against wear with Lapidolith, a concrete floor hardener that puts an end to dusty, easily-worn-down concrete floors.

2. They add years of life to their wood floors with Lignophol, a preservative dressing that keeps wood floors from splintering, rotting, or drying out.

3. They make their repainting jobs less frequent by using Cemcoat, a remarkably economical paint that may be washed again and again without turning yellow.

4. They make their buildings proof against dampness. By treating their exterior walls with Hydrocide Colorless they are assured of warm, dry interiors.

5. They stop roof leaks before they become serious by using Stormtight. Stormtight stops leaks quickly and easily. If used on the entire roof it gives permanent leak insurance.

L. Sonneborn Sons, Inc.

114 Fifth Avenue, New York City



HYDROCIDE COLORLESS will give you warm, dry buildings. This waterproofing compound is applied to the exterior of a building. It will not run in hot weather, as it contains no paraffin. It will not detract from the natural beauty of the walls, as it is absolutely invisible when applied. It will give you positive guarantee against any water or moisture seeping through the walls of your buildings. It will cut down your heating expense.



CEMCOAT. When your next repainting job comes around, try Cemcoat. The wearing qualities of this paint are remarkable. Even on brick, plaster, or concrete walls it will not crack or peel. It may be washed again and again. Because of its unusually heavy body it generally requires one less coat to a given surface than most paints. Cemcoat comes in white and colors for exteriors and interiors.

The above products have helped many manufacturers reduce their maintenance expense. Concerns such as the Ford Motor Company, Swift and Company and the Bethlehem Steel Company have used some or all of these products for years. Let us send you free samples.



L. SONNEBORN SONS, INC. I-2
114 Fifth Avenue, New York City

Please send me, without any obligation, demonstration sample and literature on:—Lapidolith....; Lignophol....; Cemcoat....; Hydrocide Colorless....; Stormtight..... Check those products that interest you most.

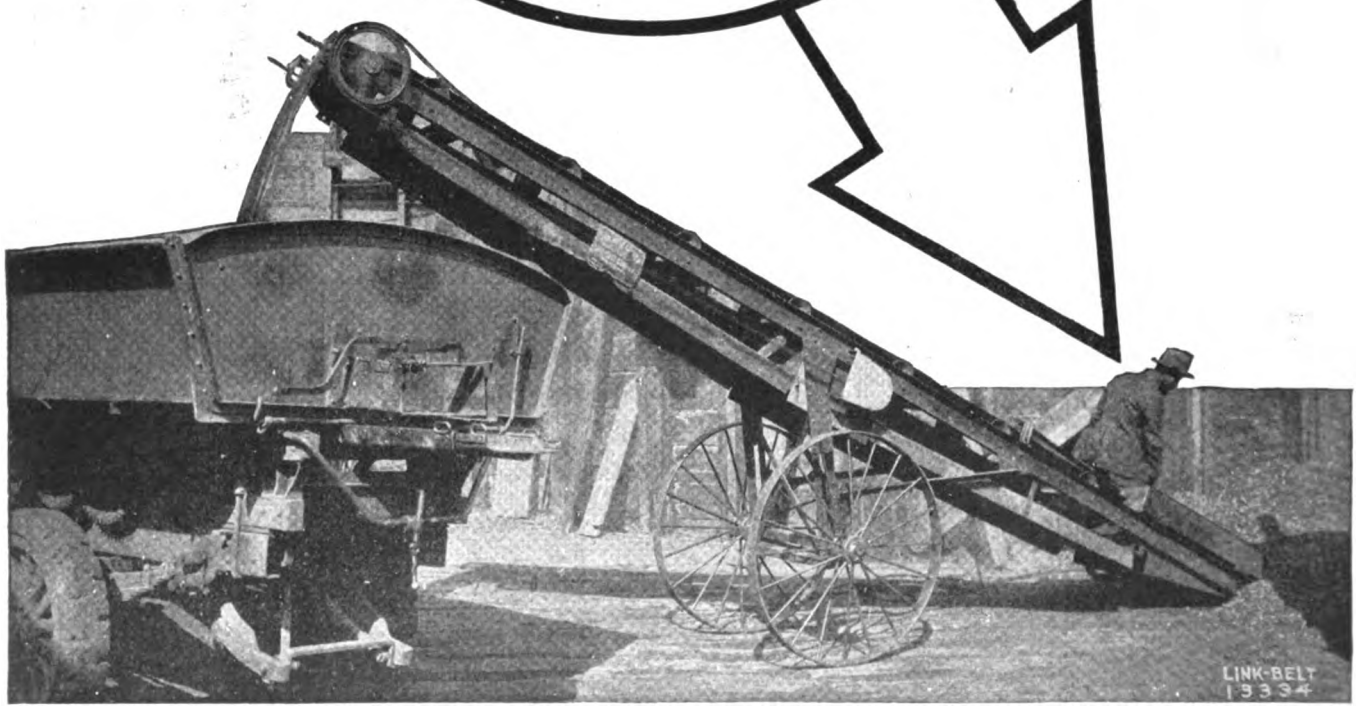
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One Man
And a Link-Belt "Cub"
Will Cut Your Handling Costs and Take the Drudgery Out of This Work

That's why it doesn't pay to shovel

We build a complete line of Loaders for all purposes. Let us tell you which one to use in your yard.



LINK-BELT COMPANY 2710

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LINK-BELT
Famous Portable Loaders

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GOHEEN

PAINT ENGINEERS

Offer Scientifically Prepared Coatings for Concrete and Wood

GOHEENS
WOOD FLOOR PRESERVATIVE

Accomplishes perfectly the three major requirements of a wood floor protective coating.

1. **Toughens the surface to prevent or stop splintering.**
2. **Waterproofs the floor.**
3. **Penetrates to kill rot producing fungi.**

It adds years to the life of wood floors. Makes floors sanitary and does not change color of wood.

Purchase cost is low and it can be applied by unskilled labor. Covers about 400 square feet per gallon.

Can be used in any building, from factory to residence, interior or exterior.

CONCREWALTUM PAINT
(TRADE MARK)
FOR WALLS

For interior or exterior use on any type of brick or cement surface or masonry walls, Concrewaltum Wall Paint is the highest grade concrete coating made. Used by Public Utilities and largest Industrials for years. Waterproofs and damp-proofs. Will not crack, peel or flake off. Combats weathering and disintegration for many years. Concrewaltum is unaffected by alkalinity of concrete or plaster. Can be scrubbed and cleaned. Made in many colors or special shades. Covers about 300 square feet per gallon. Made in Flat, Eggshell and Gloss.

ROCKOTE
For Hardening Concrete Floors

Rockote is a scientifically prepared and tested liquid product which **overnight** gives a permanently hard, flintlike surface to soft dusting granular concrete floors. Purchase cost is low and its ease of application with unskilled labor makes the labor cost insignificant. Any janitor or laborer can apply Rockote. Only two applications necessary. Concentrated to permit dilution with water. No interruption of plant operation, dries overnight. Covering capacity remarkably high.

CONCREWALTUM
TRADE MARK
FLOOR ENAMEL

Produces a hard elastic, durble and beautiful enamel finish on Concrete Floors. Prevents absorption of oils, greases, etc. Makes concrete floors easy to clean and keep sanitary. Most economical, covering 300 square feet per gallon. Gives years of service. Made in many colors or special shades.

CONCREWALTUM
TRADE MARK
COLORLESS—INVISIBLE

Concrewaltum Colorless is a preparation that can be applied on any brick or concrete surface that is already up. The modern use of brick and concrete buildings creates the need for a COLORLESS CONCREWALTUM for waterproofing and to prevent dampness from penetrating. COLORLESS CONCREWALTUM is a transparent coating that does not change the color or the texture of the surface to which it is applied. It can be easily brushed into the surface and will absolutely prevent dampness from penetrating.

It will not change the color of the surface in any manner. It is easily applied by either brush or spray and has excellent covering capacity.

GOHEEN CORPORATION of N. J.

Paint Engineers since 1888

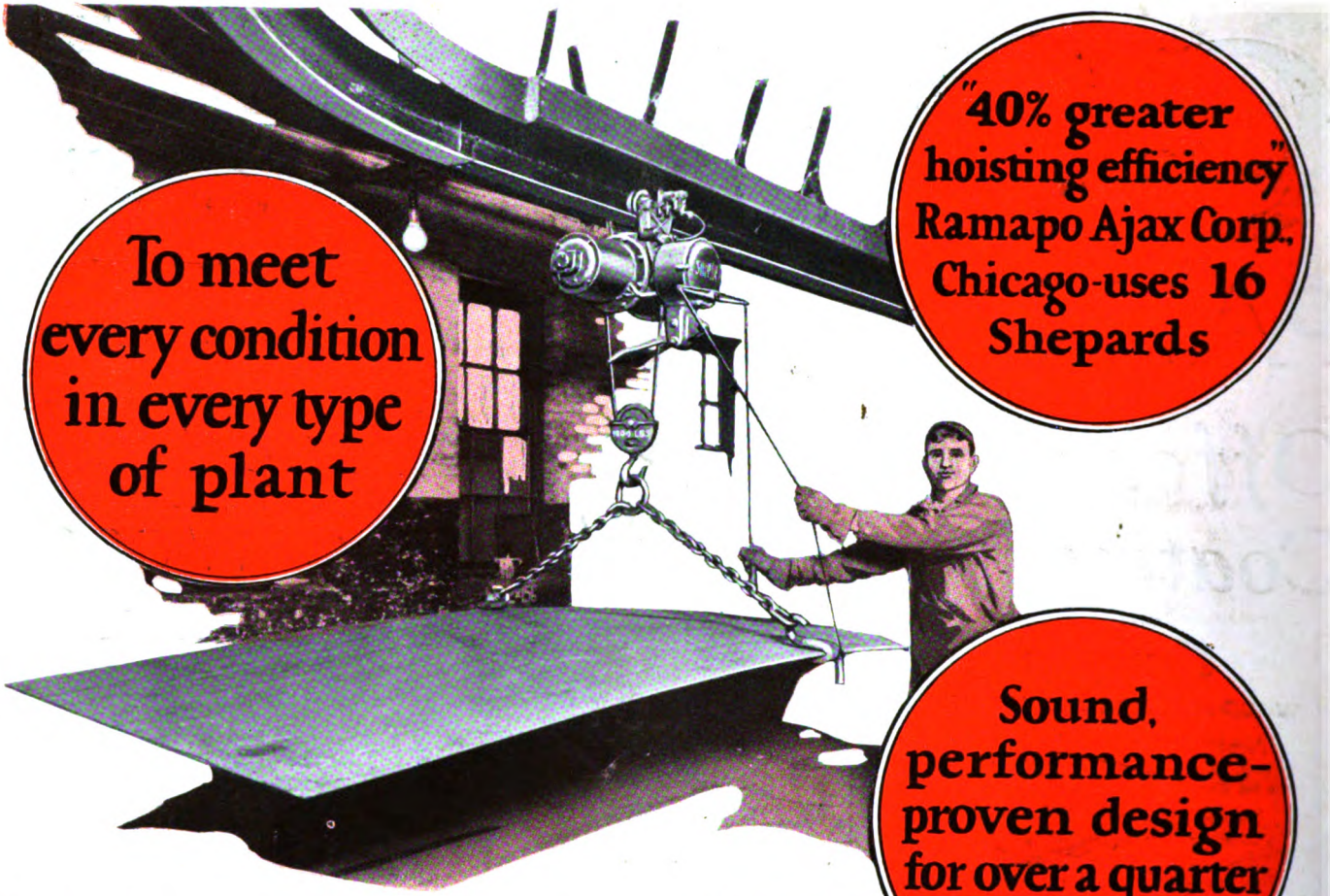
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A Standard Goheen Paint for Every Type of Surface and Use

Galvanum — Carbonizing Coating for Iron and Steel — Chemically Combined Highway Red Lead Paint — Thermokote, A Goheen Product, A Paint for All Hot Surfaces and Stacks — Goheen's Mill White, Trade Mark

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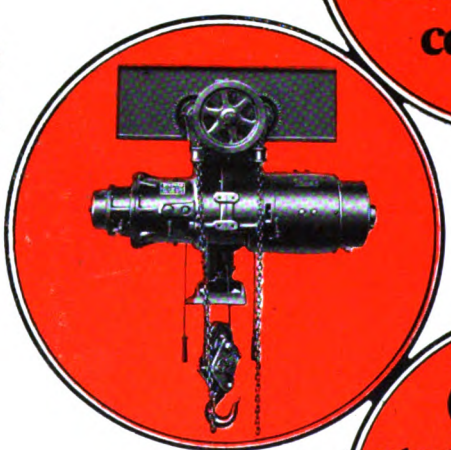
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To meet every condition in every type of plant

"40% greater hoisting efficiency" Ramapo Ajax Corp., Chicago—uses 16 Shepards

Sound, performance-proven design for over a quarter century



Over 50 standard types of floor operated electric hoists

Shepard—the hoist that predominates in American Industry

Name your plant conditions —meet them with Shepard

A wealth of experience in electric hoist application is yours when you come to Shepard.

It is an experience dating back to the earliest days of electric hoist manufacture—over a quarter century ago.

It is an experience that has enabled Shepard to produce America's most complete line of electric hoists—for instance, 50 standard types of floor operated machines.

It is an experience that dictates Shepard design; a balanced drive; automatic oil bath; enclosed unit construction; permanent alignment.

Name your plant conditions—meet them with Shepard. You can fit a Shepard Electric Hoist to the Job, for there is a unit to meet every purpose.

Write for LiftAbout "Book of Illustrated Economies", and Floor Operated Hoist Catalog, or for specific information about Shepard Single I-Beam Cranes, Transfer Cranes, Traveling Cranes, Overhead Track and Switches, Speed Reducers, and Winches.

SHEPARD ELECTRIC CRANE & HOIST CO.
366 Schuyler Ave., Montour Falls, N. Y.

Branches in Principal Cities

Largest Manufacturer of Electric Hoists in America

SHEPARD
ELECTRIC CRANES & HOISTS

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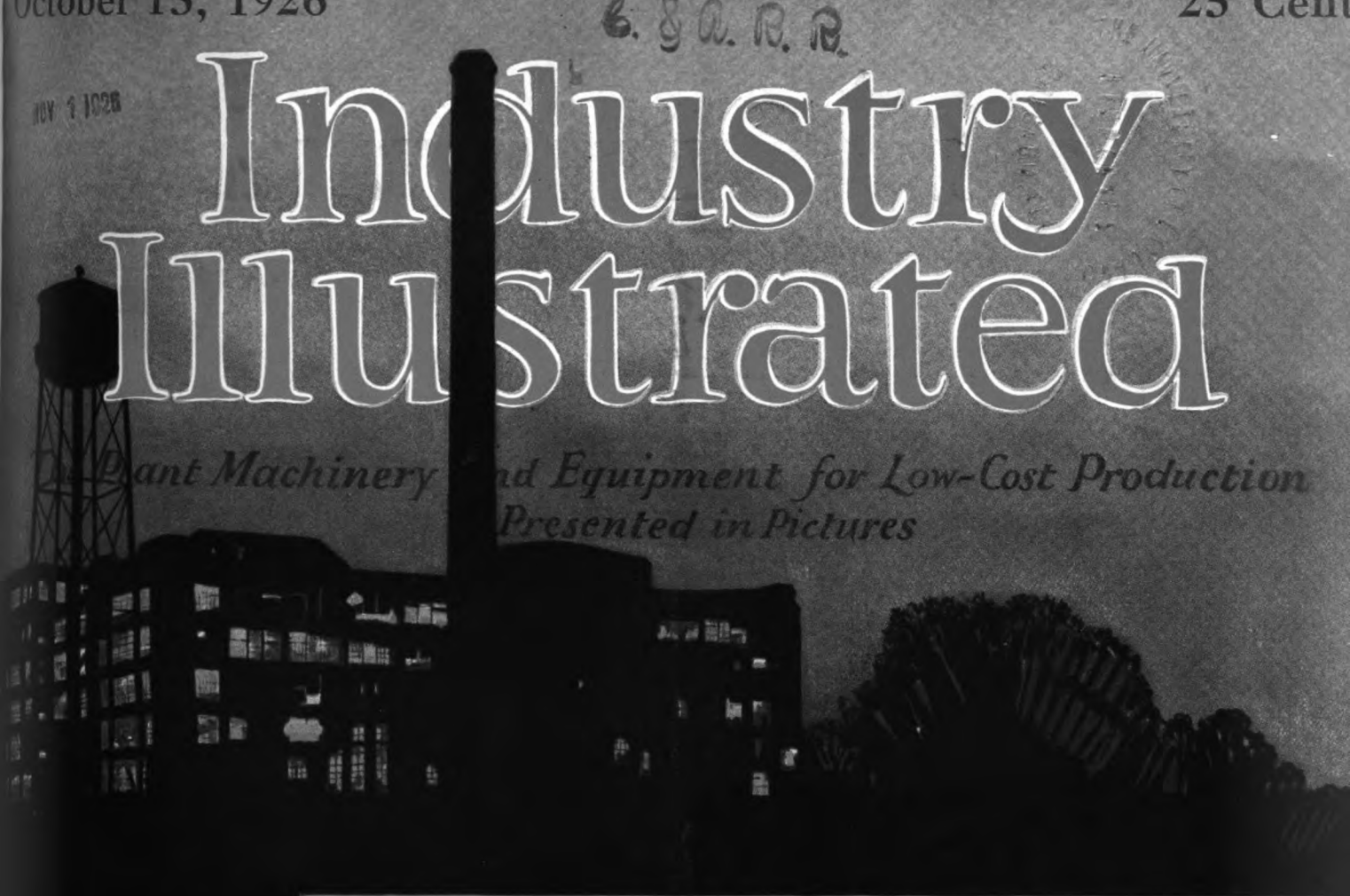
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C. & A. R. R.

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Industry Illustrated

Plant Machinery and Equipment for Low-Cost Production Presented in Pictures



Put Them to Work

Some of the greatest ideas that were ever conceived, died with the dreamers who evolved them but failed to apply them. And these ideas, potentially of incalculable worth, were actually worth nothing at all because they were not used.

As you go through the pages of this issue of INDUSTRY ILLUSTRATED, how many of the practical ideas it contains have direct application to your own problems? That is the first consideration. But the final measure of the value you get from this and every other issue of this magazine, lies in the use you make of those ideas.

Boiled down, condensed, presented in such a way as to save your time, the ideas are there. It is for you, yourself, to make them work for you.

Publishing Offices
Industry Illustrated
W. 32nd Street, New York

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BONNEY*CV CHROME VANADIUM WRENCHES HAVE ESTABLISHED NEW STANDARDS OF WRENCH QUALITY

A few years ago Bonney Forge & Tool Works were manufacturing a superior line of carbon steel wrenches.

They sensed the need for wrenches of better quality than were available and after much research and experimentation developed a wrench made of Chrome Vanadium steel.

These new Bonney Chrome Vanadium wrenches established new standards of wrench quality.

When the public began to demand Bonney Chrome Vanadium wrenches and refused to be satisfied with anything else, alloy steel wrenches of various kinds began to appear on the market, but the BONNEY CHROME VANADIUM WRENCHES STILL REMAIN THE STANDARD OF WRENCH QUALITY.

You cannot fool a good mechanic when it comes to tools, and the fact that good mechanics almost invariably specify Bonney Chrome Vanadium Wrenches means more than anything we can say.



(PATENTS PENDING)

You can secure from your Mill Supply Jobber.

Bonney Forge & Tool Works
Allentown, Pa.

Makers of Special Service Wrenches of Chrome Vanadium, Carbon Steel Drop Forged Wrenches, Stillson Wrenches, Vises and Drop Forgings and the Bonney Rim Tool.

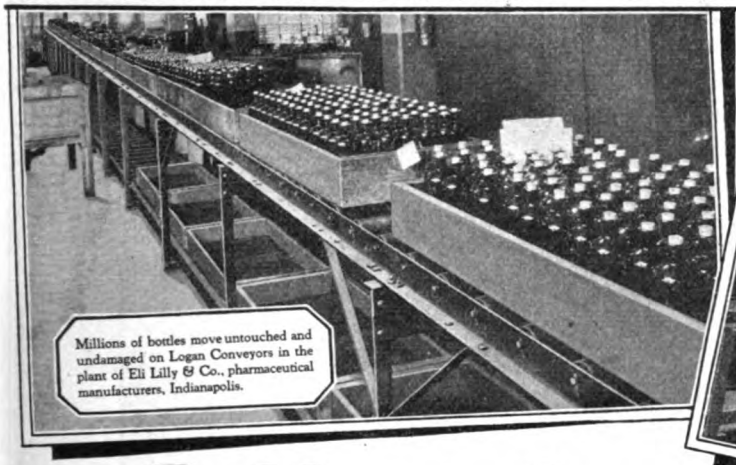
BONNEY Chrome-"CV"-Vanadium WRENCHES
REG. U.S. PAT. OFF.

C. V. is a Bonney trademark registered in the U. S. Patent Office

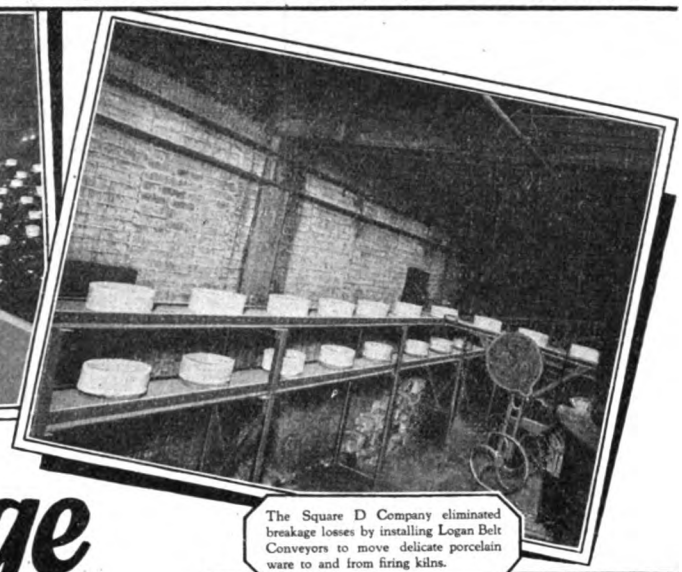
Chrome Vanadium registered August 11th, 1925

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50 YEARS OF SERVICE ~ OUR GOLDEN ANNIVERSARY



Millions of bottles move untouched and undamaged on Logan Conveyors in the plant of Eli Lilly & Co., pharmaceutical manufacturers, Indianapolis.



The Square D Company eliminated breakage losses by installing Logan Belt Conveyors to move delicate porcelain ware to and from firing kilns.

4 Breakage Can Be Avoided-

"WELL, charge it up to profit and loss" —that was the old way of meeting the breakage difficulty. But the idea that breakage is a necessary evil in fast production is becoming more and more obsolete with the constantly increasing use of Logan Conveyors.

And by preventing breakage, Logan Conveyors can save you in other, less obvious ways—by reducing the amount of overruns allowed for damage; by cutting the waiting time before handling is safe and by permitting continuous, uninterrupted production all along the line. *All this in addition to what they save you in labor, time and space.* It will pay *you* to know the economies of Logan Conveyors adapted to your needs. Use coupon for convenience.

This is the FOURTH of a series of announcements featuring seven distinct savings made by using Logan Conveyors.

No. 1—Savings in Labor.

No. 2—Savings in Time.

No. 3—Savings in Space.



Above: The Westinghouse Lamp Company cuts out breakage of electric bulbs by the use of Logan Gravity Rollers from finishing to shipping rooms.

Below: Even rolls of asbestos are not immune from damage in handling, so Logan Conveyors are used by Keasby & Mattison, Philadelphia, to prevent breakage losses.



Logan Co.
INCORPORATED 1885

LOUISVILLE, KY. *Offices in Principal Cities*

LOGAN CO.
Louisville, Ky. Date.....

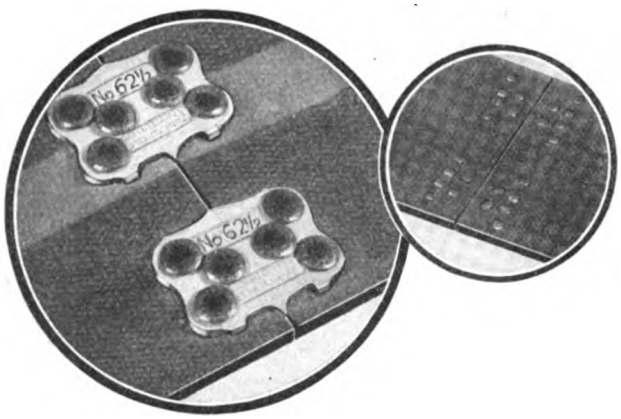
We are interested in conveyors. Send catalog ☐ Without obligating us, have your representative call ☐

Name .....

Address .....

Logan Conveyors
LOUISVILLE

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The New Belt Fastener Stronger—More Serviceable Longer Life

Users of belt fasteners and belt manufacturers who realize how difficult it is to properly apply belt fasteners will appreciate the following features in Standard Self Aligning.

Self Aligned Plates. The strain is equally distributed on each fastener.

Rivets are self aligned lengthwise of the belt; the right way.

The plates are rust proof and will give longer service than other plates.

Their construction guarantees a strong, durable, and expert job in a jiffy, and you don't throw them away every time you take up a belt.

Send for samples to compare with what you are now using.

THE BOURNE-FULLER COMPANY

Upson Works

Unionville, Conn., U. S. A.

Also manufacturers of Standard Malleable and Steel Fasteners.

The Publisher's Column

ARE you keeping step?

During the past ten years, there has been an increase of 34 per cent. in the efficiency of American Industry. This is measured by the average increased output of the wage earners employed.

During the next ten years there will undoubtedly be a still further increase in the efficiency of our industry, of at least 34 per cent. Americans have a reputation for beating past records.

Executives who keep step with this fast rate of progress will keep up with the procession. Those who do not, will fall back, and out. Industrial progress has no use for stragglers.

Both the editorial and the advertising pages of INDUSTRY ILLUSTRATED are planned to convey a message and prove a source of inspiration for those who keep step.

Industry Illustrated

Published Monthly by

THE ENGINEERING MAGAZINE CO.

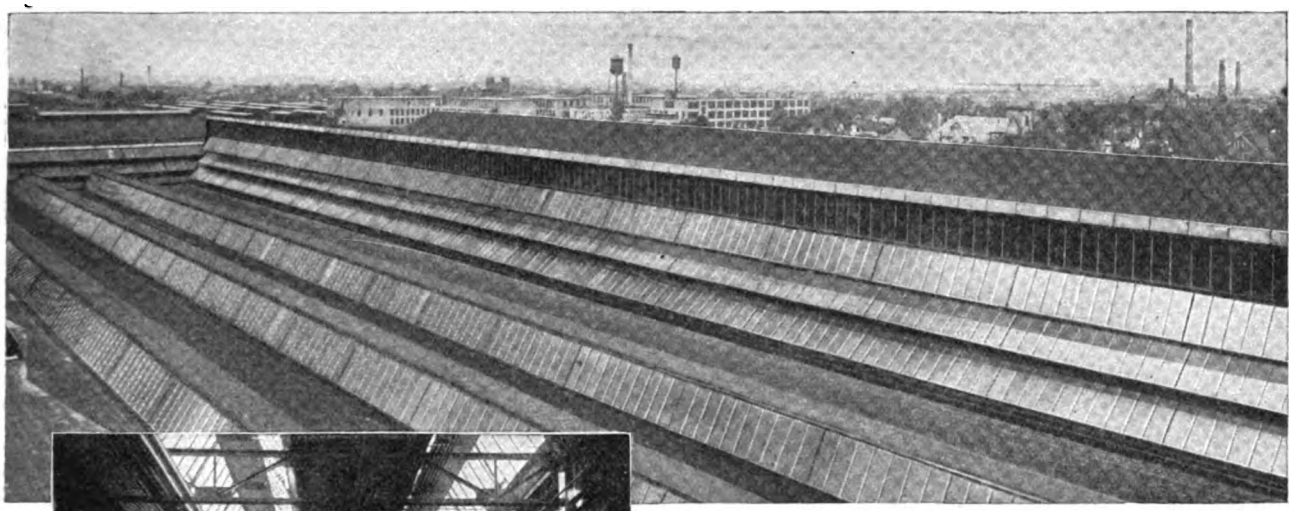
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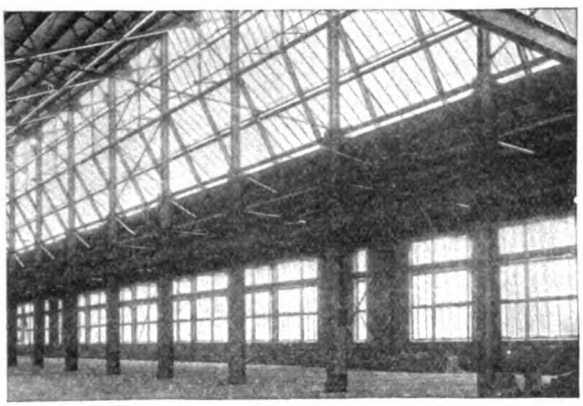
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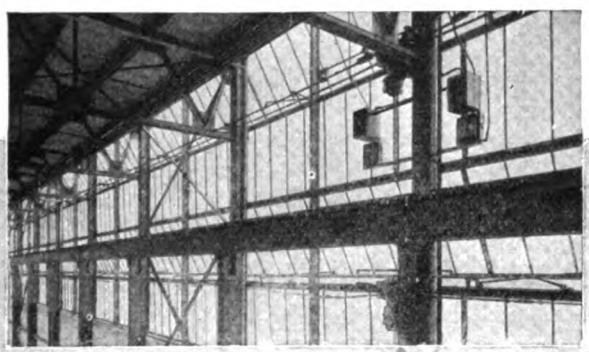
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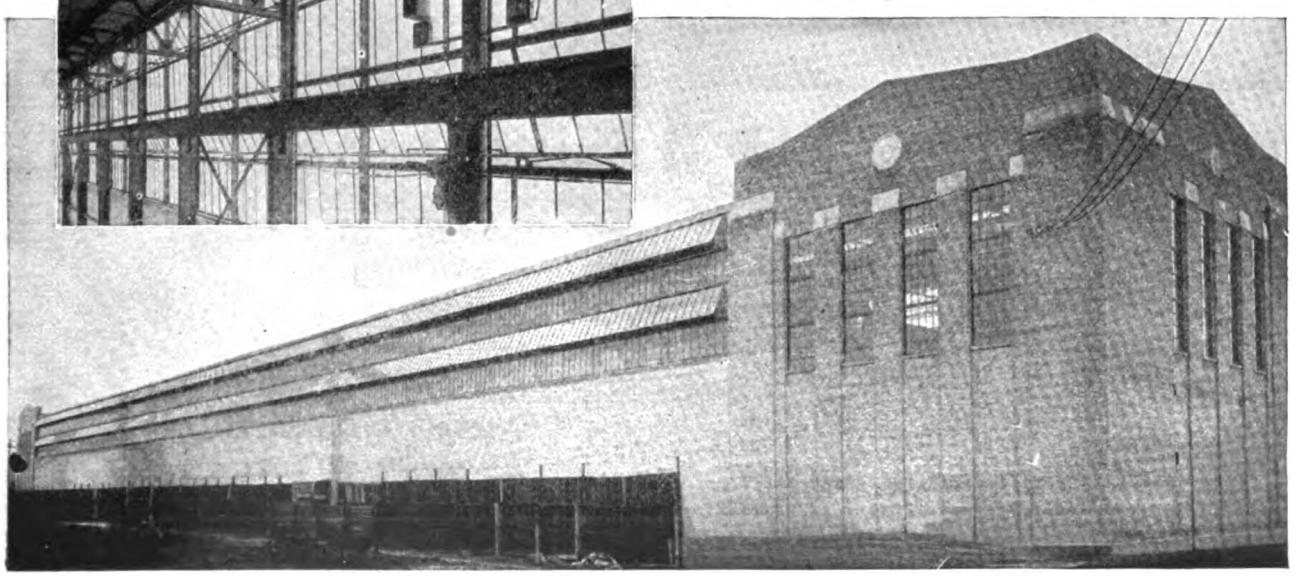
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DONT FIGHT FRICTION WITH OIL



WHEN you fight friction with oil, you merely keep on fighting, but when you fight it with Skayef Bearings, you WIN!

One of the largest soap manufacturers in the country used plain bearing line shaft equipment for years. The bearings lasted only from two to eight months. They were lubricated fifty-two times a year.

THEN, Skayef Self-Aligning Ball Bearing Hangers were installed! The result was a saving in power of 8%, or $1746.87 per year, lubrication was reduced to four times a year, and in three years of rigorous service, only one Skayef Bearing was replaced.

No wonder manufacturers all over the country are turning to Skayef transmission equipment. It pays for itself in less than two years' time.



FIGHT IT WITH BETTER BEARINGS

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Self-Aligning **HANGERS** *Ball-Bearing*

1645

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Nuttall-Timken

Nuttall, one of the world's largest makers of gears, mounts them on Timken Tapered Roller Bearings, in a whole line of Nuttall gear drives.

An impressive combination of industrial experience is represented in products sponsored by two such institutions as Nuttall and Timken.

Nuttall, with its rigid standards, honors Timken by concurring in the basic Timken advantages—reduced friction to save power, lubricant and belts—tapered design to carry thrust without complication or loss of anti-friction properties — Timken-made steel to assure material as fine as possible for its purpose — and Timken *POSITIVE ROLL ALIGNMENT* for speed characteristics and elimination of the bearing cage as a calculable factor.

THE TIMKEN ROLLER BEARING CO., CANTON, OHIO

Technical information regarding bearing sizes and their mountings can be secured from the Timken Roller Bearing Service & Sales Company's Branches located in the following cities: Atlanta, Boston, Buffalo, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Kansas City, Los Angeles, Memphis, Milwaukee, Minneapolis, Newark, New York, Omaha, Philadelphia, Pittsburgh, Richmond, St. Louis, San Francisco, Seattle, Toronto, Winnipeg.

TIMKEN *Tapered Roller* **BEARINGS**

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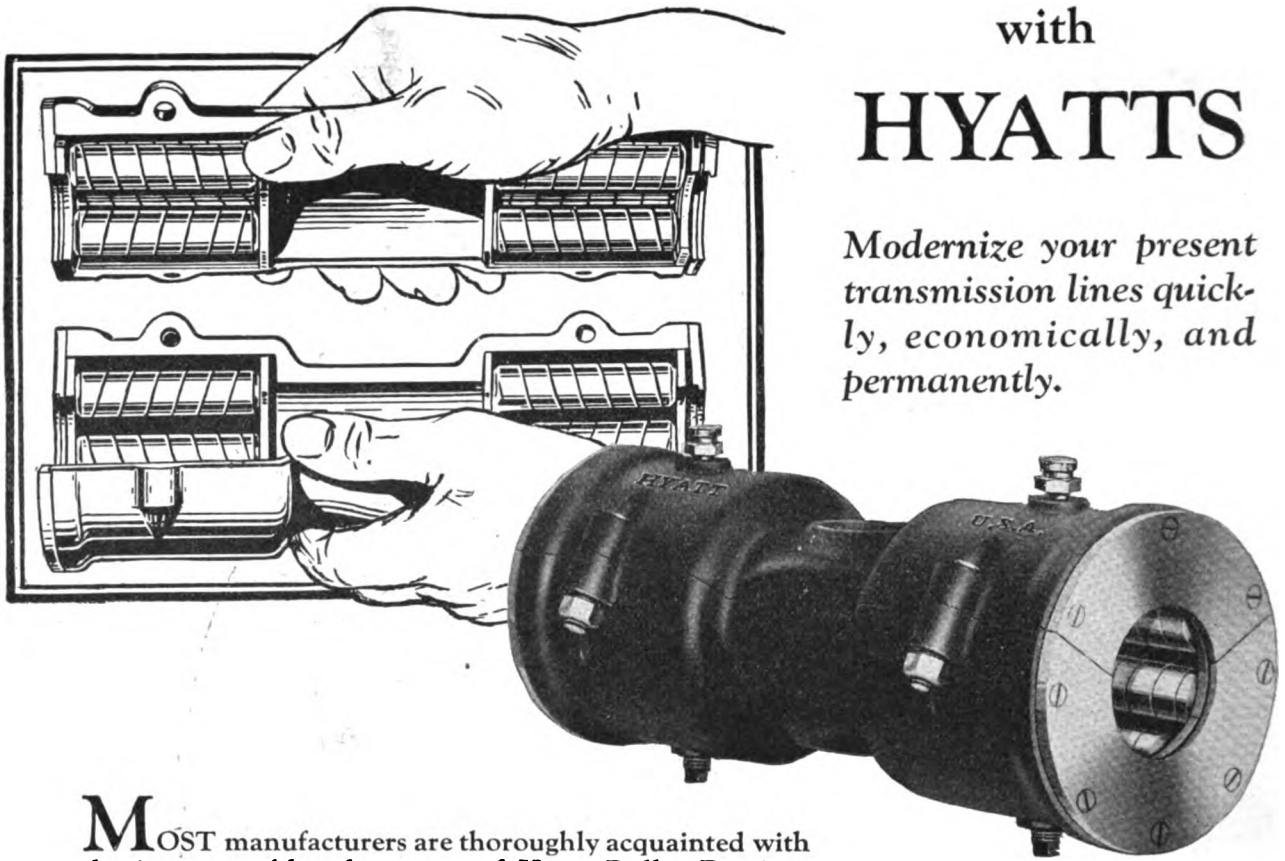
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Replace your power consuming line shaft bearings

with

HYATTS

Modernize your present transmission lines quickly, economically, and permanently.



MOST manufacturers are thoroughly acquainted with the incomparable advantages of Hyatt Roller Bearings over ordinary bearings on line shaft equipment. But some still fail to realize how simple and economical a job it is to change over to Hyatts.

The fact is that Hyatt Roller Bearings can be installed without tearing shafting, pulleys, or hangers down. The bearings, and their boxes, are furnished split so they can be placed around the shafts and bolted securely together in a few minutes' time.

Once installed, you have launched them on a career of lasting service. Some Hyatt Line Shaft Bearings have been in service over thirty years—and aren't old timers yet. They are practically frictionless and wearproof.

The helically wound Hyatt rollers absorb loads, vibrations, and irregularities in shaft surfaces. Their full line contact prevents overloading, reduces friction, and saves 15% of your power bill. Lubrication is required only three or four times a year.

¶ The new *narrow center* Hyatt bearing fits all hangers, size for size. Your nearest mill supply dealer can tell you more about them.

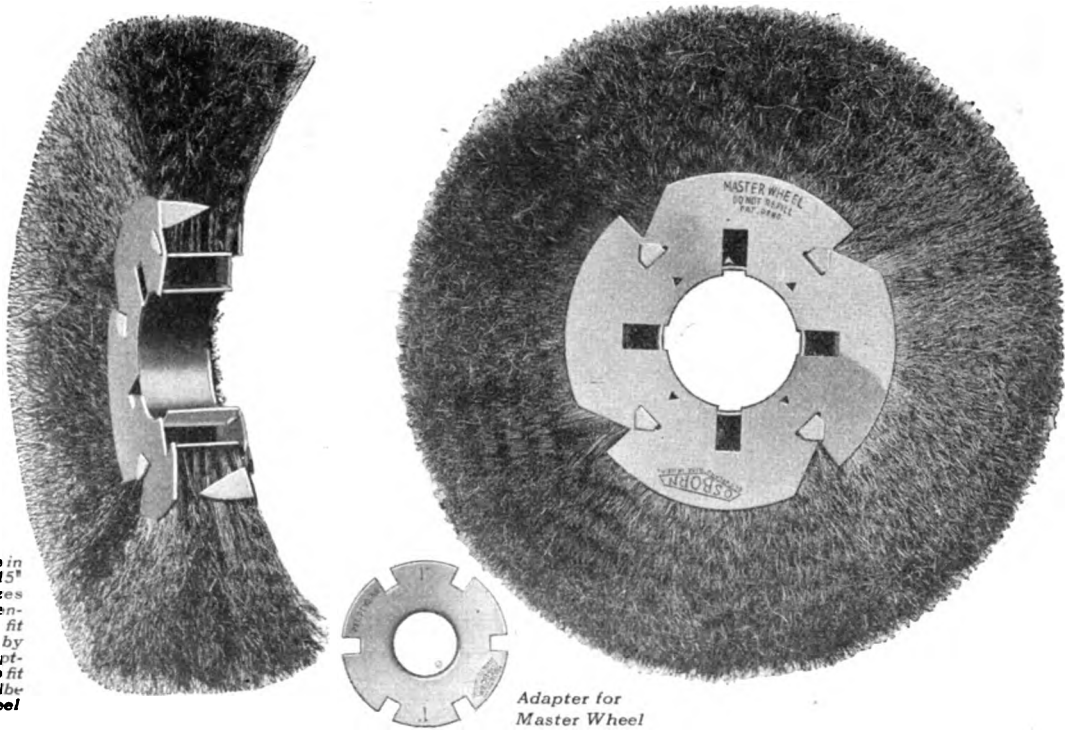
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NEWARK, NEW JERSEY
Pacific Coast Address: San Francisco, Cal.

HYATT
ROLLER BEARINGS

HYATTS ARE USED WHEREVER GOOD BEARINGS ARE NEEDED

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Master wheels are made in sizes ranging from 8" to 15" in diameter and all sizes have a standard 2" opening. The adjustment to fit any size shaft is made by the use of Osborn Adapters. A set of adapters to fit any size of arbor hole will be furnished with each wheel

Adapter for Master Wheel

Osborn Master Wire Wheel Brushes—Better for Cleaning, Scratching, Polishing

Osborn's world-wide reputation — a better-wearing brush for every use—is clearly demonstrated in Osborn Master Wire Wheel Brushes and Adapters.

When used for cleaning, scratching and polishing by rubber companies, wire, steel, brass and aluminum foundries, machine shops, garages, tire repair shops etc., it provides a degree of service and long life which is typical of all brushes bearing the Osborn trademark.

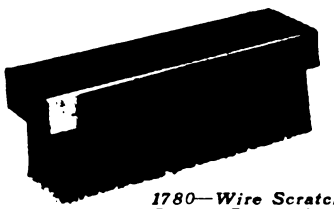
One of the outstanding features is the use of adapters to make this wheel fit any size shaft. This overcomes the necessity of carrying in stock wheels with many size arbor holes.



1781—Wire Scratch Brush. Standard Shoe Handle Brush for household, auto or factory use.



1777—Steel Wire Scratch Brush. A narrow brush for pattern makers and brazier's finishing work, cleaning architectural iron work, figured brass and small castings. Size ¾" wide, length over all 14", length of wire 1⅛".



1780—Wire Scratch Brush. Straight back brush with extra long wires for general use. The wire used in Osborn Scratch Brushes is the first quality tempered steel, drawn especially for scratch brush use.

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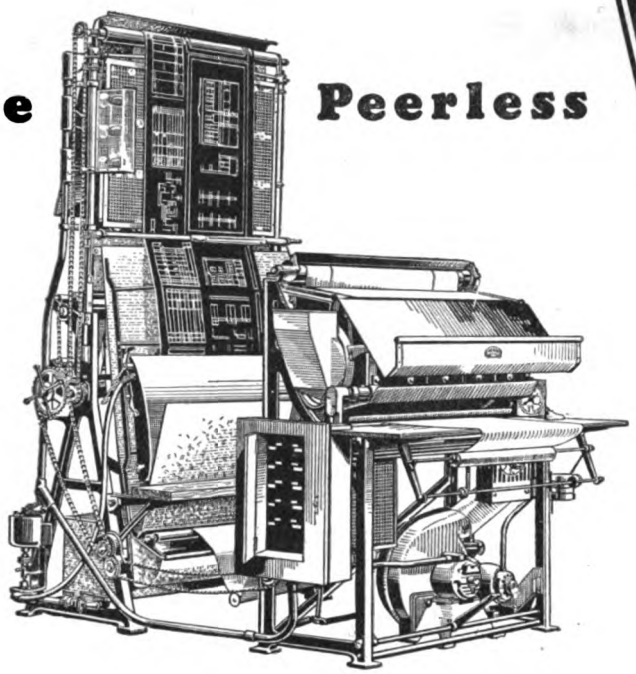
Osborn Brushes

A BETTER WEARING BRUSH FOR EVERY USE

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PEASE CHICAGO

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The Pease Peerless Blue Printing Equipment can handle large or small tracings in any quantity as fast as they can be fed into the machine. No more discouraging waits for important prints—no side-tracking of rush jobs—because, day or night the Pease Peerless will give you perfect blue prints at the rate of 4 inches to 6 linear feet per minute, *and at a saving in price, that is worth investigating.*

From start to finish, blue prints are printed, washed, potashed and dried in one continuous operation. Merely feed the tracings, the Peerless does the rest—gives you prints ready to use immediately. The Printing Machine may be purchased separately and can be used entirely independent of the Washer and Dryer when desired. Our new Machinery Catalog completely illustrates and describes this economical, time and labor saving equipment.

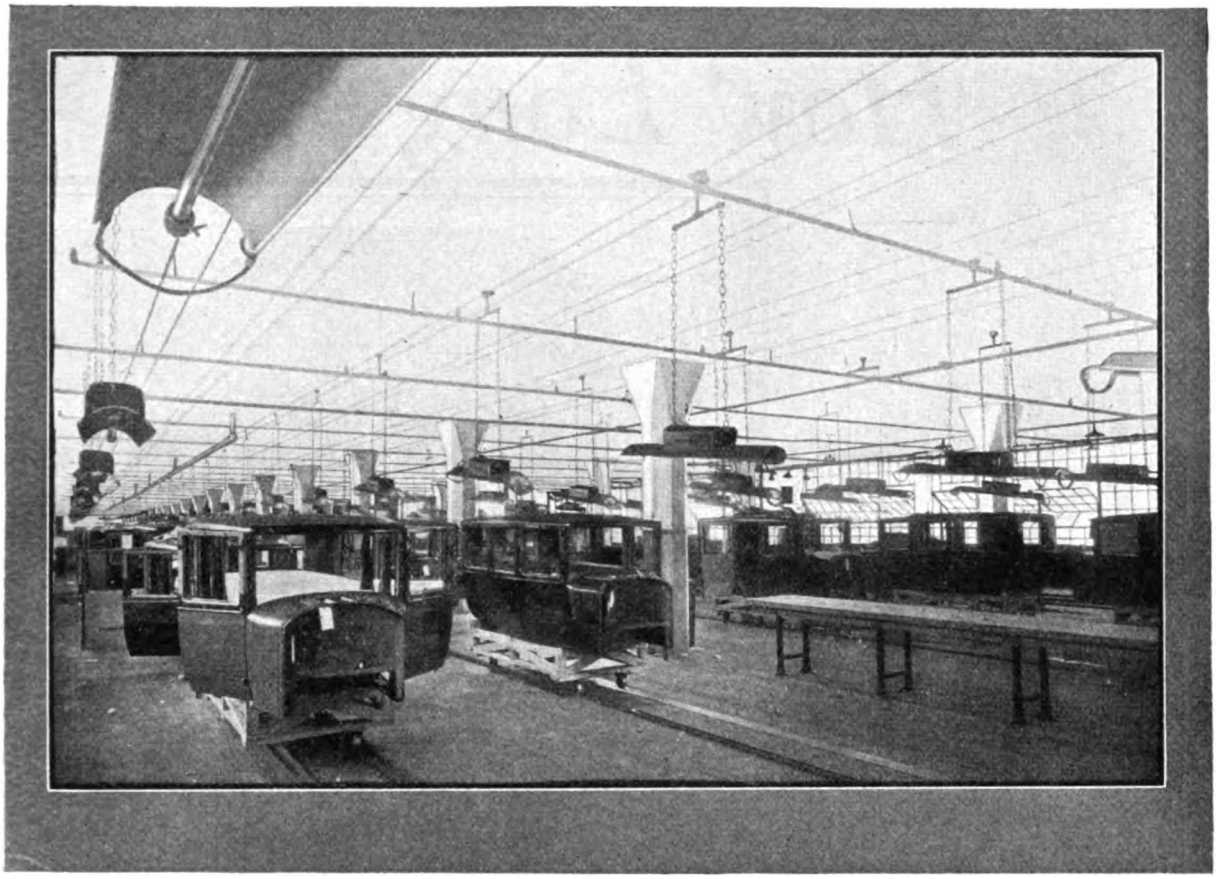


Just ask for a copy of Catalog M-28.

THE C. F. PEASE COMPANY
828 North Franklin Street
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Blue Printing Machinery, Drawing Materials, Drafting Room Furniture, Engineering Supplies

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The great Packard plant at Detroit uses Barreled Sunlight for interior painting "to maintain the best working conditions and to keep down repainting costs."

A letter from PACKARD— *on interior painting*

THE excellence of the Packard car speaks for the superb plant that produces it. A plant perfect in every detail of modern efficiency.

Read what the Manager of the Packard Company says about industrial interior painting:

> "We find that well-kept buildings help to improve the manufacture of our product, and that good painting is a most important factor.
>
> "We have used Barreled Sunlight on the interior of a great many of our buildings. Its lasting whiteness and washability have helped greatly to maintain the best working conditions and to keep down repainting costs."

This letter expresses the experience of *thousands* of plants that now use Barreled Sunlight on their ceilings and walls.

So satin-smooth is the finish of Barreled Sunlight that dirt cannot sink in. It washes like tile, even after years of service. Thus washing takes the place of repainting—and repeated washings will not wear away this durable finish.

Furthermore, made by the exclusive Rice Process, Barreled Sunlight is actually *guaranteed to remain white longer than any gloss paint or enamel, domestic or foreign, applied under the same conditions.* And it will not flake or scale if properly applied.

Labor costs are less when Barreled Sunlight is applied. Containing no varnish, it flows on freely with brush or spray. at the lowest cost per square foot of surface covered.

Sold in 55- and 30-gallon churn-equipped steel drums and in cans from ½ pint to 5 gallons. Where more than one coat is required, use Barreled Sunlight Undercoat.

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New York—350 Madison Ave. Chicago—659 Washington Blvd.
San Francisco—156 Eddy Street
Distributors in all principal cities

Barreled Sunlight
Reg. U. S. Pat. Off.



THE RICE PROCESS WHITE

U. S. GUTTA PERCHA PAINT CO.
5 Dudley Street, Providence, R. I.
Please send us your booklet "More Light," and a painted sample of Barreled Sunlight.

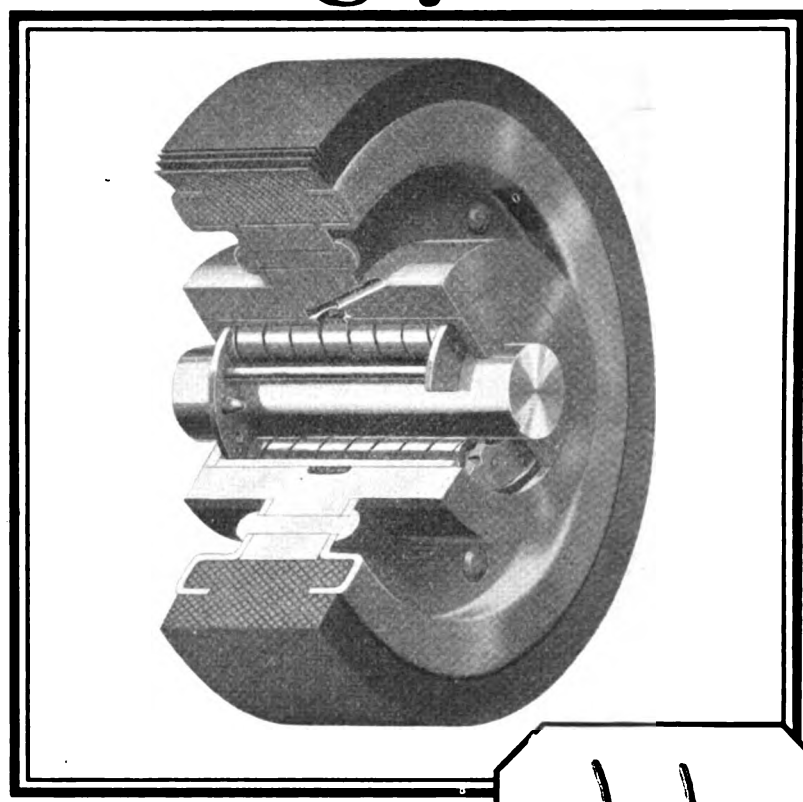
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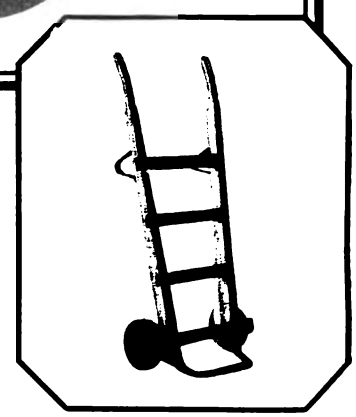
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How Long?





Do your truck Wheels last

THERE is only one answer to this question, if you are not using Divine Canvas-Cushion Wheels—"not long enough."

Divine Canvas-Cushion Truck Wheels outlast many sets of rubber tired wheels, are as durable as iron or steel wheels, and protect floors 100%.

In the face of these facts—and we will be glad to prove them to you—get Divine Canvas-Cushion Wheels, if you want durable protective-tread truck wheels.

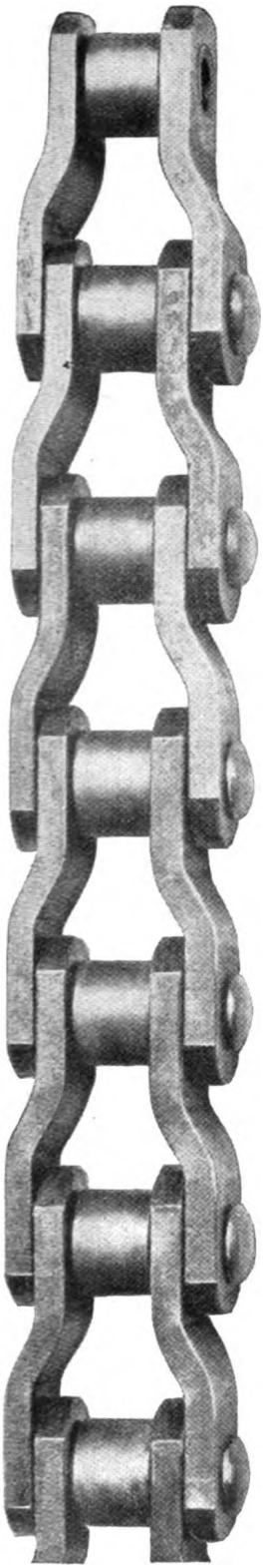
Send for further information today about these incomparable wheels.

Divine Brothers Company
INCORPORATED
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DIVINE *canvas cushion truck* WHEELS

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Sinews for a Steel Arm

THIS Jeffrey Chain, winding the heavy steel shovel arm up and down, thrusts it into the rock and gravel, taking sudden jolts and strains that would snap an ordinary chain.

But Jeffrey Steel Thimble Roller Chain No. 234 withstands all this, and more. That is why the Thew Shovel Company of Lorain, Ohio, places No. 234 Chain on their L-75 Shovel, pictured above.

Jeffrey Steel Thimble Roller Chains for hard service.

The Jeffrey Manufacturing Company

946-99 North Fourth Street, Columbus, Ohio

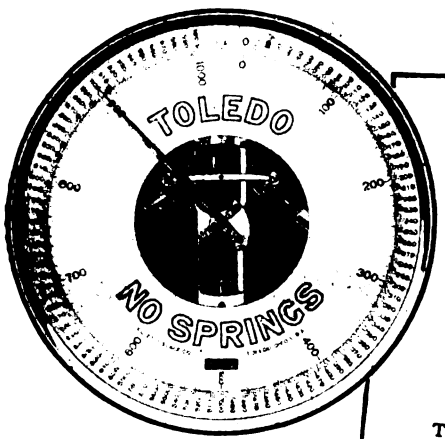
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JEFFREY PRODUCTS
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How 52 Toledo Scales Contribute to the Efficiency and Precision of Packard Manufacture



1 By detecting errors in incoming shipments at the receiving room door. →

2 By reducing labor of counting screw machine production. →

3 By holding motor units to closely uniform weight. →

4 By testing power of motors during development. →

5 By holding paint and colors to a standard. →

6 By determining freight charges and postage. →

7 By the solving of many special problems. →

Automatic Scales for every purpose. Service Stations in 106 cities

How Toledo Automatic Scales are used in the Packard Plant

The Packard Motor Car Company has in operation fifty-two Toledo Scales of various designs.

In the Receiving Room there are Toledo Weighing and Counting Scales. Each incoming shipment is checked almost simultaneously for weight and count and compared with vendor's invoice. Many errors are corrected at this initial point to the ultimate advantage of both vendor and the Packard Motor Car Company.

In the Automatic Screw Machine Department is one Toledo Counting Scale, which with the assistance of one man accurately counts this department's entire production, which amounts to one-half million pieces a week. Before the installation of this equipment it required five men and four counting machines of various makes to handle this production.

The greatest degree of accuracy possible is exercised in the machining and inspection of motor parts. Special Toledo equipment in these departments assists in holding all important motor units to within one-eighth of an ounce in weight. This insures a perfect motor. Coil springs of all kinds are also tested on Toledo Scales and are held to a very close limit.

Some of the world's finest power plants have come from the Experimental Division of the Packard Motor Car Company. Their performance had been previously checked on Toledo Dynamometer Scales.

In the Body Division all colors and paint are mixed to Packard standard formulas and every cup full of material is carefully checked over Toledo Bench Scales.

The Post Office, Returned Goods and Service Shipping Departments are all equipped with Toledo Scales ranging in styles from the small Parcel Post Scale to the large 5-ton Dormant and the accuracy of the weights have never been questioned by the postal or express authorities.

With the advancement of the industry, many weighing and balancing problems have presented themselves and it has been found in most cases that the solution is acquired through the installation of Toledo Automatic Scales

In their marvelous manufacturing development, the Packard and other American automobile plants have utilized the most efficient means at their command, including Toledo Automatic Scales for weighing, counting and testing. In these operations, which are common to most industries, Toledo Scales provide accuracy, stop losses, and save time.

What they accomplish in the Packard plant they will likewise accomplish in your plant. A survey by a Toledo man will cost you nothing. It may save you much. Write for particulars. Kindly address Industrial Sales Department, Section U.

Toledo Scale Company, Toledo, Ohio
Canadian Toledo Scale Co., Limited, Windsor, Ont.

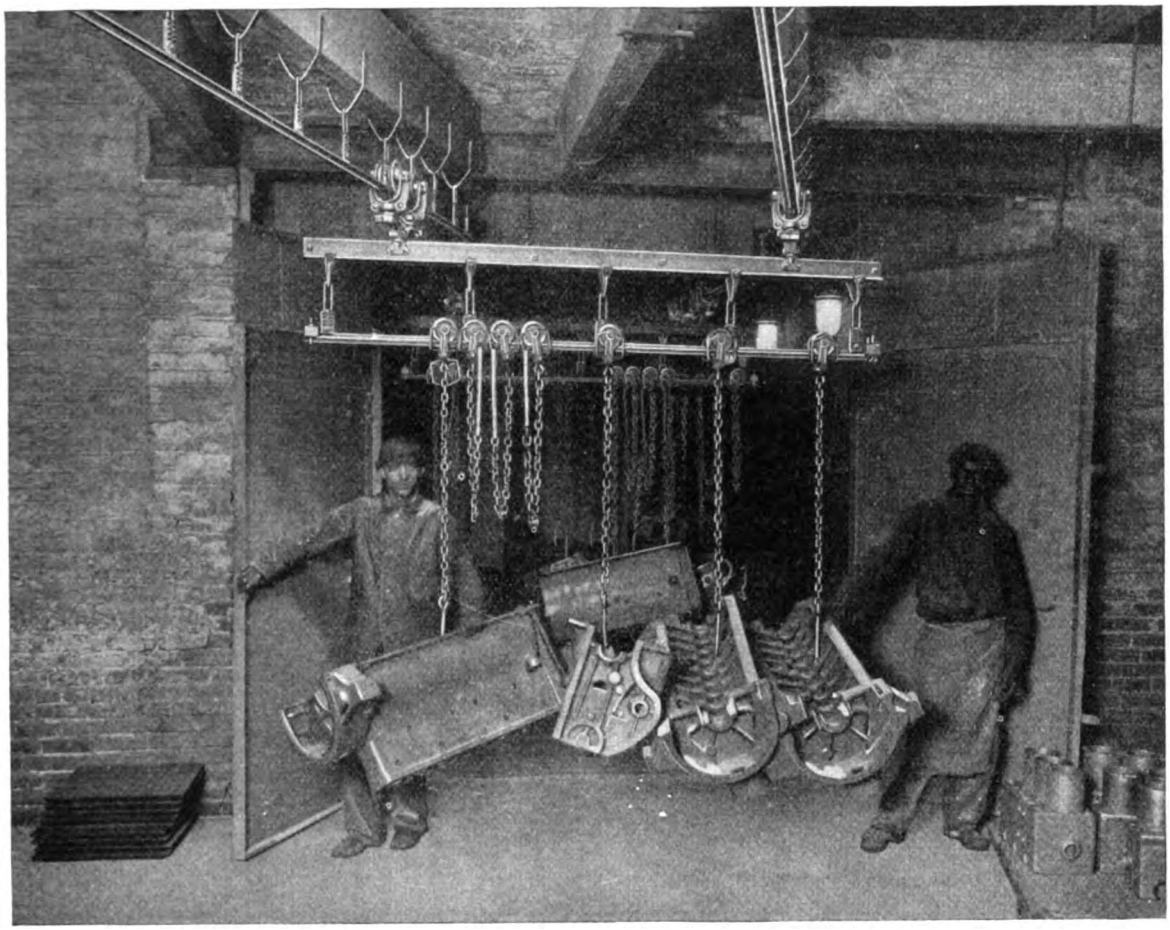
TOLEDO SCALES

NO SPRINGS HONEST WEIGHT

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Saving $25,000 a Year!



Louden Monorail operating through sand blast room. Blocks are suspended from carrier as shown so the first block can be turned completely around during sand blasting, then shuttled to one end of carrier and the next block taken, etc. When all are blasted carrier is taken out on parallel monorails, as shown, to two turntables, operating in unison, which transfer trolleys so carrier can be run off at right angles on single rail to grinders.

LOOK where you may, in the plant where the above picture was taken, and you will see Louden Trolleys coming and going, carrying molten metal, castings, sprue, slag and sand. Production hums and to this Louden Monorail System is credited, in a year, net savings in production costs of $25,000. This indicates how Louden Monorail can reduce material handling expense and increase plant earnings. Modern equipment such as this is fast replacing the less efficient equipment used in the past.

Material Handling Experts At Your Call

The years that Louden Engineers have spent, day after day in plants and warehouses of every description, meeting old problems, solving new problems and planning more economical and ever better methods of handling all kinds of materials, have earned for them the right to be classed as material handling experts. These men are available always — and probably close at hand — for consultation at any time, without obligation to you.

If you have a material handling problem we shall welcome the opportunity of showing you how we would handle it, in whole or in part, with Louden Monorail. This will not obligate you in any way. May we have that opportunity now?

THE LOUDEN MACHINERY COMPANY

5002 West Avenue (*Established 1867*) Fairfield, Iowa

Albany—Boston—New York—Philadelphia—Buffalo—Pittsburgh—Cincinnati
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LOUDEN

INDUSTRIAL MONORAIL SYSTEMS

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When you put into service a new or old

WIRE ROPE

do you KNOW the grade (tensile strength) or are you just taking a chance?

Engineers everywhere are endorsing

WILLIAMSPORT

Wire Rope, not alone for its high standing as a quality product, but because it is the only wire rope made that contains definite proof of its grade (tensile strength).

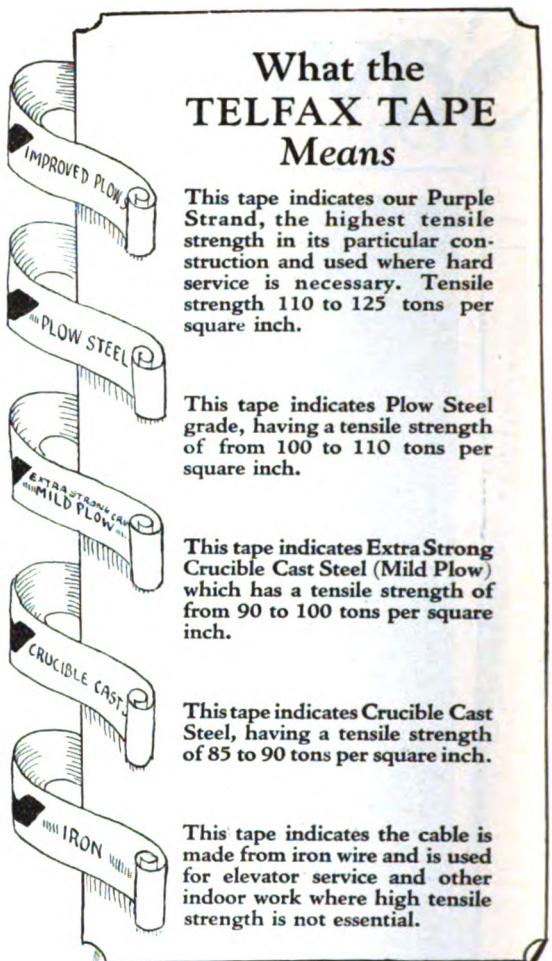
This is a protection worth more to the user than he pays for the rope itself.

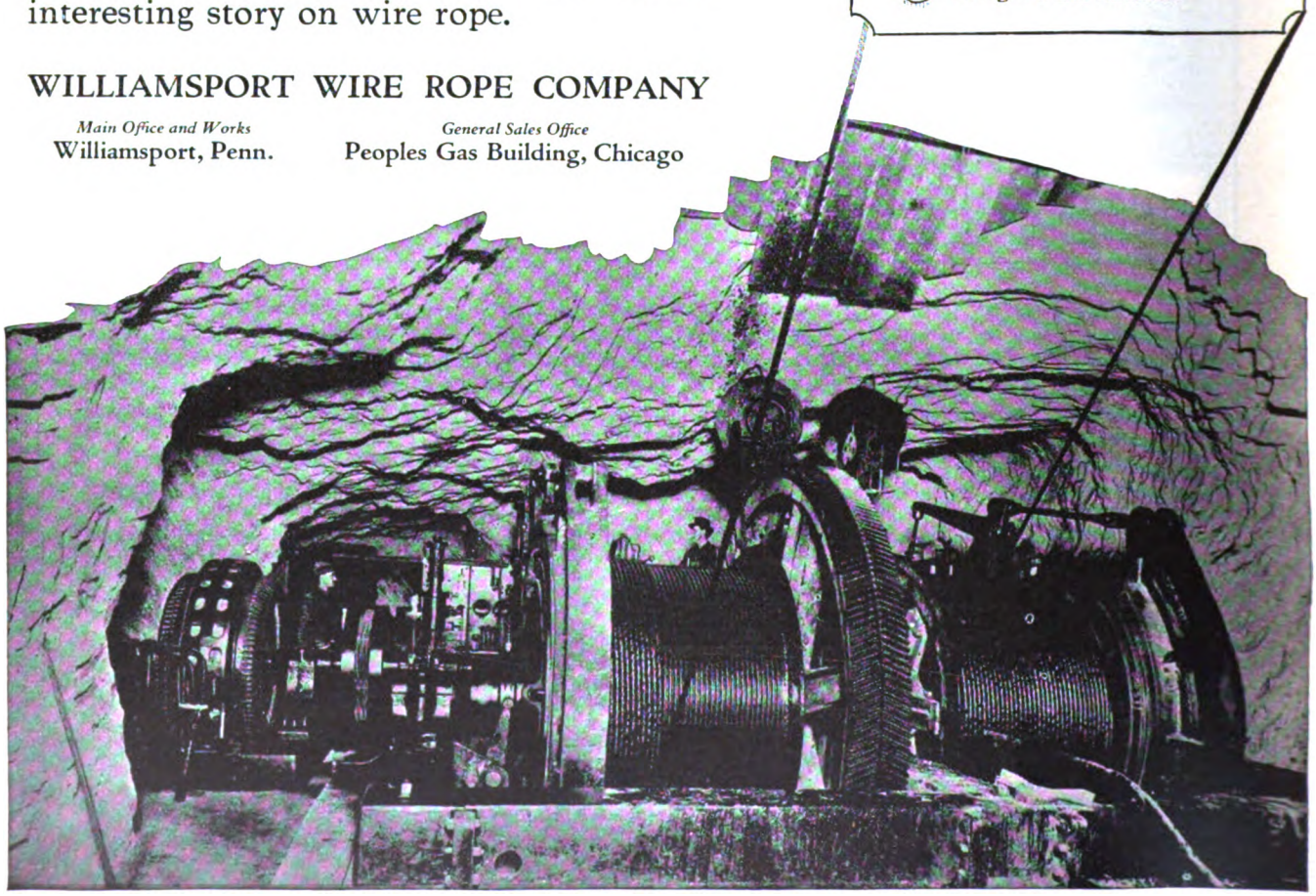
Send for your copy of MWR, which tells an interesting story on wire rope.

WILLIAMSPORT WIRE ROPE COMPANY

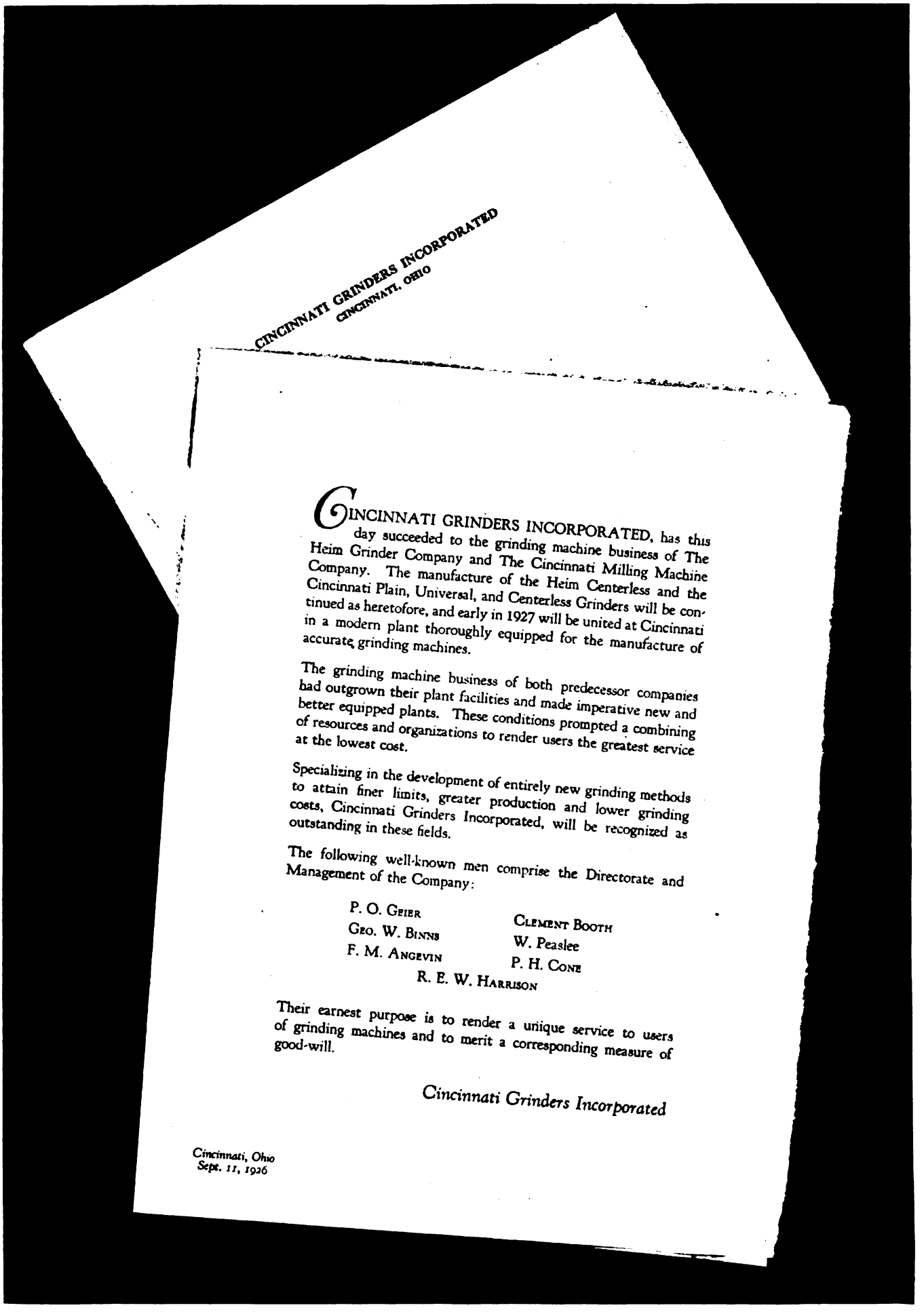
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Peoples Gas Building, Chicago





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CINCINNATI GRINDERS INCORPORATED
CINCINNATI, OHIO

CINCINNATI GRINDERS INCORPORATED, has this day succeeded to the grinding machine business of The Heim Grinder Company and The Cincinnati Milling Machine Company. The manufacture of the Heim Centerless and the Cincinnati Plain, Universal, and Centerless Grinders will be continued as heretofore, and early in 1927 will be united at Cincinnati in a modern plant thoroughly equipped for the manufacture of accurate grinding machines.

The grinding machine business of both predecessor companies had outgrown their plant facilities and made imperative new and better equipped plants. These conditions prompted a combining of resources and organizations to render users the greatest service at the lowest cost.

Specializing in the development of entirely new grinding methods to attain finer limits, greater production and lower grinding costs, Cincinnati Grinders Incorporated, will be recognized as outstanding in these fields.

The following well-known men comprise the Directorate and Management of the Company:

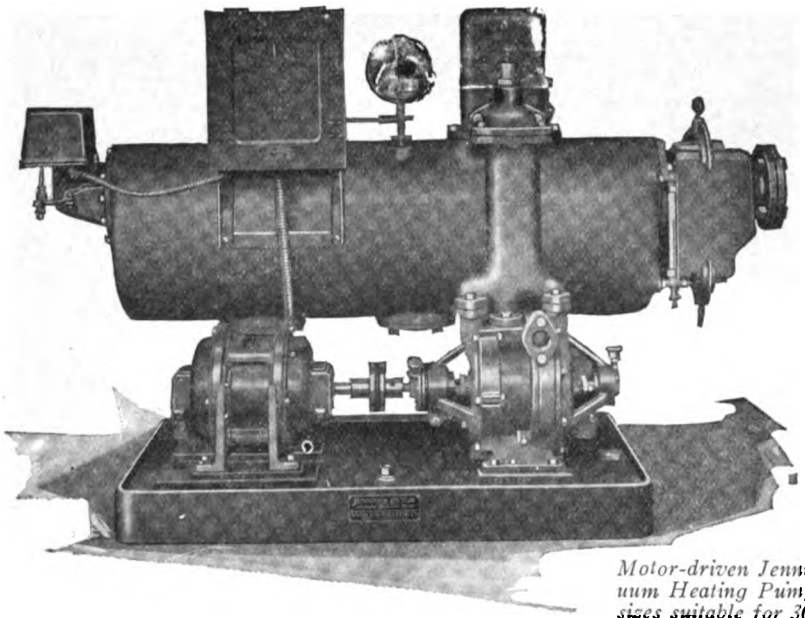
P. O. GEIER
GEO. W. BINNS
F. M. ANGEVIN
CLEMENT BOOTH
W. Peaslee
P. H. CONE
R. E. W. HARRISON

Their earnest purpose is to render a unique service to users of grinding machines and to merit a corresponding measure of good-will.

Cincinnati Grinders Incorporated

Cincinnati, Ohio
Sept. 11, 1926

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Motor-driven Jennings Return Line Vacuum Heating Pump, supplied in standard sizes suitable for 300,000 sq. ft. equivalent direct radiation. Larger sizes when so ordered.

For heating pumps— come to heating pump specialists

Users of Jennings Heating Pumps acknowledge Jennings superiority. They know from every day experience that the efficient and economical way to remove condensation and air from return line heating systems is the Jennings way. It is only logical that this is so.

Jennings Pumps are built by experts—skilled engineers, who for many years, have specialized in the refinement and perfection of heating pump design. These specialists do not divide their time between pumps and other kinds of equipment. On the contrary, they concentrate on pumps exclusively, for this company manufactures pumps only.

When you specify Jennings, you get the benefit of this intensive specialization, which is but another way of saying that you get the best heating pump obtainable.

NASH ENGINEERING COMPANY

SO. NORWALK **CONNECTICUT**

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Jennings Pumps

RETURN LINE AND AIR LINE VACUUM PUMPS CONDENSATION AND CIRCULATING PUMPS

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Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures

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The Plant Blacksmith

A Real Aid to the Operation of the Modern Industrial Plant

By Girard H. Story
The Stanley Rule & Level Plant



Fig. 1. The blacksmith and his helper using a flatter to smooth down and straighten a flat bar. Flatters are made with faces from 2″ to 4″ square.

MACHINERY breaks down without warning, and delays in securing new parts are costly. Often these broken parts can be duplicated or repaired by a blacksmith and the machine again placed in operation promptly. New equipment of various kinds can be made, such as bolts of special size; and where hand tools are used in quantity, they can be, in many cases, reclaimed and salvaged by being placed in the fire and redressed to their original form and usefulness.

With the result that, today, most large industrial plants have found it a source of profit and economy to maintain a forge and an efficient blacksmith. However, if he is to do the work required of him in a proper manner, he will need a full and complete set of anvil tools and tongs, in addition to his forge, anvil, hand hammer and sledge. These tools are carried in stock by mill supply houses and can be purchased at far less cost than they can be made by hand.

Good tools are the cheapest in the long run. Anvil tools should be full patterned and well designed. If the top tools are to last, they should have ample length heads, as the heads batter down under continual striking. The grooves in the swages want to be straight, accurate as to dimension and run parallel with the handle, and the cutting tools must be of a high carbon steel, properly hardened and tempered. On the bottom tools shanks to fit a 1″ hole in the anvil are ordinarily carried in stock but where a small anvil is used, the shanks can easily be reduced by the blacksmith to fit the smaller hole.

The accompanying illustrations show the blacksmith at work on various jobs, using his anvil tools and tongs.

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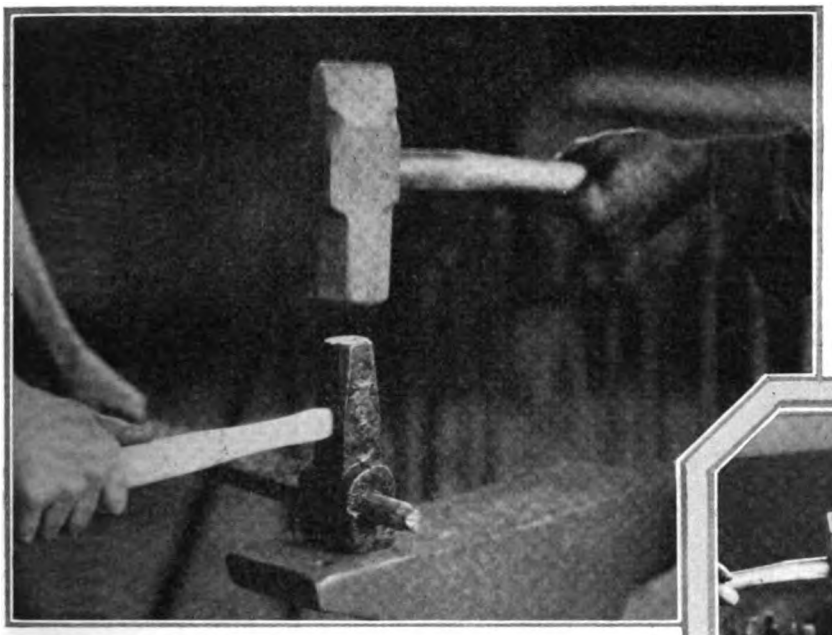


Fig. 2. At the left—Shaping, sizing and smoothing round forgings is done with swages. Swages are made in sizes from ¼″ to 3″ and designated by the diameter of the round to which the Swage will finish.

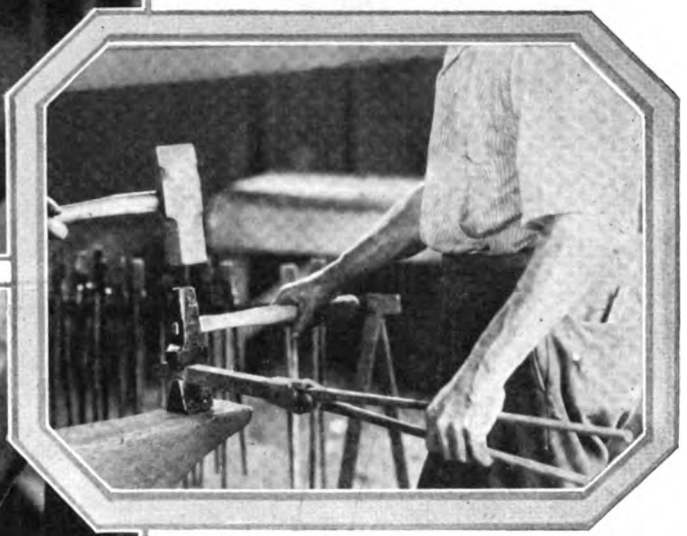


Fig. 3. Above—Fullers are used for necking, scarfing, grooving and drawing down a forging to size. Made in sizes from ¼″ to 2″, they are marked to show the diameter of the groove they will form.

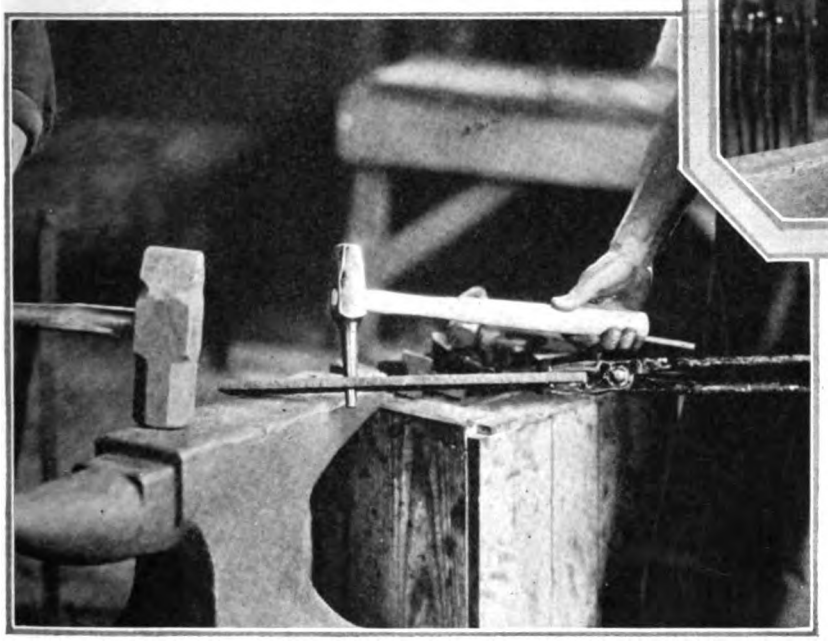


Fig. 4. At the left—Use the right size punch for the job in hand, otherwise the metal will be spread and strained. Punches are made in sizes from ¼″ to 1″ diameter of face.

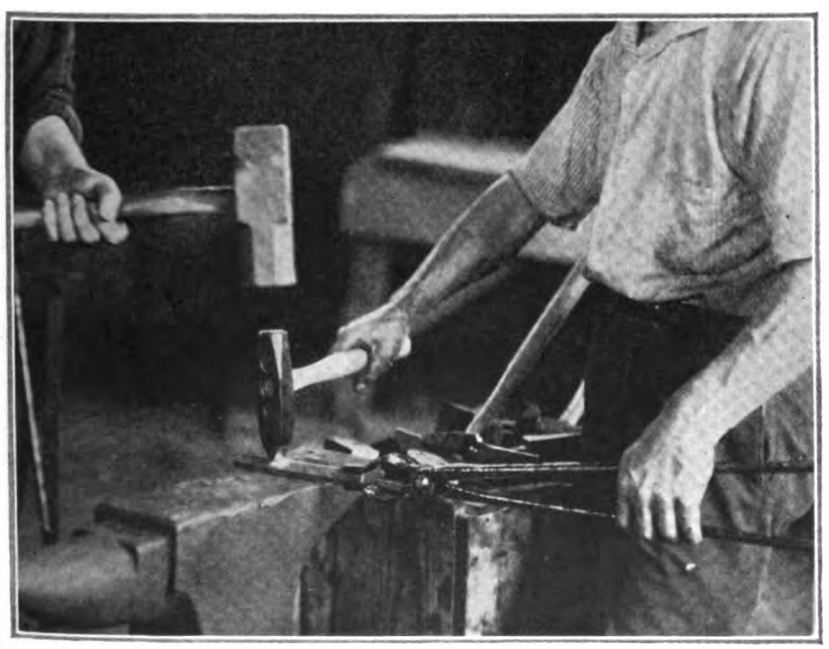




Fig. 5. Nicking a cold bar of steel with a cold chisel, preparatory to breaking it in two. Cold chisels are made with bits from 1¼″ to 1¾″ in width.

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Fig. 6. Hot Chisel, for cutting or splitting hot metal. Hot Chisels are measured across the eye, and are made in sizes from 1¼" to 1¾".



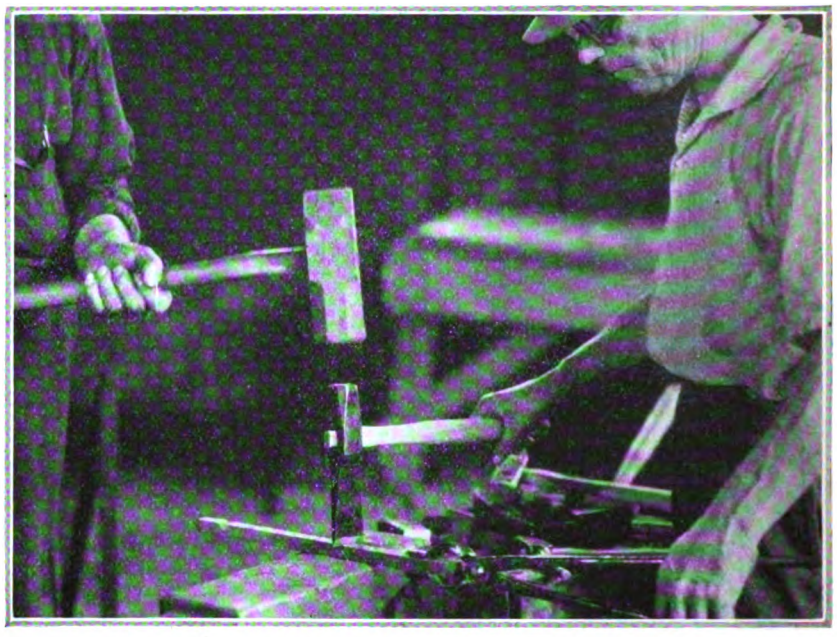


Fig. 7. At the right — Forming a sharp shoulder with a Set Hammer, which is also used in corners. Known by the size of the face, 1¼" to 1¾".

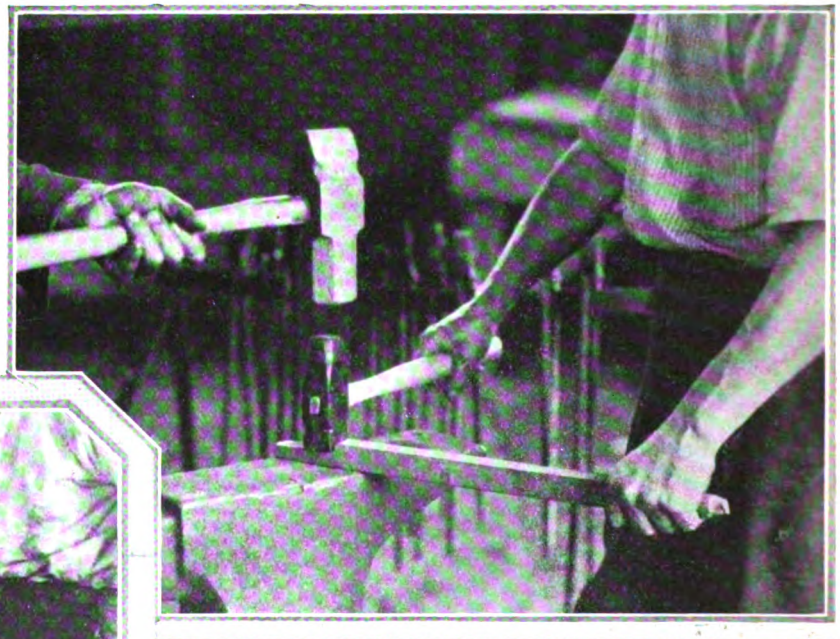
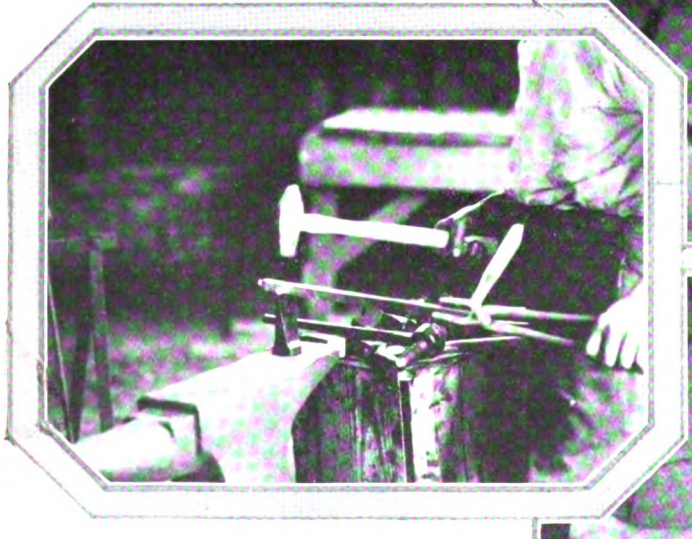


Fig. 8. Below — Hot metal can be cut with a Hardie when the blacksmith is working without a helper. Hardies are made with shanks ranging from ⅝" to 1¼" in size.



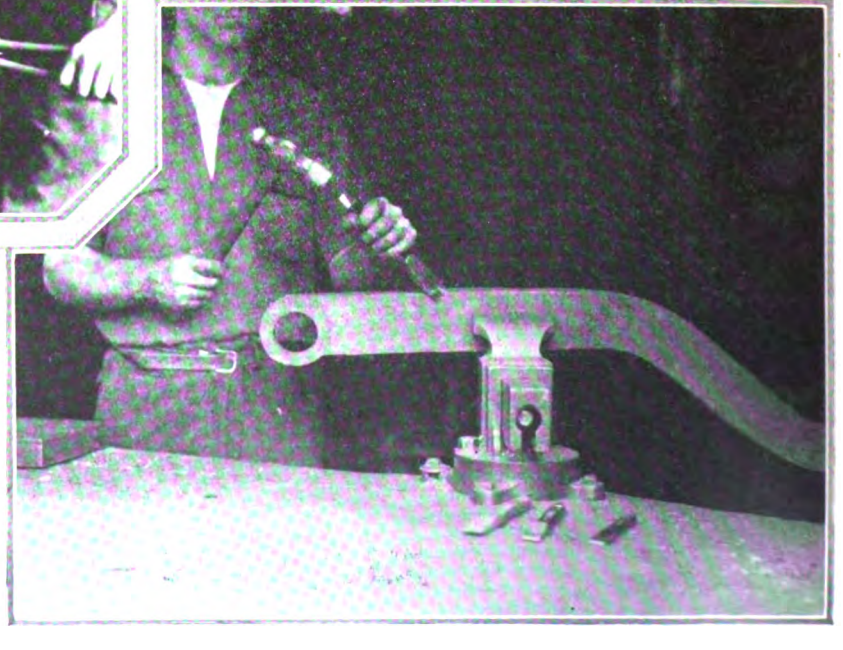


Fig. 9. At the right—Hand chipping with Hand Cold Chisel in the machine shop. Cheap Cold Chisels are a source of annoyance and expense. Insist on Chisels with tough cutting bits that are not too hard or brittle. Alloy steels make the best Chisels.

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Various Types of Milling Cutters and Their Work

By Frederick B. Heitkamp

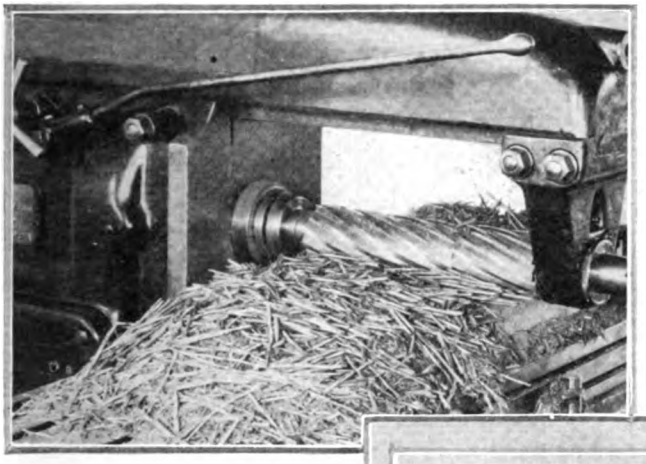


Fig. 1. An excellent example of a gang of spiral mills taking an unusually heavy cut in cast iron, is shown above.

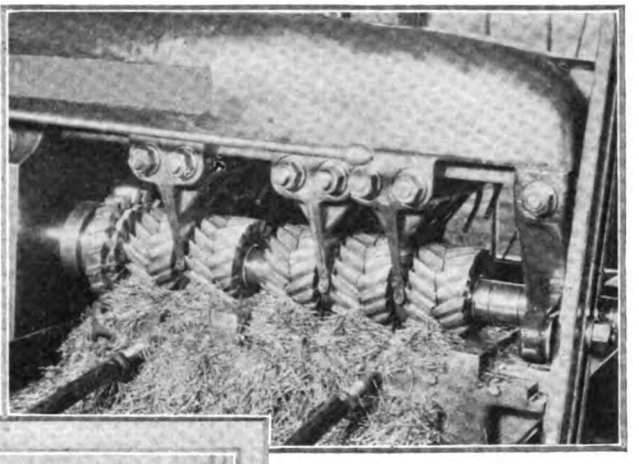


Fig. 2. Above—Interlocking spiral slotting cutters, mounted in gang. Spiral is used to get shearing action. Cutters are adjustable for width and are interlocked in order to secure continuous cutting action, and eliminate seam. Cutters immediately adjacent to the spindle nose are large diameter side mills. This is a most unusual gang of cutters and requires an additional intermediate arbor support to take the heavy cut on cast iron.

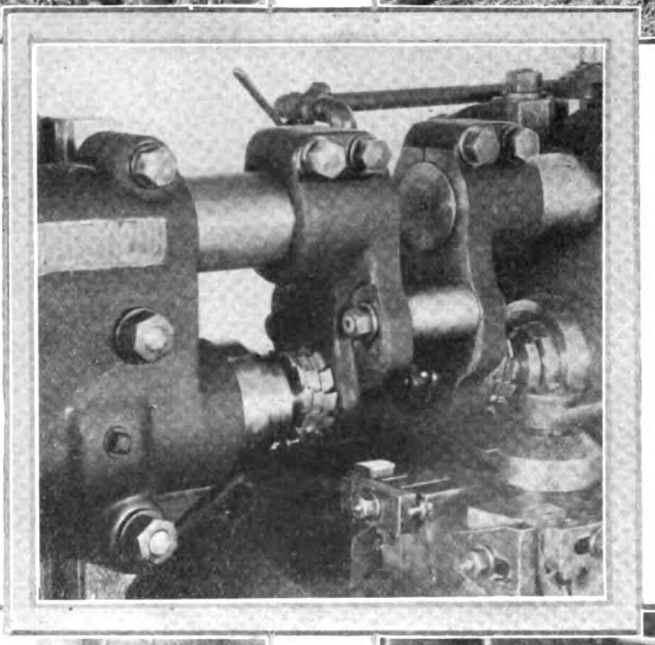


Fig. 3. At the right, is shown a fine example of special inter-locking form cutters for producing serrations on the top of hatchet heads. Incidentally a radius is also obtained through the use of the special cam operated fixture.

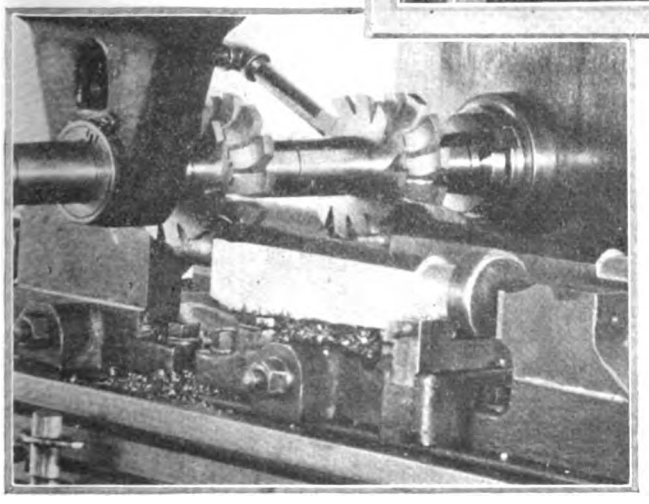


Fig. 4. An excellent example of a pair of concave formed cutters. The cutters are made interlocking in the center in order to give adjustment for width of cut.

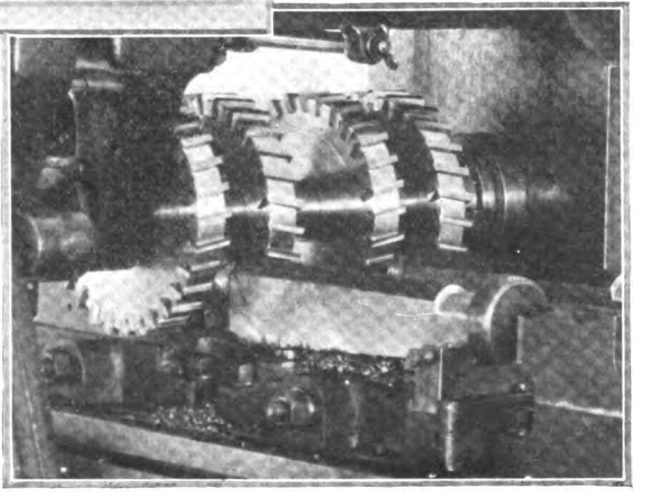


Fig. 5. A large gang of inserted blade, side mills is used for straddle milling the sides of taper wedges. Note that the blades are set in the body of the mill at an angle in order to get a proper shearing action.

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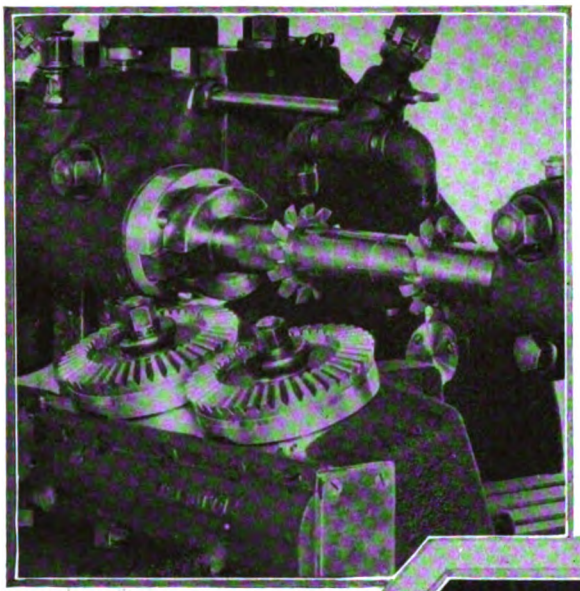


Fig. 6. Two gear cutters are being used (in the above illustration) for stocking or roughing bevel gears, previous to being generated on a bevel gear generator. The teeth on the cutters are staggered in order to get a clean shearing action.

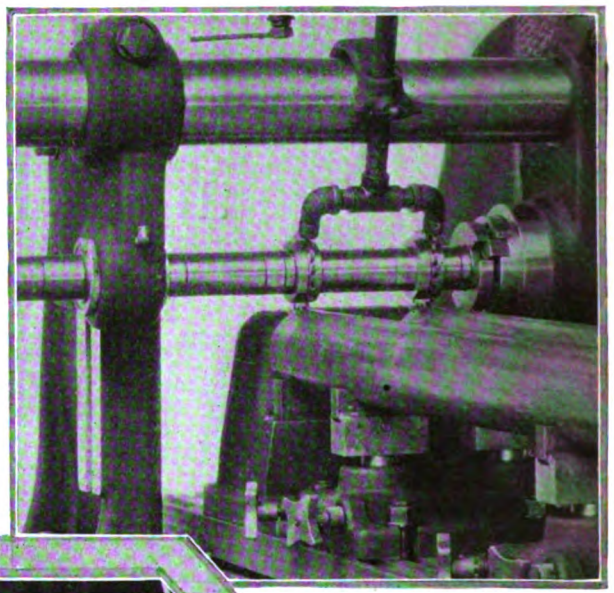


Fig. 7. Above—Slotting cutters performing a very interesting operation; milling slots in machine steel plungers for elevators. Each slot is milled to a different length.

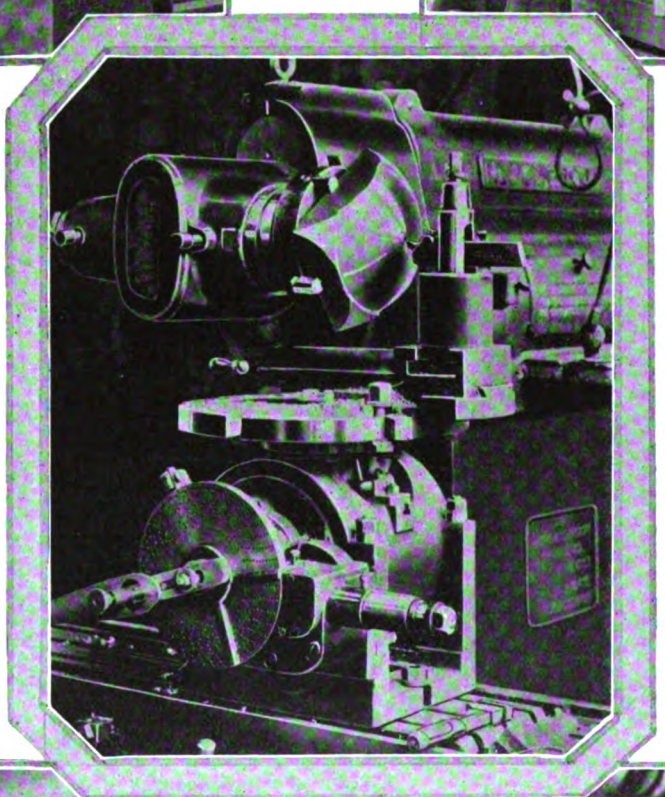


Fig. 8. At the left—An unusual job in which the milling machine in conjunction with a universal dividing head forms a lathe job. The face of a reflector die is being formed.

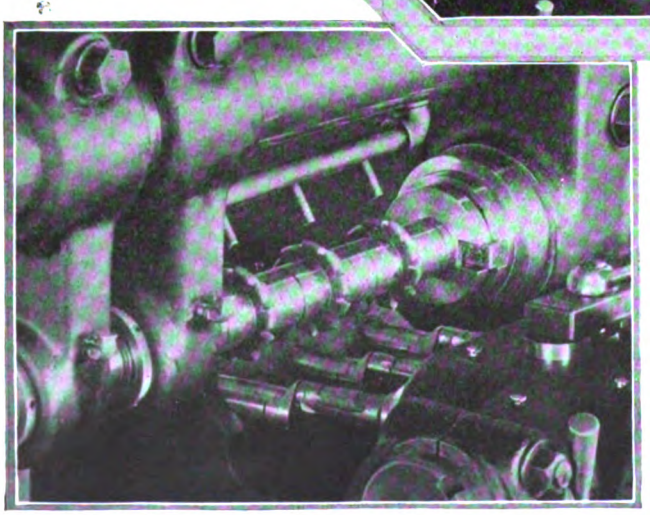


Fig. 9. Three convex form cutters 3½" in diameter are used for milling drill flutes in high carbon tool steel combination drill and tap.

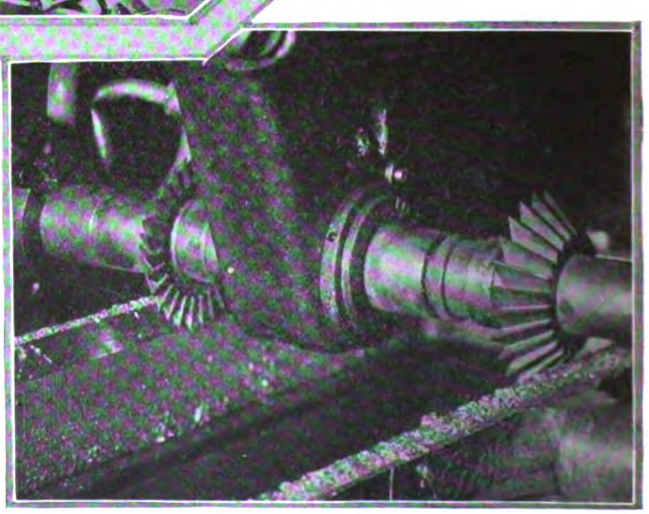


Fig. 10. Two angular cutters are shown milling steel castings in a railroad shop. Angular cutters allow cutting right up to the corner of the piece, which was previously handled by a shaper.

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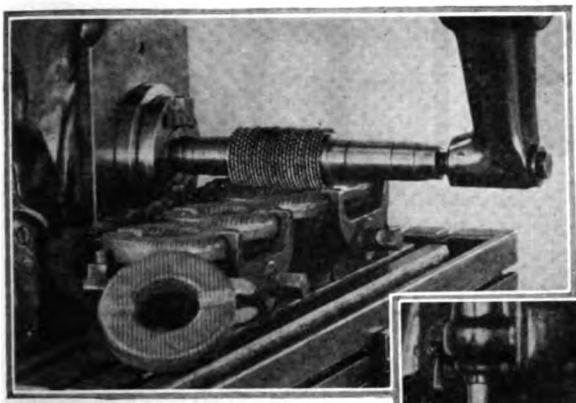


Fig. 11. An excellent example of a gang of slotting saws. 25 carbon steel saws .025″ thick and 3″ in diameter mill the slots in the cast iron gas burner, as shown above.

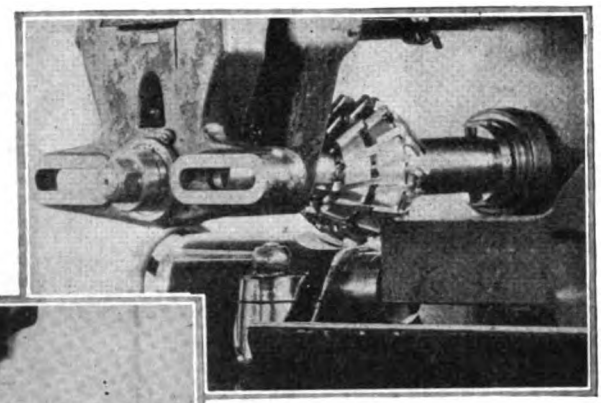


Fig. 12. A unique example of a gang of inserted blade double angular cutters, consisting of four to six units, used for milling the vee grooves in the friction member of steel casting draft gears. The interlocking of the cutters makes it possible to obtain a clean, unbroken surface when milled.

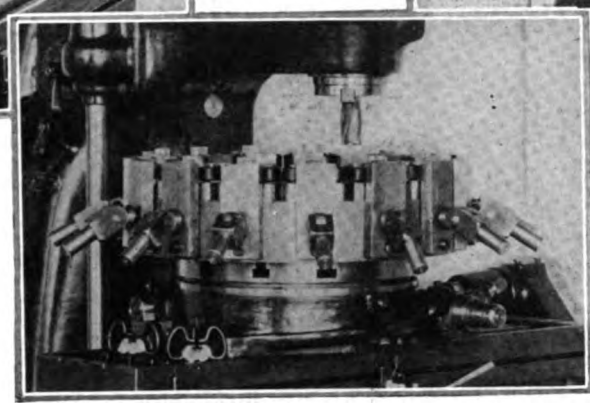


Fig. 13. This shows a typical spiral end mill used for milling the face of a brass magnet clamp.

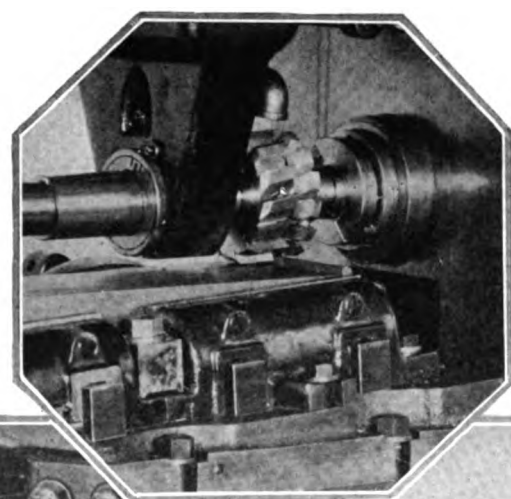


Fig. 14. At the right—Another operation on a railroad job—a steel wedge. A gang consisting of a form cutter and a plain spiral cutter with side teeth is used to mill the head.

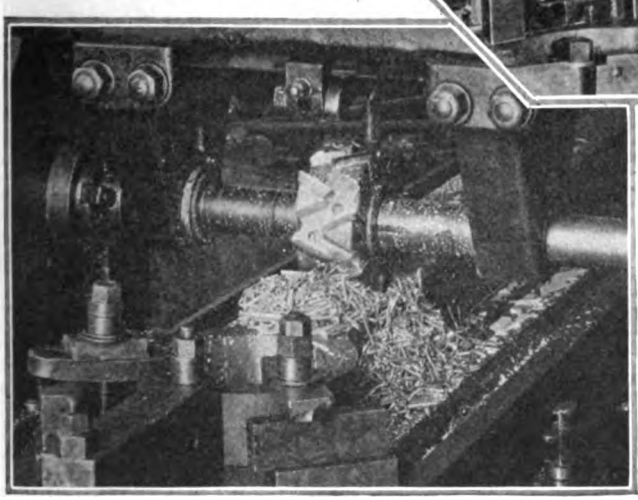


Fig. 15. Another good railroad job. A 6″ diameter by 3⅞″ wide staggered tooth slotting cutter milling the channel from a drop forged steel side rod. The staggered effect is desirable in order to break up the size of chip and give freer cutting action.

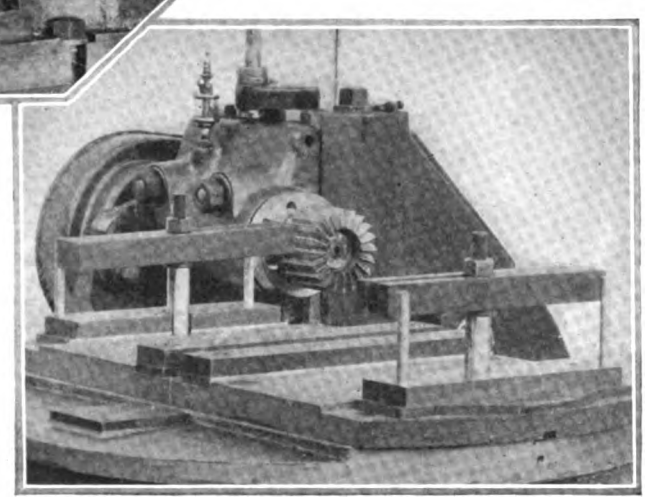


Fig. 16. A stellite shell end mill used for milling the end of chain cover. Due to the nature of stellite, the chip per tooth must be kept down to a minimum, hence the cutter teeth are more closely spaced than on the usual high speed steel cutter of a similar variety and style.

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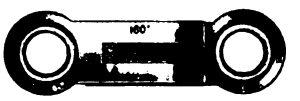
—they cost no more than tin-clad doors; they're as good as money can buy;

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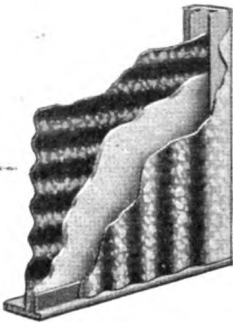
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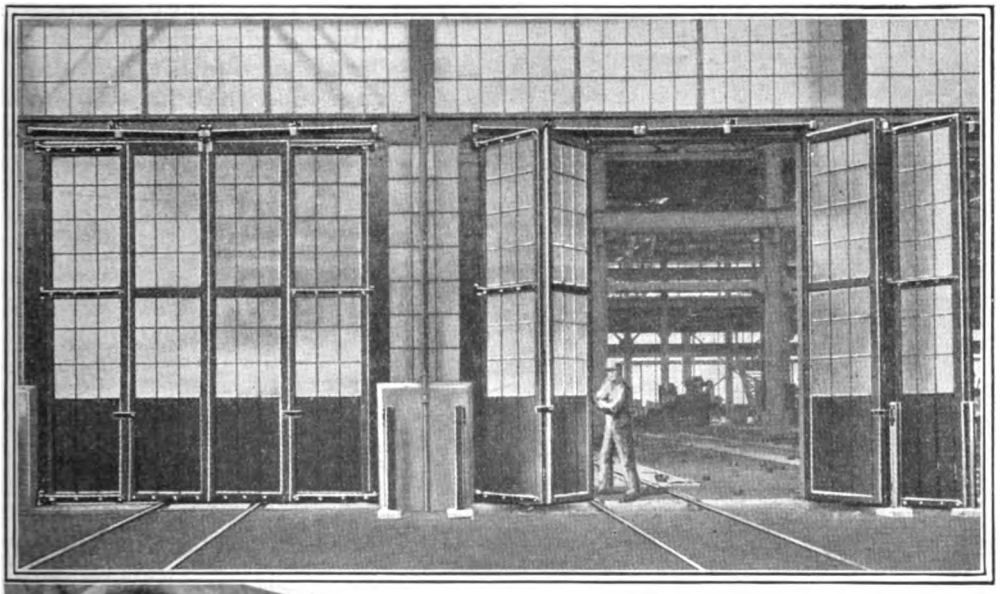
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Fig. 1. In continuous molding the flasks are usually poured as they move along a continuous conveyor. The men who pour devote their entire time to this work.

Foundry Sand Handling

How Mechanical Methods Are Transforming Foundry Practice

By Edward J. Tournier

THE relationship existing between a ton of iron castings and the other materials used in its production, indicates that from 60 to 200 times the tonnage of castings must be handled for each ton of the latter. These various materials are made up of flasks, castings and sand, of which the latter averages 50% of the total. Sand handling is, therefore, the largest item in foundry materials transfer, and its cost is greater than the cost of making castings.

When one considers the 2,000 iron and steel foundries of the United States with an average daily production of 200,000 tons of castings, and the additional fact that only the largest have installed materials handling equipment, the conclusion is inevitable that there are great possibilities of substituting machines for muscles.

The ideal modern foundry is



Fig. 2. As the flasks are poured they move along the conveying system to a knockout grating. After being emptied the flasks are immediately available.

one in which the various processes are continuous, and in which each man's sole duty is to perform that work for which his skill best fits him. Each workman stands at his appointed place and everything necessary for his work is brought or taken away by mechanical means. The completely continuous process is suitable only for the large foundry requiring quantity production. The small foundry, however, may make use of portions of the larger equipment; possibly a sand conditioning system or even a single elevator for sand and may thereby make proportional savings. The engineers with special knowledge of the possibilities may be depended upon to specify the proper equipment to meet the requirements of either small or large foundries.

Essentially the continuous system of molding consists of a con-

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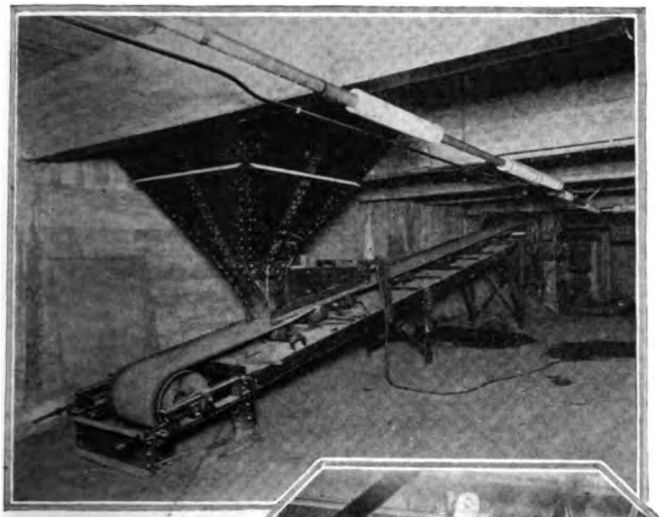


Fig. 3. From the knockout grating the sand drops into a hopper discharging onto a belt conveyor. The latter carries the sand to a screen.

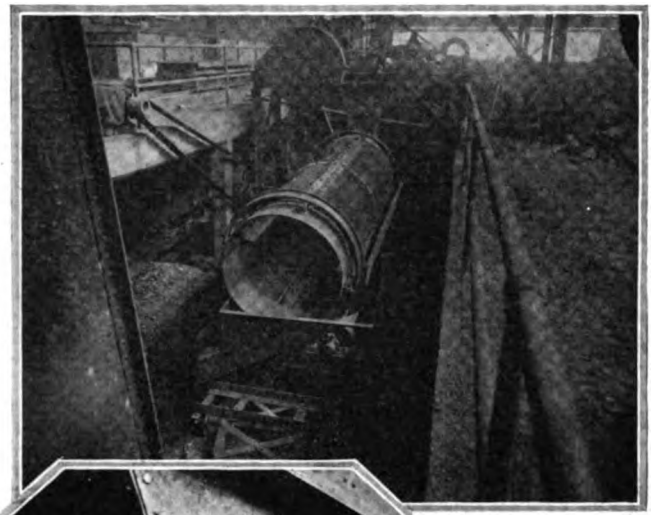


Fig. 4. The screen takes out all hard lumps, sprues, gaggers, rods, nails and cools the hot sand. The screen discharges onto a magnetic separator which removes all remaining metal.

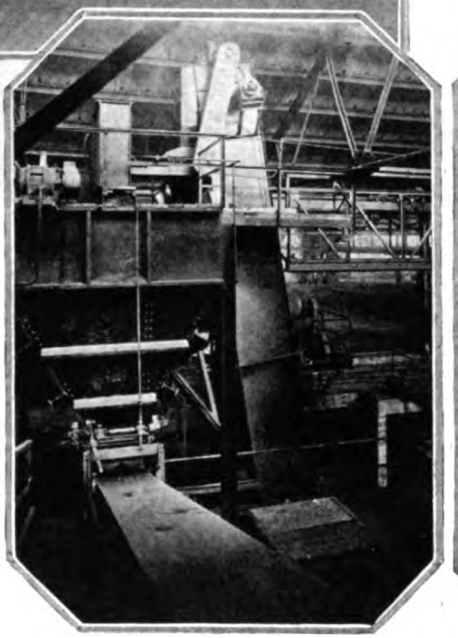


Fig. 5. The sand then passes over a tempering belt where it is wet down, and thence into a conditioning machine. This machine cuts, aerates, blends and tempers the sand in proper condition for molding.

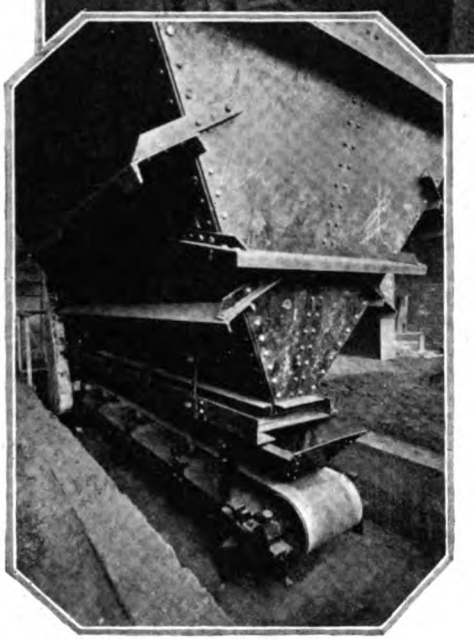


Fig. 6. Conditioned sand is delivered to a storage bin of sufficient capacity to allow time for seasoning. An automatic cutting feeder under the bin delivers sand uniformly to a belt conveyor.



Fig. 7. The distributing conveyor delivers sand to the molding machines by means of plows. The latter are set along the conveyor and divert the sand into individual overhead bins which serve the molding machines.

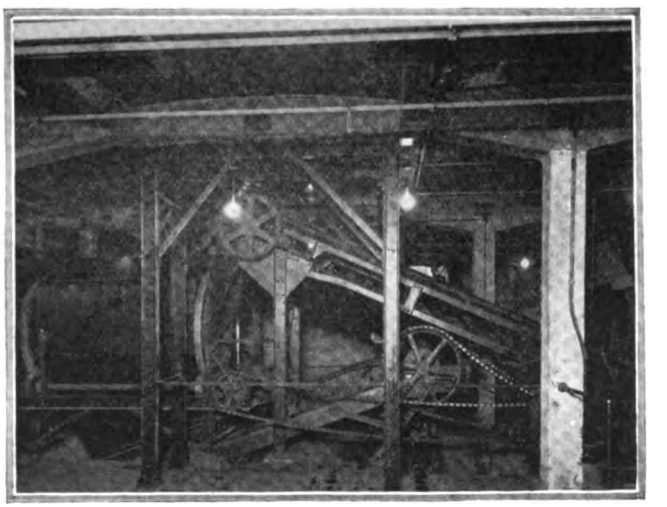


Fig. 7A. This view shows the arrangement of shake-out sand handling and screen at the J. L. Mott Co., Trenton, N. J. This consists of a steel apron conveyor, revolving screen and belt feeder delivering to the tempering belt.

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veyor for molds and flasks during the pouring operation and backing to the molding machines when empty. It also includes equipment for conditioning used sand and distributing it at points readily accessible to the molders.

Recovery of used sand begins at the shakeout grating, where flasks are emptied into a hopper. From this point sand is conveyed to a revolving screen which removes fragments of metal. The screen delivers to a hopper



Fig. 8. Overhead sand bins conserve time and floor space. By pushing a button or operating a lever, the molder delivers sand into a flask at will.

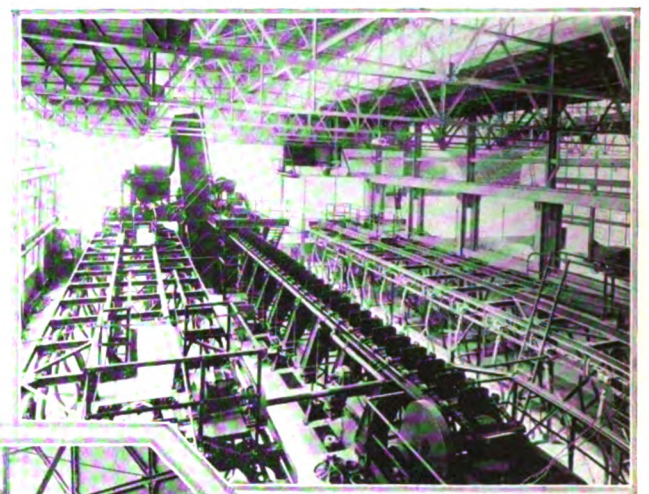


Fig. 9. The Kelsey Wheel Co. have, in their Detroit plant, an excellent example of a mechanically equipped foundry. With these two mold conveyors and sand handling equipment, 10 molders can produce 2,000 tractor wheels in a 9 hour day.

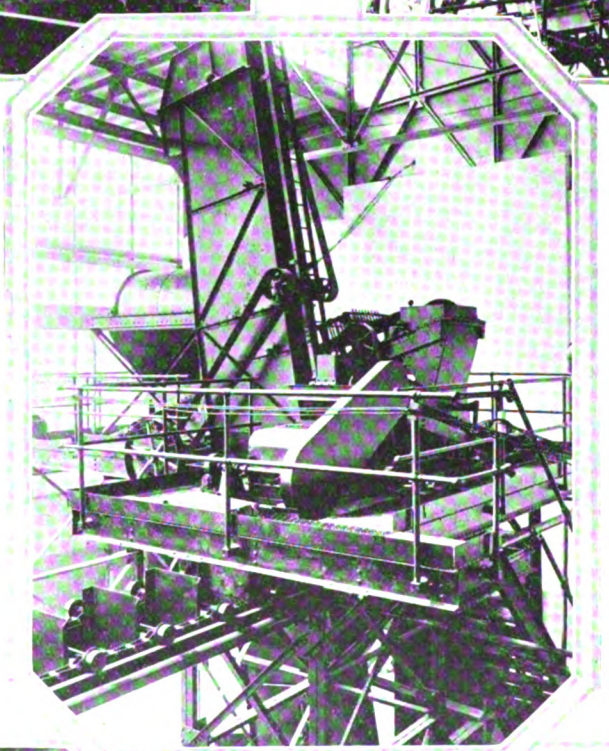


Fig. 10. This view shows the elevating, screening and conveying equipment used in connection with the sand revivifier in the foundry of Kelsey Wheel Co., Detroit, Mich. An unusual feature is the good lighting condition. This is rarely met with in foundries, yet good lighting means easier maintenance, hence less cost.

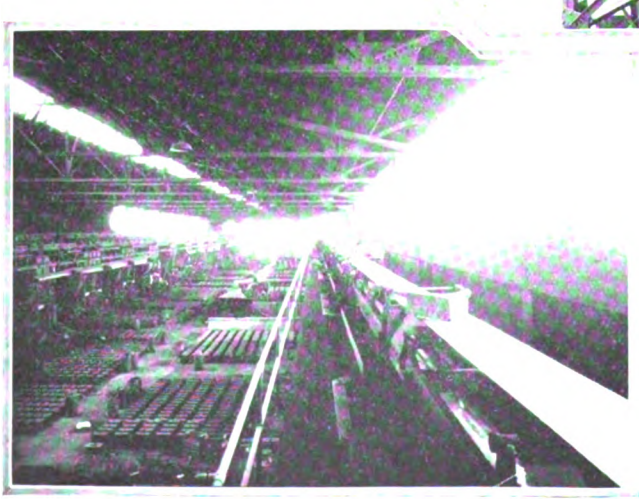


Fig. 11. Distribution of sand to hoppers over the molding machines is generally accomplished by means of belt conveyors. The installation shown consists of a flat steel belt with plows at intervals, and is in operation in the foundry of the Link Belt Co. at Indianapolis, Ind.

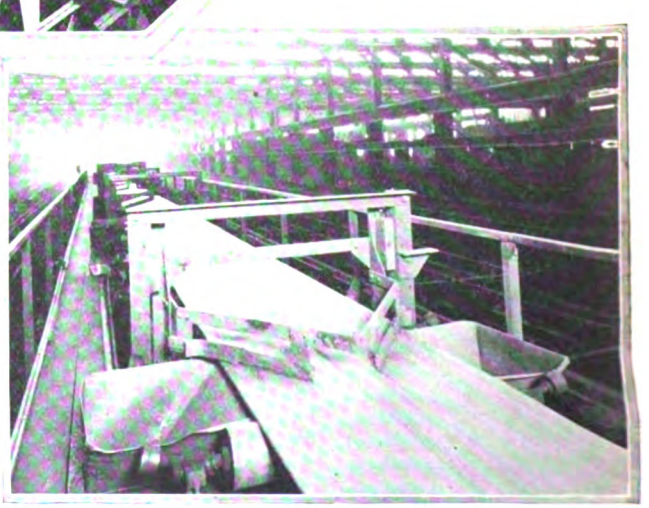


Fig. 12. A close-up view of another design of plow, showing the simple construction of this device. The hoppers supply sand to the molds on the foundry floor or on a flask conveyor.

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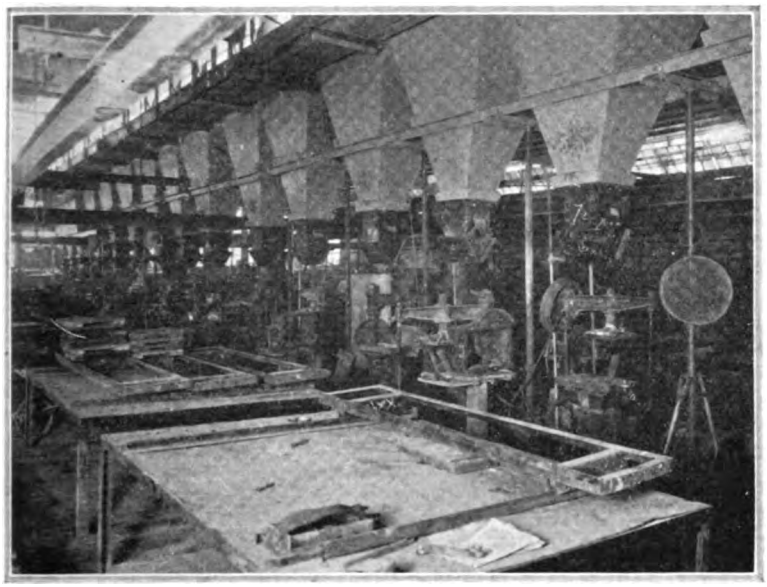


Fig. 13. A series of hoppers are located under the distributing conveyor and discharge through gates to the molding machines. This is part of the equipment in the brass foundry of the Neptune Meter, Long Island City, N. Y.

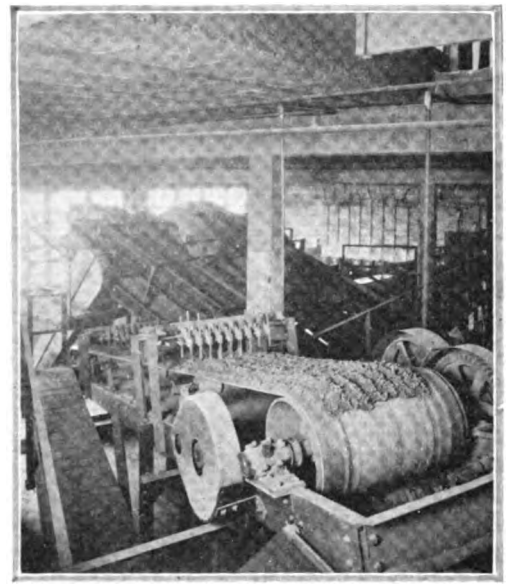
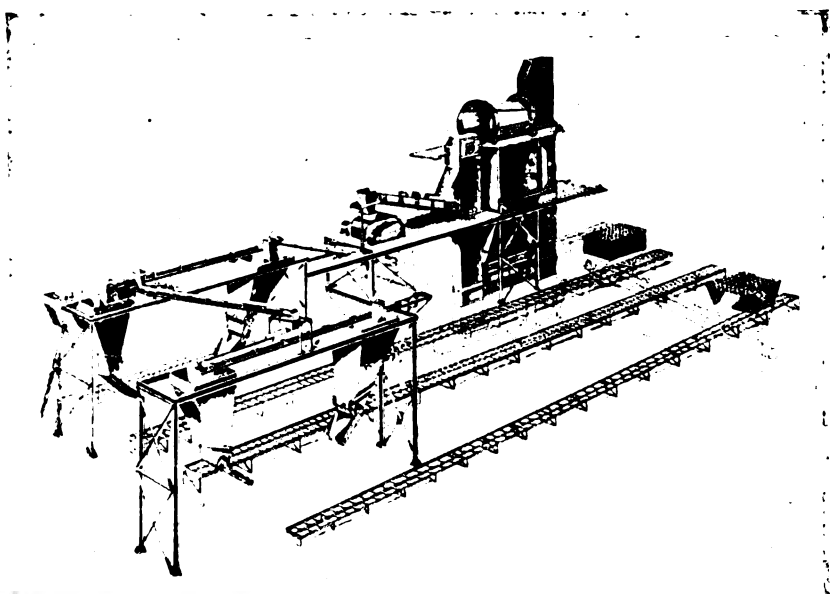


Fig. 14. It is sometimes desirable to spread the damp sand on the belt before delivery to the revivifier. An arrangement giving a raking effect is placed near the discharge of the tempering belt, as in the view taken at the Ferro Machine & Foundry Co., Cleveland, O.

having a feeder belt underneath. The latter is equipped with a magnetic head pulley, which removes small particles of iron from the sand and delivers it to a bucket elevator. While on this belt the sand is moistened with water, and after being discharged from the head of the elevator it is delivered to a tempering machine. The latter discharges into a storage bin, from which material is drawn to a second elevator, thence on to a distributing belt. The latter discharges into hoppers from which the molders draw the sand as required.

Properly conditioned sand is an essential requirement of economical foundry operation, and cannot be obtained by the use of muscle, shovels and a sprinkling can. The superiority of machine methods over hand work is just as true in the foundry as in the machine shop. The adoption of modern handling methods has made comparatively slow progress in foundries, but there is evidence that it pays dividends.



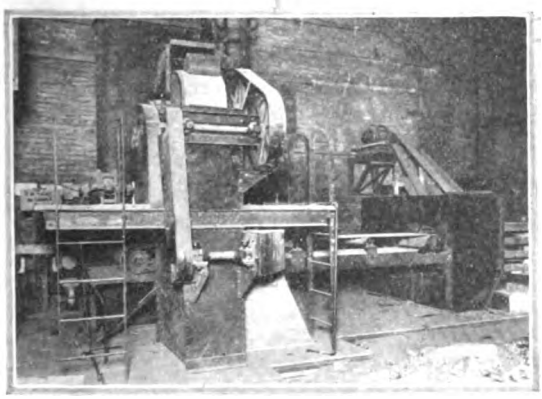


Fig. 15. Part of the sand tempering equipment in the bath tub foundry of the Wolff Mfg. Corp., Chicago, Ill. The elevator at the left delivers sand to a 24" flat tempering belt, which in turn discharges to a revolving cage type conditioner at the right.

Fig. 15A. Above is shown an excellent perspective view of the foundry equipment at the Utica plant of the International Heater Co.

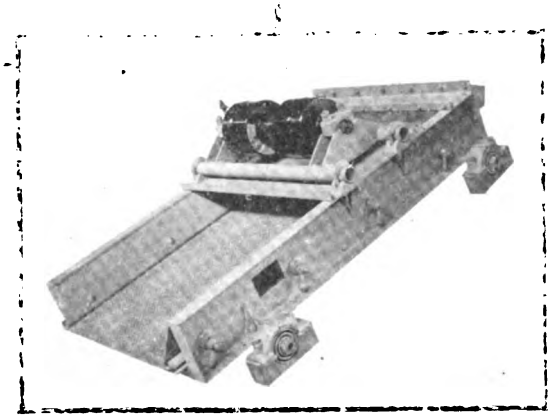
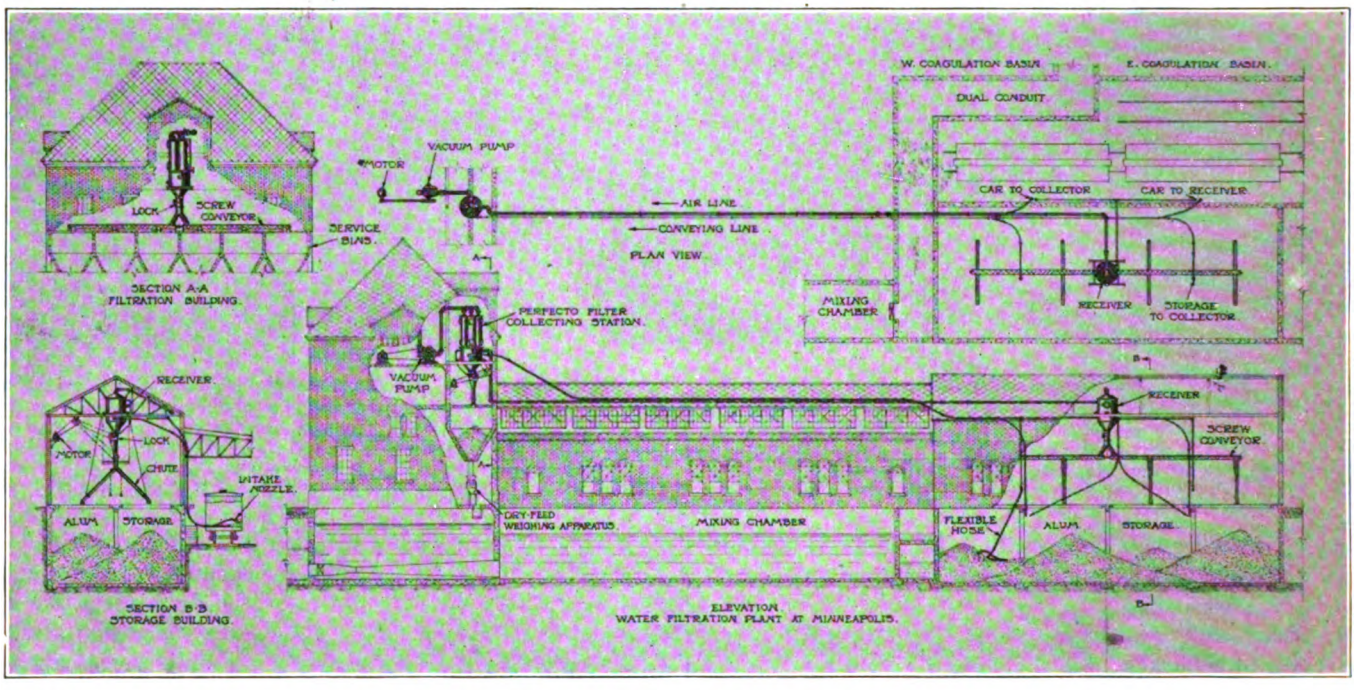


Fig. 16. For fine sand screening, the vibrating screen of the type illustrated is being increasingly favored because of low power consumption, floor space occupied and efficiency.

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they chose a "DRACCO" Pneumatic System



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The details of this installation should interest every industrial executive in charge of a plant where dusty, granular, bulky materials must be handled or conveyed.

Write for Bulletin 515, which contains the complete story with illustrations.

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Which Type of Equipment?

Six Handling Jobs Which Look Alike— But Conditions Differ, and Each Requires a Different Type of Equipment

By Frank L. Eidmann

Associate Professor of Machine Design, School of Engineering, Princeton University.

THERE is no one type of handling equipment which will serve as a 'cure-all" for materials handling problems. Each type of equipment has its place and only a thorough and complete analysis of each handling problem and factors which affect it should be used as a basis for selection of equipment. Too often an over-enthusiastic salesman will recommend the equipment which he is selling, when a different type of equipment should have been provided. It therefore behooves the plant manager to investigate each type which may be used in order to determine which will best serve his particular requirements in the long run.

The accompanying photographs illustrate six installations where the problems seem quite alike at first glance, but where it is apparent, from further consideration, that the requirements are different and that the type of equipment shown is the logical choice in each case. In each instance we have the charging of a vat or of a mixing machine, but there are many other factors to be considered, such as: the number of mixers or vats to be served by the equipment;

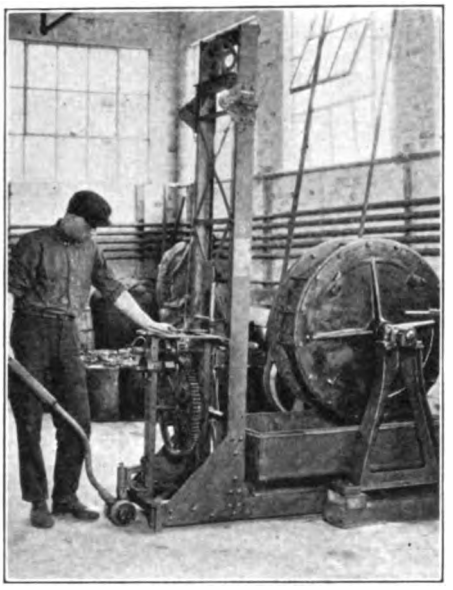


Fig. 1. Emptying tumbling barrel in which small articles have been burnished by tumbling with steel balls. Installation at plant of The Abbott Ball Company.

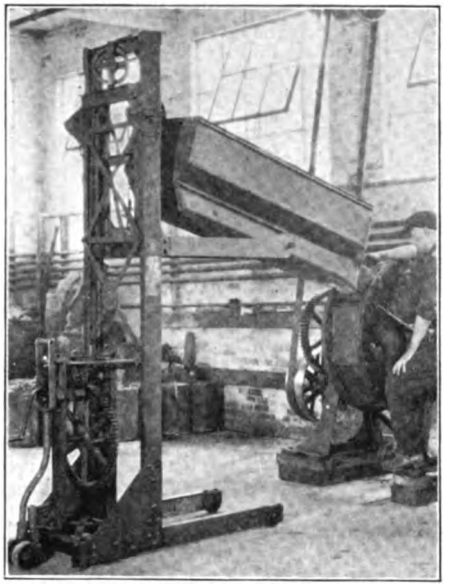


Fig. 2. The steel balls have been separated from the articles by falling through a coarse screen into the bottom of the pan, and the portable elevator is employed to pour the balls back into the barrel.

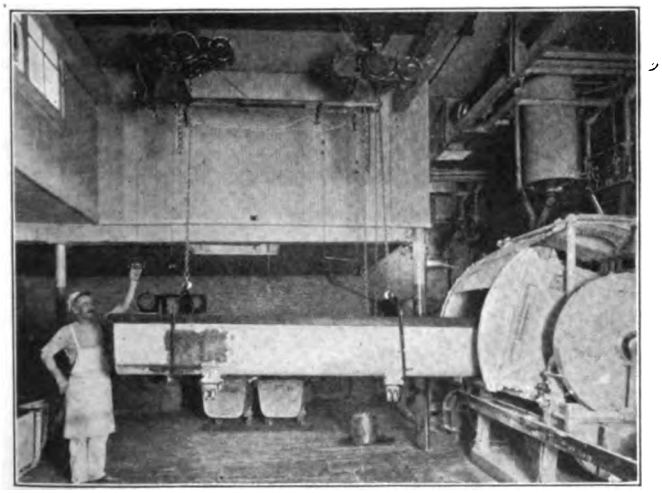


Fig. 3. Electric hoists are employed to empty the troughs of dough into the mixing machine.

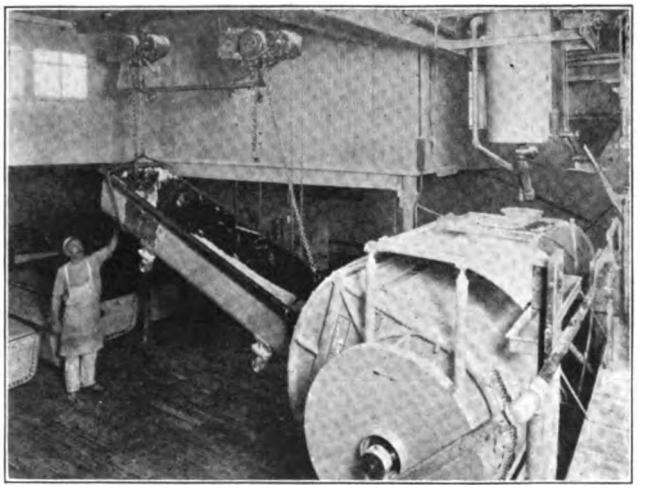


Fig. 4. After lifting the trough to the position shown in Fig. 3 (by operations of both hoists), it is tipped and emptied by further elevations of the left end.

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the particular construction of each mixer; and the auxiliary equipment (containers) employed; the frequency of charging; the size and character of the charge; the distance that the charge must be handled; floor conditions; ceiling height; the general type of handling equipment used in the rest of the plant; first cost of the equipment; cost of upkeep, and other factors peculiar to the installation.

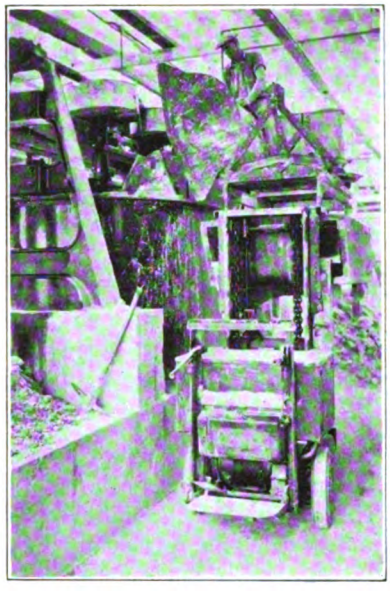


Fig. 5. For long hauls and good floor conditions the high-lift electric truck which was already in use in the plant is adapted to the job of filling the clay-mixer by the use of dump hoppers built on lift truck skids.

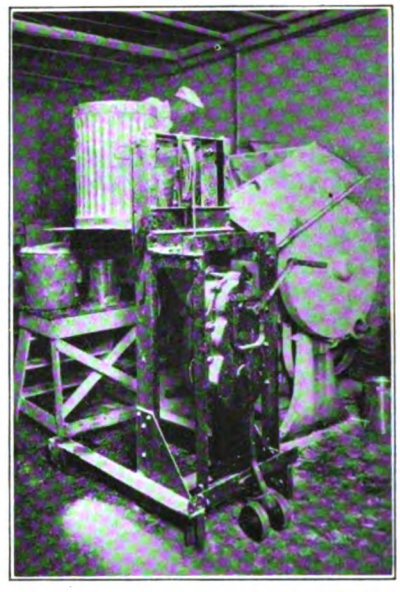


Fig. 6. Employing a portable elevator to load the mixer with the ingredients of cake frosting.

Figs. 1 and 2 illustrate the use of a portable elevator at the plant of the Abbott Ball Company in connection with machines which burnish small metal articles. The articles may be dumped into the tumbling barrels, where they are tumbled with small steel balls to burnish the articles. The articles together with the steel balls are removed from the barrel into the pan, as shown in Fig. 2. The pan is of special construction, having a false bottom, which is constructed of coarse screen and which allows the balls to go through to the bottom of the pan, from which they are poured back into the barrel as shown in Fig. 2. One portable elevator with a single pan may be used for a large battery of machines.

While the problem illustrated in Figs. 3 and 4 appears similar to that of Figs. 1 and 2, several factors enter which make it advisable to use electric hoists for this installation. Dough is allowed to raise in the troughs and is later mixed in the mixing machines. Three operations are required for emptying the dough from the troughs into the mixing machine: First the trough is lifted three feet above the floor by operating both hoists. Then the end of the trough is pushed into the opening of the mixing machine. Finally, only the left end of the trough is raised as shown in Fig. 4, emptying the contents of the trough into the mixer. It is to be noticed that interconnections of the controls of the hoists are so arranged that the set of controls at the right operates both hoists at the same time, lifting or lowering both ends of the trough simultaneously. The left set of controls raises or lowers only the left end of the trough. Among the apparent factors in which this installation differs from the first installation

(*Continued on page 34*)

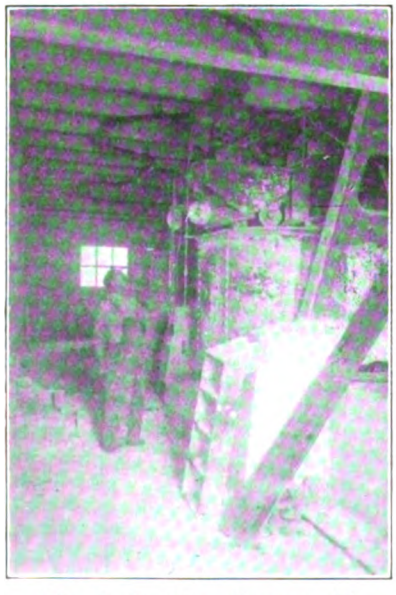


Fig. 7. Loading plungers with clay in a pottery. Special drop-bottom carriers operating on a tramrail replace the former method of wheeling the material in wheelbarrows over uneven surfaces and shoveling it to a height of 6½ feet into the plungers.

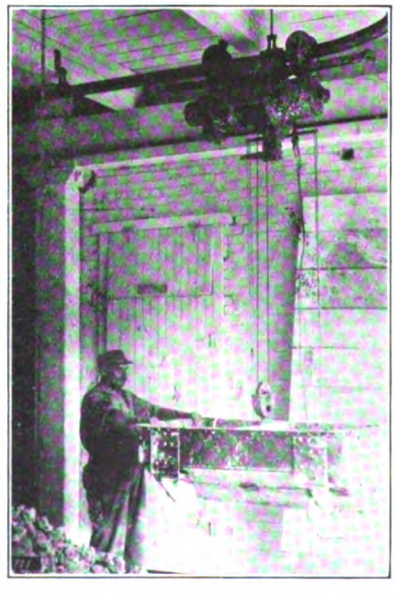


Fig. 8. A close-up of the drop-bottom carrier used for carrying clay on the tramrail. Consider the number of hand-labor operations done away with by this method.

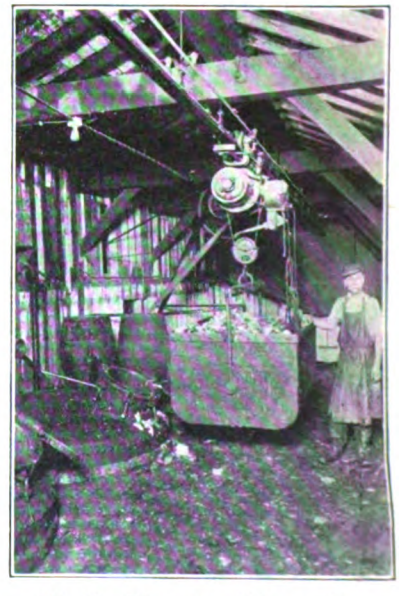
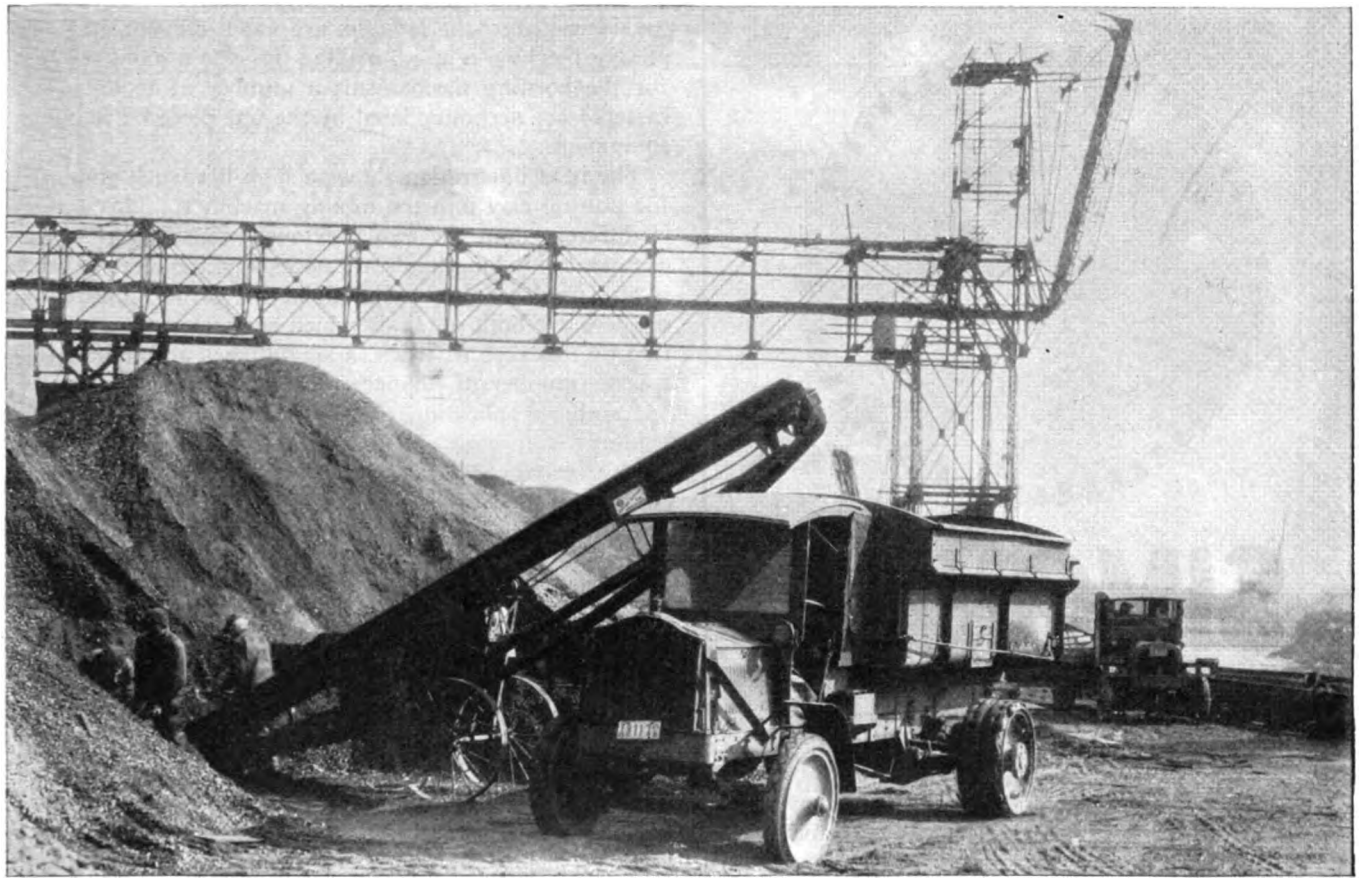


Fig. 9. The tramrail is used to load the tallow vats shown in this view which is taken on the loading platform. Here, again, it is easy to realize the immense saving in waste motion that has been made.

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That Makes Hand Labor a Big Expense

The Barber-Greene "U" Coal Conveyor is a small *one-man* conveyor, and it *sells at a price* that makes hand labor an expensive overhead item even for the smaller users of coal.

Where it ordinarily takes two men one day to unload a car of coal, the "U" Conveyor unloads it in about one hour and thirty-five minutes. Other materials are handled with equally surprising speed.

You get six times the same amount of unloading accomplished—with only one man. In other words—

The "U" Coal Conveyor cuts down your yard gang—it can speed up unloading 60% —and it helps to save all demurrages and track rentals.

And in addition, you can show a general saving of 10 to 50 cents on the handling cost of each ton.

The hopper of the Barber-Greene "U" Conveyor fits right under the coal cars. The cross cleats on the belt are cup shaped and exert a continuous digging effort.

Full length skirt boards increase the belt capacity. The special belt construction gives you a discharge height as high as 11 feet 9 inches.

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(*Continued from page 32*)

considered are: the troughs are much longer; only one mixing machine is used, making possible a fixed position for the hoisting mechanism; a number of troughs (on casters) are accommodated by the one piece of handling equipment.

The next illustration shows a high-lift truck employed for putting clay into the mixing machines. This system is different than the two previously considered, in that comparatively long hauls are necessary, the electric truck is also used for other jobs about the plant. The dump hoppers are built on skids which are picked up and carried by this type of truck, a single truck accommodating a large number of hoppers.

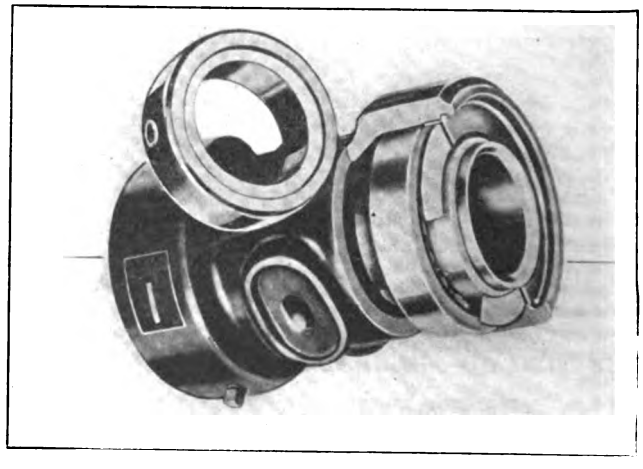
Another application of the portable elevator to the loading of mixing machines, as used by the Grennan Cake Company, is shown in Fig. 6. Here the loads are comparatively light and the various ingredients for cake frosting are elevated to the mixing platform on a hand-operated portable elevator. One elevator handles the loads for a number of mixers.

The application of the tramrail to the filling of plungers in a pottery is shown in Fig. 7. A special tub provided with a drop-bottom is mounted by a special load bar on a tramrail. It is attached to a rope-controlled electric hoist as shown in the close-up view in Fig. 8. The operator pushes the loaded tub or carrier over the top of the plunger, where he drops the bottom of the carrier. The tramrail is selected in this instance because of the long hauls and the floor conditions which make the use of trucks impossible. These same reasons obtain for adapting the tramrail to the loading of vats at the plant of the Western Tallow Company, as shown in Fig. 9. Here an electric hoist operating on a tramrail is employed for lifting the loaded hoppers to the loading platform and for conveying to the vat.

A New Ball Bearing Hanger Box

T. B. WOOD SONS COMPANY, Chambersburg, Pa., has officially announced the adoption of the Fafnir bearing as an incorporated part of its own line of transmission equipment.

Fafnir ball bearings have been used in "U. G." hanger boxes, Wood's loose pulleys and friction clutches for many years, but they are now adopted as standard part of the entire Wood line of products. The housings are



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Let's Get Down to Fundamentals



Push a book along the table. Note the drag due to the friction of sliding one surface over the other.



Place the book on pencils. It moves easier because *rolling* contact is substituted for sliding friction. But note the tendency of the rollers to change direction —and then to resist movement in the original direction.



Place the book on balls. The slightest touch starts the book across the table. And note particularly that the balls show no tendency to change the direction in which you are moving the book. Nothing rolls so easily, so true, so free of friction as a ball. *So it is with the New Departure Ball Bearing.*

New Departure Quality Ball Bearings

CONT. 427

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A Simple Chart for Finding the Heat Value of Coal

By W. F. Schaphorst

HERE is a chart that makes it easy to compute the heat value of any coal knowing the percentages of carbon, hydrogen, sulphur, and oxygen.

For example, selecting at random from a long list of coal samples the writer has taken one called Marianna mined near Pittsburgh. Its analysis shows 78.76 per cent. carbon, 5.23 per cent. hydrogen, 0.78 per cent. sulphur and 7.61 per cent. oxygen.

To apply the chart find the 78.76 per cent. carbon in column A at the extreme left. Opposite this in column B will be found 11,300. Write 11,300 on a slip of paper.

Then find 5.23 per cent. carbon in column C and in column D the corresponding number is 3,250, which is to be added to the 11,300.

Then find 0.78 per cent. sulphur in column E and column F shows the corresponding number to be 31.

Adding, we get:

$$11{,}300 + 3{,}250 + 31 = 14{,}581$$

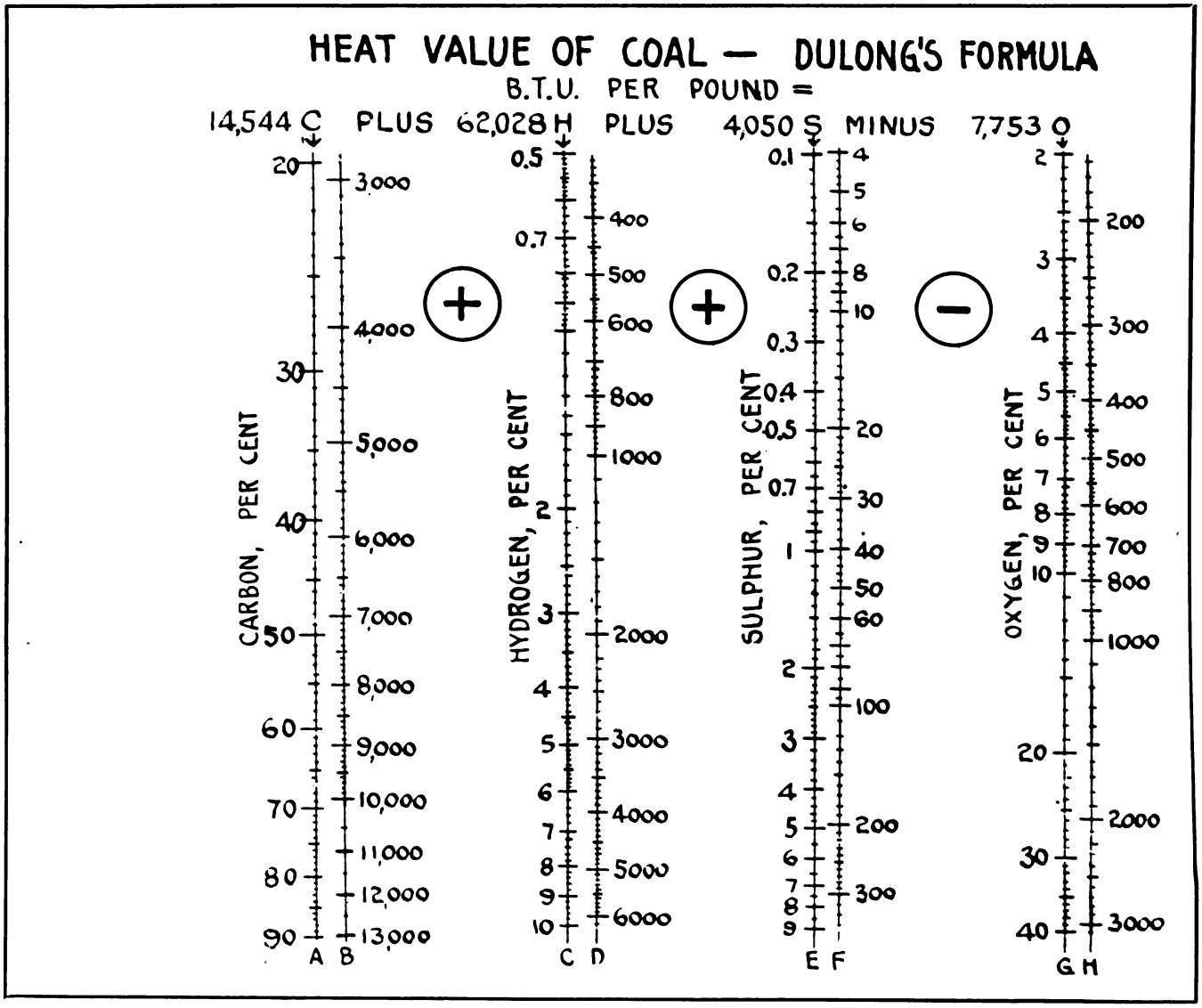
Now find 7.61 per cent. oxygen in column G. The corresponding number in column H is about 595.

Subtracting 595 from 14,581 we get 13,986 as the heat value of the coal in B.t.u.

This chart is based on Dulong's well known formula which is said to give results that are accurate within one and one-half per cent. of most coals that are dry.

As will be observed I have slightly altered the formula for the purpose of making this chart. The alteration is written out at the top of the chart.

Observe, too, that arrows point from the symbols C, H, S, and O, at the corresponding columns so that no mistake can be made. Also within circles between the columns the signs plus, plus, and minus, are shown prominently to aid the user in making rapid computations and to prevent possibility of error.



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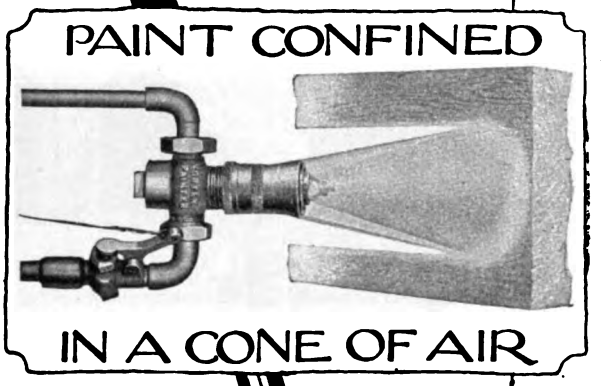
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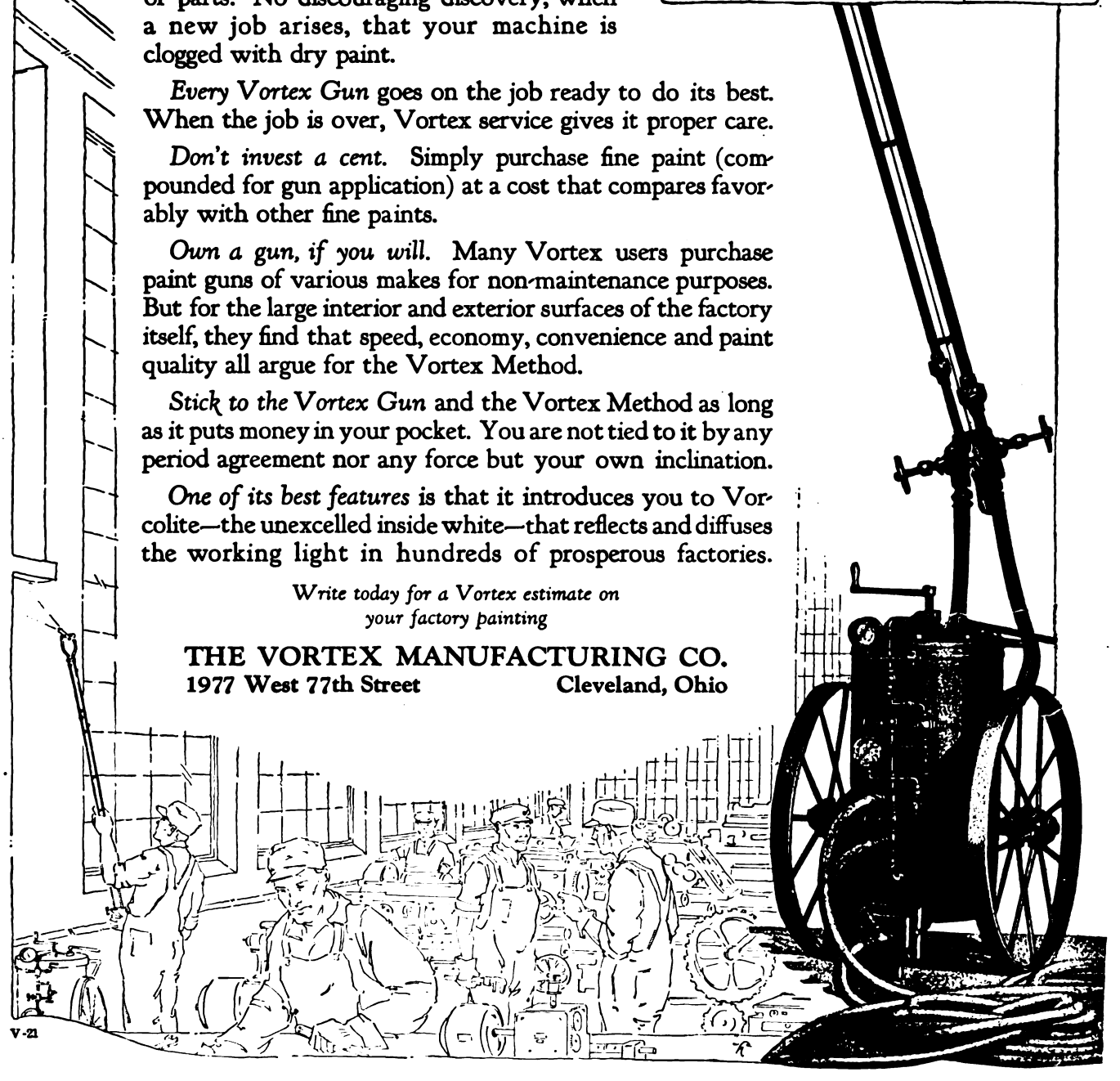
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The Preservation and Protection of Wire Rope

By Allen F. Brewer

WEAR will occur in any wire rope in service. It is impossible to absolutely eliminate friction between individual strands, the rope surface and the sheaves or winding drums, however suitable the lubricant or the attention paid to lubrication.

On the other hand, deterioration through age or the effects of outside causes such as acids, alkalis, water, chemical fumes or excessive heat can be effectively counteracted by judicious application of the right kind of rope lubricant.

This can be effectively brought about by saturation of the core of a wire rope, and if the latter is not neglected after being put into service, it can be maintained at its maximum flexibility, with the core serving as an adequate reservoir for the rope lubricant.

The most effective lubricants for wire rope are those products in which consistency is a natural property, not built up, as in certain greases or compounds. Such a lubricant of a viscosity ranging from approximately 500 to about 1,000 seconds Saybolt at 210° Fahr. will, by virtue of this comparatively high consistency, have a natural adhesive tendency, which compounding or resorting to so-called artificial means can seldom equal.

A wire rope lubricant must never be too heavy or viscous, for a product which is too heavy would lack in penetrative ability, and while the exterior of a rope might apparently be effectively lubricated, the inner strands and core might be suffering and in a condition conducive to rapid deterioration.

There are too many operators who will have a tendency to treat their ropes with highly viscous gear lubricants which, while adequately adhesive, frequently cannot penetrate throughout the strands or saturate the core to the requisite degree. Under abnormally high temperatures they may give approximately the desired results, but such conditions are rarely entirely constant. Too, under lower temperatures, power consumption might be materially decreased due to internal or molecular friction within the lubricant.

Wire rope can be relubricated in a number of ways. Troughs or split boxes through which the ropes can be passed during operation are very effective. Such containers can

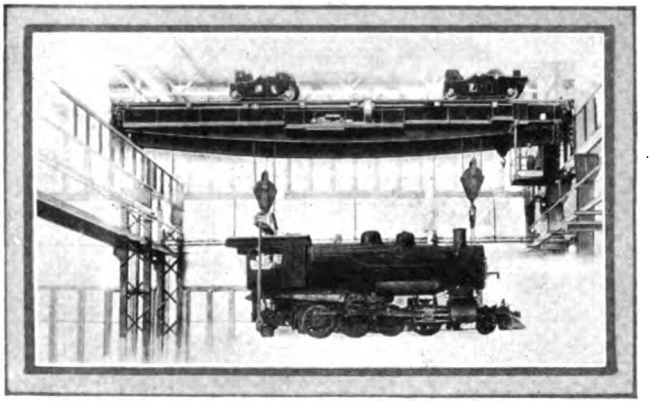


Fig. 1. A typical example of the duty that will frequently be imposed upon wire rope. The matter of lubrication and preservation is therefore of paramount importance.

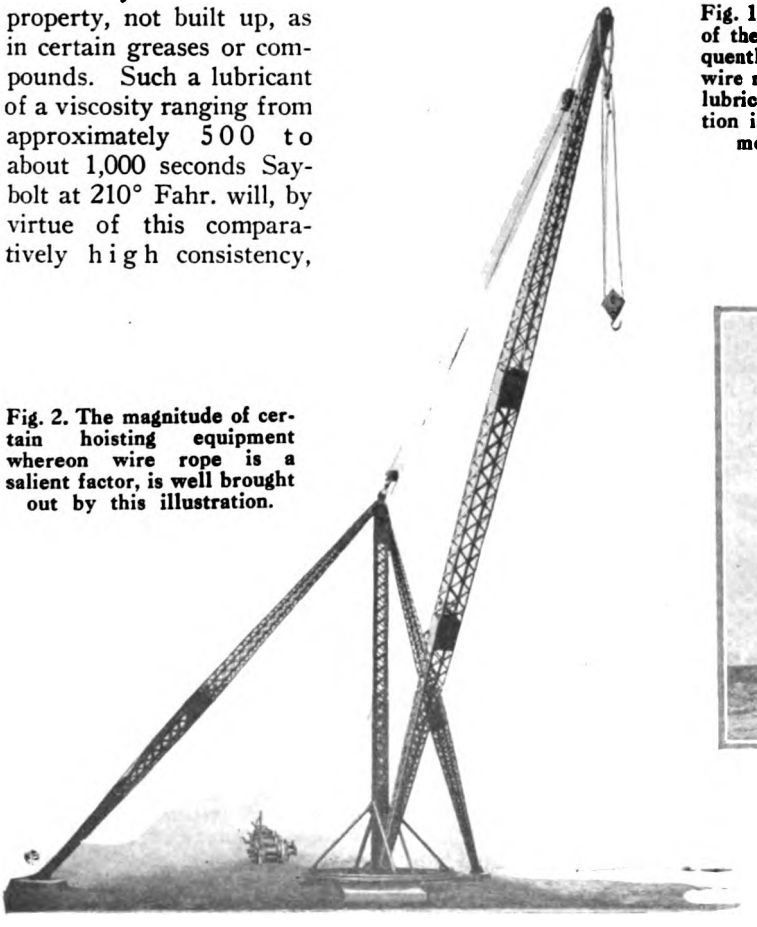


Fig. 2. The magnitude of certain hoisting equipment whereon wire rope is a salient factor, is well brought out by this illustration.

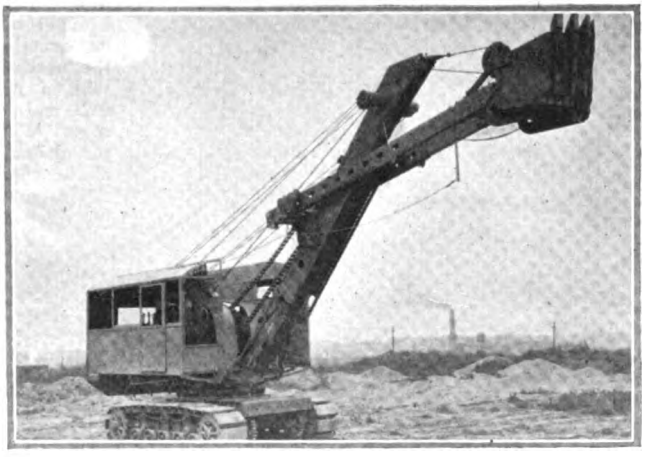


Fig. 3. The excavating shovel is subject to most intensive service. Its working elements are exposed, and its wire rope which controls the shovel and boom must resist shocks, and handle heavy loads. Effective lubrication renders all this possible.

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be filled to the necessary level with heated lubricant. Another method is to set up a barrel or drum above the rope so that the lubricant can drip from a suitable outlet valve, the container being equipped with steam coils for maintaining the temperature therein constant and as high as desired.

Where such equipment is used, a brush for spreading arranged so as to be relatively fixed in position and in contact with the rope will be advantageous. By locating the bristles beneath the flow of fresh lubricant, they can be maintained in saturated condition so that the maximum of spreading will be accomplished with the greatest economy.



Fig. 4. The type of outdoor service to which wire rope will frequently be subject is shown in this illustration. Long spans to give effective service must be properly lubricated. Such protection also increases the durability and life of the rope.

Immersion, however, insures the requisite penetration with perhaps the maximum of economy. Lubricants of this nature are decidedly adhesive and therefore difficult to handle. They are also detrimental to clothing or any more or less perishable products with which they may come in contact. As a result means of application such as the split box container or trough of oil-tight construction through which the rope may be run, serves the purpose in the most cleanly and effective manner.

Flexing or working the rope around drums or sheaves while the lubricant

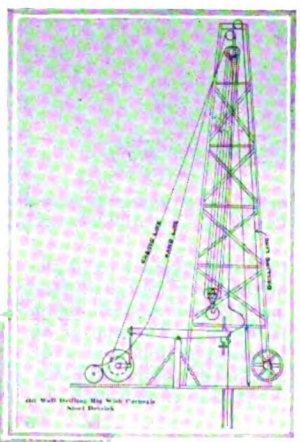


Fig. 5. Wire rope layout on an oil well drilling rig showing extent to which rope is involved, and the several accessory parts.

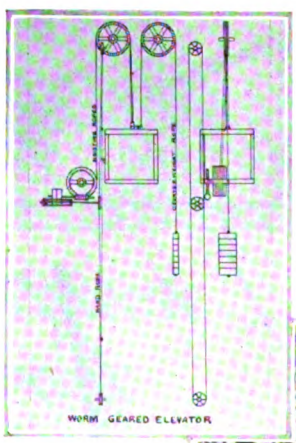


Fig. 6. The wire rope hook-up on a worm-geared elevator. Here responsibility is paramount due to the extent to which personal safety depends upon the condition of the cables. Lubrication by means of a suitable rope lubricant is excellent insurance—that strands will not wear excessively and that all ropes will continue to meet the load requirements.

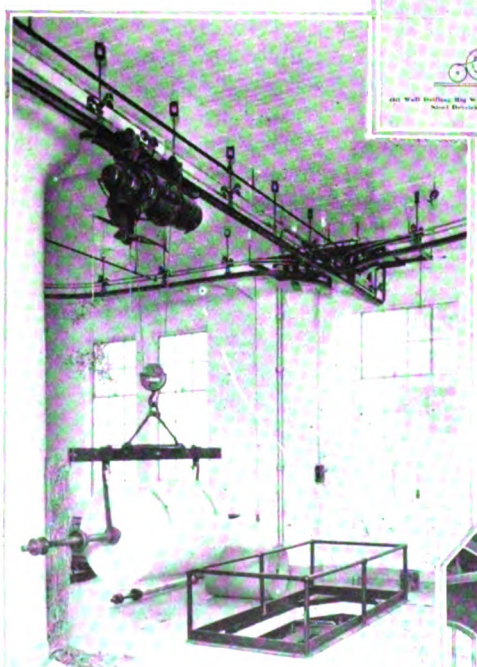


Fig. 7. Ideal operating conditions. Handling paper from storage to press room. Wire rope, with proper lubrication, should function with a minimum of friction under such conditions of cleanliness, and possess an indefinite life.

Fig. 9. The magnitude of hoisting drums and the relation to driving engines is well brought out below. This is an excellent illustration of the necessity for lubrication with a product which will stick and penetrate within the rope. Were it to throw off, the ultimate sloppy condition of the engine room could be easily imagined.

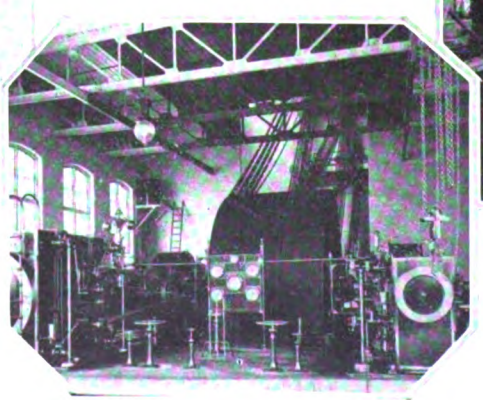




Fig. 8. In contrast (with Fig. 7) note the operating conditions above. Here rope is exposed to the elements, lengthy hoists are involved, and abrasive dust is prevalent,—all calling for careful lubrication to protect and preserve the core and strands of the cables.

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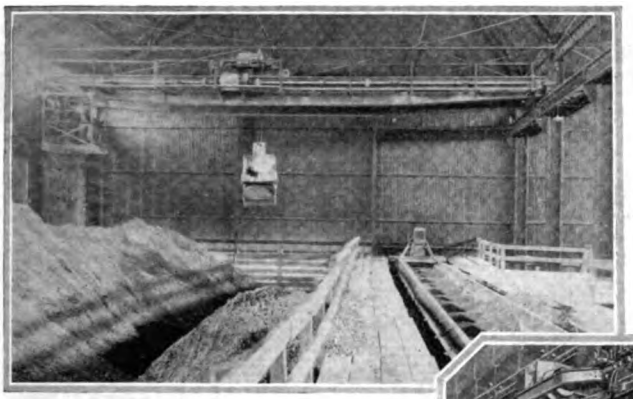


Fig. 10. The handling of mineral products in bulk involves considerable dust of an abrasive nature. Hoisting cables being exposed, and normally with sticky surfaces (if lubricated at all) will catch a good deal of this dust. One of the primary functions of the rope lubricant is therefore to form so perfect a **film as to prevent this foreign matter from penetrating with the strands.**



Fig. 11. The duty expected of the hoisting ropes on an excavating shovel can be realized from this view. Innumerable shocks, severe strains, lack of attention, and exposure to weather, all lead to rapid depreciation.

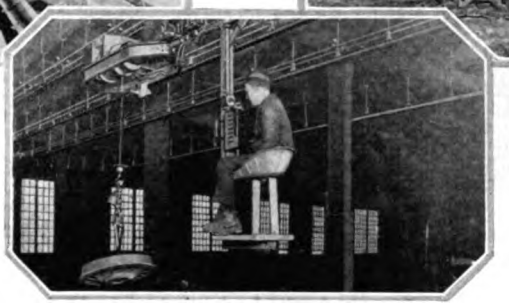


Fig. 12. Close-up view of an electric tram rail carrier charging and recharging pits in a car-wheel foundry. Here again the wire rope bears the brunt of the service.

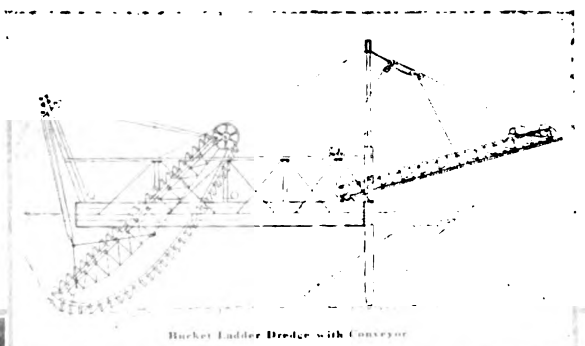
is hot and fluid enough to find its way between the strands and down to the core will frequently promote penetration to a marked degree.

No wire rope lubricant should be used which may have a damaging effect upon the core fibres of the rope, for it will result in more or less reduced protection.

Products such as certain tar compounds which may contain more or less acid would be detrimental and would fall within this category, yet in general appearance they might be very deceiving and similar to the more suitable straight mineral rope lubricants.

Other factors to guard against are fillers of non-lubricating nature, for they will frequently be detrimental especially if the rope is to be used under relatively low temperature conditions. Certain substances of this type will often tend to cause flaking or cracking of the lubricating films in service of this nature, water or other destructive corrosive elements subsequently gaining entry through the seams.

Fig. 13. The wire rope involved on a bucket ladder dredge and conveyor is shown below. Here salt water conditions, with accompanying corrosion, will be one of the chief problems to be solved by effective lubrication.



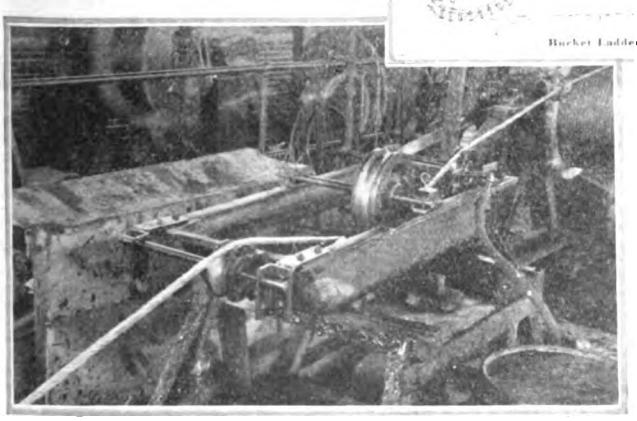


Fig. 14. A means for lubrication of wire rope by immersion. Note how the rope is drawn over and under guides to insure submersion in the lubricating pan prior to winding.

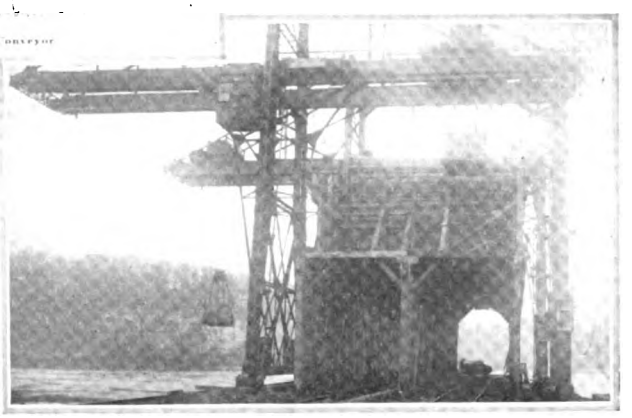


Fig. 15. A ten-ton gantry crane showing in another way the intensive service to which the hoisting cables are subjected.

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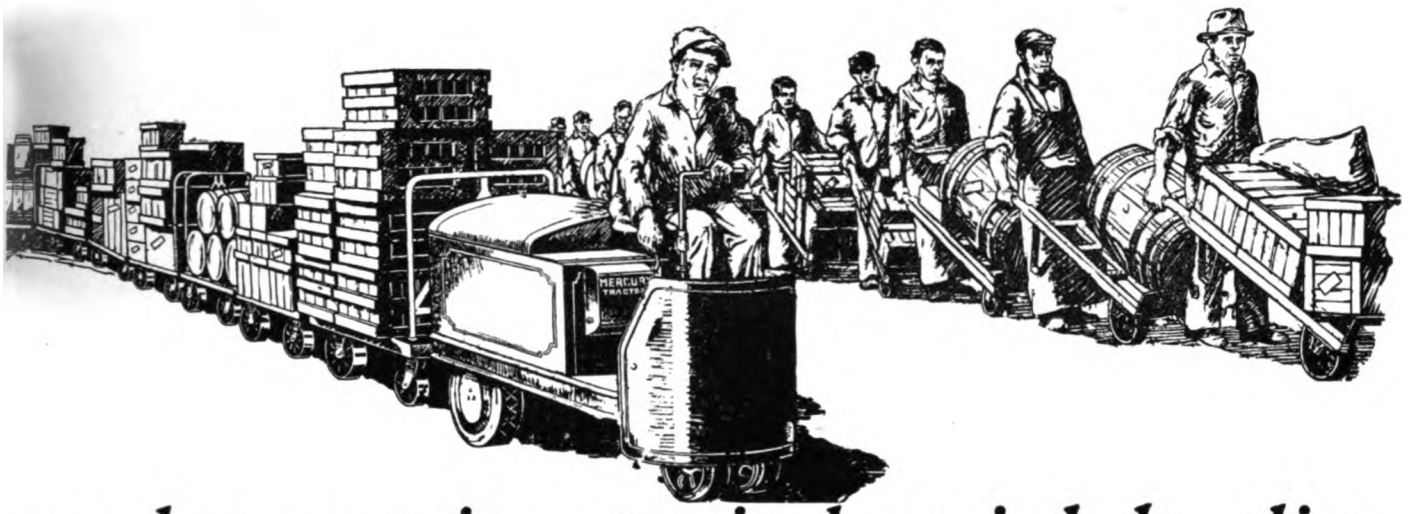
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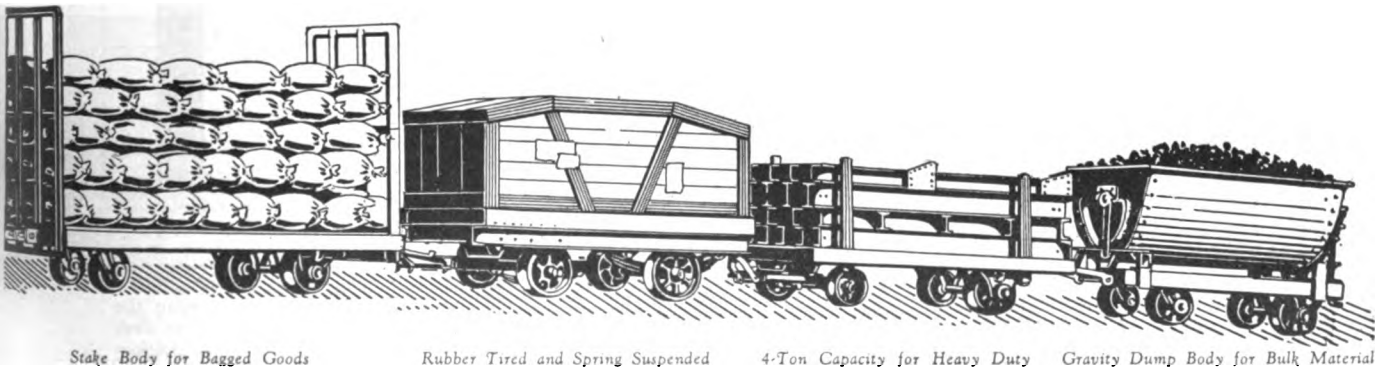


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What Is Prosperity?

Some Lessons from a Decade's Achievements

Graphic Visualization by Frederick H. Peard

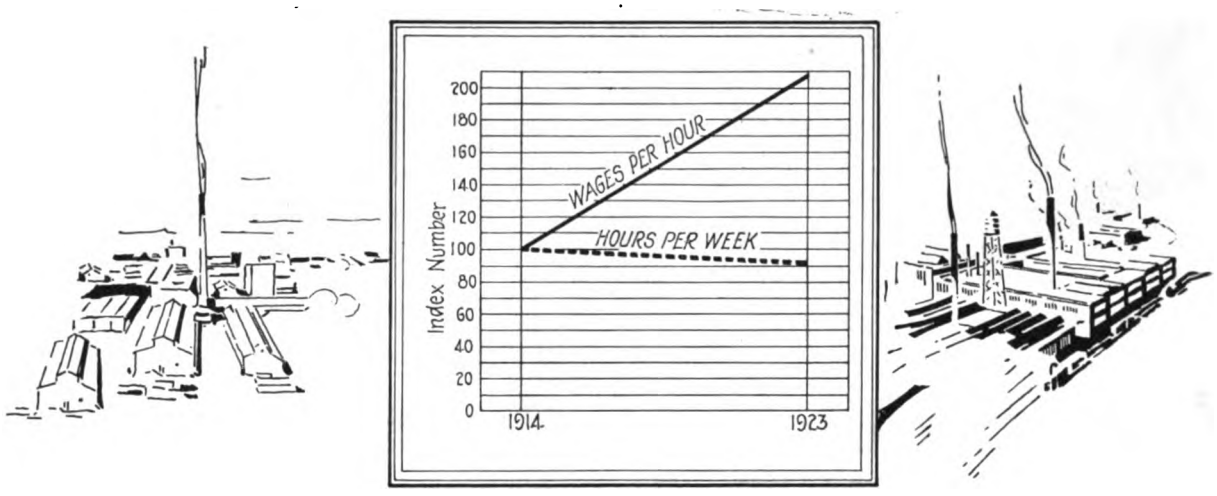


Fig. 1. The two trends, as shown here, might seem to point toward an early realization of living without the necessity for work. At any rate, "industrial slavery" is disappearing.

THE automotive industry is today acknowledged to be the leader among industries in the United States. Where but a few years ago it stood low in the list, as to total annual value of products, today it stands first.

Measured in another way, the past decade has seen an increase in the efficiency of the automotive industry of over 100 per cent.; that is, it is today selling its product at a price level almost 30% lower, although its raw material costs and wage levels have both advanced materially during the same period.

It is worth noting, at the same time, that the automotive industry is not the only thing that has been advancing by leaps and bounds. If we look at the Department of Commerce figures for the census years 1913 and 1924, it will be seen that in the former year American manufacturers, in all industries, utilized 22,401,000 horsepower; while in 1924 this figure of horsepower utilized in manufactures had jumped to 33,083,000—an increase of more than 47% in a ten year period during which the increase in population was less than 15%.

The statement has been made, especially by some European observers, that this country's prosperity is the result of the war. In a sense, this is true; but not at all in the sense that is intended abroad. The war awakened this country to the need for intensified

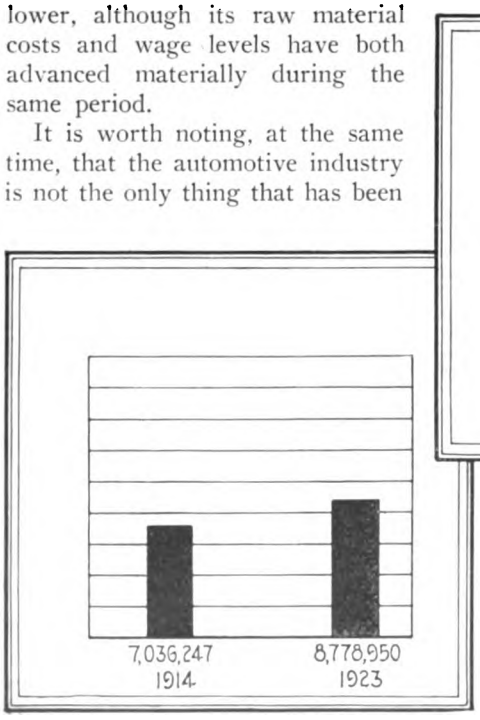


Fig. 2. Compare this ten-year increase in the average number of wage earners gainfully employed, with the increases in production and in machinery.

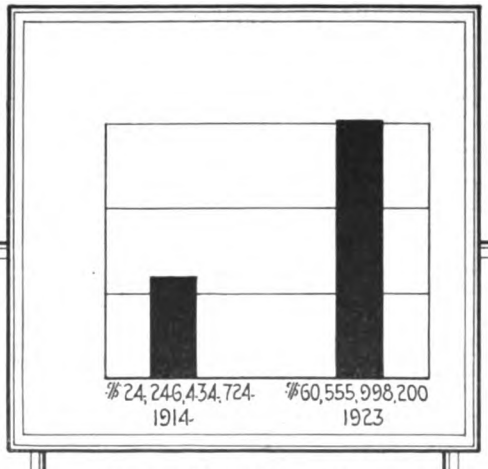


Fig. 3. Note the great increase in production for 1923 over 1914, with a relatively small increase in the number of workers. Fig. 4, however, is a significant explanation.

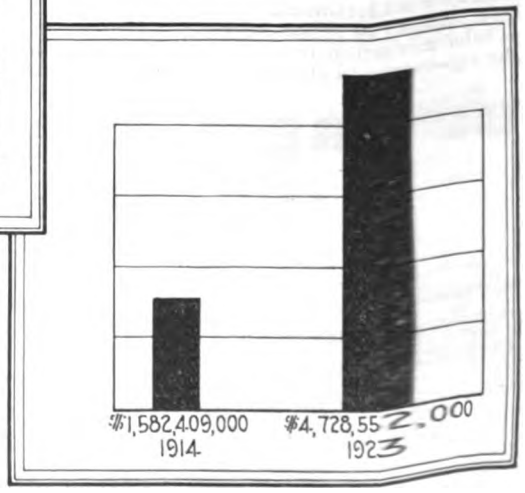


Fig. 4. Note how great has been the increased investment in machinery during this decade. Here, then, is the key to Figs. 2 and 3.

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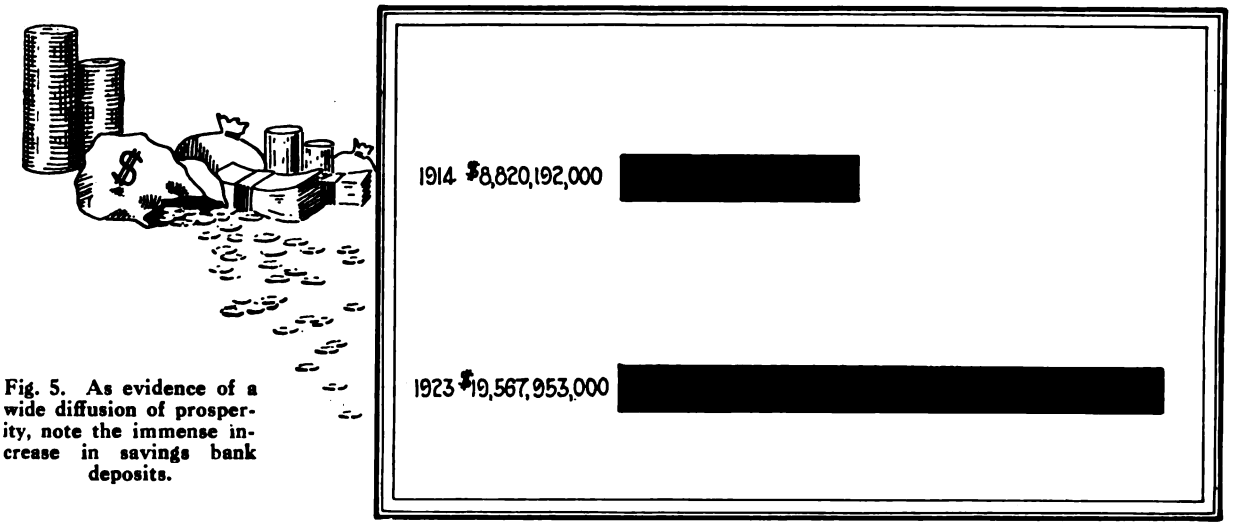


Fig. 5. As evidence of a wide diffusion of prosperity, note the immense increase in savings bank deposits.

production; it forced us to supplant dwindling manpower with mechanical power; it taught us once again the old lesson—that machinery not only holds the key to better and cheaper production, but that it provides also the pathway to higher wages.

The prosperity of this country today is not a static thing; it is dynamic. It is not based upon what we bought or sold or loaned during the war, but upon the mechanism that has so multiplied our production per worker as to permit higher wages and shorter hours and still avoid higher prices for the product.

The kind of prosperity we are often accused of enjoying—a prosperity founded on war profiteering—would be a temporary thing at best; its benefits confined to a relatively small proportion of the population.

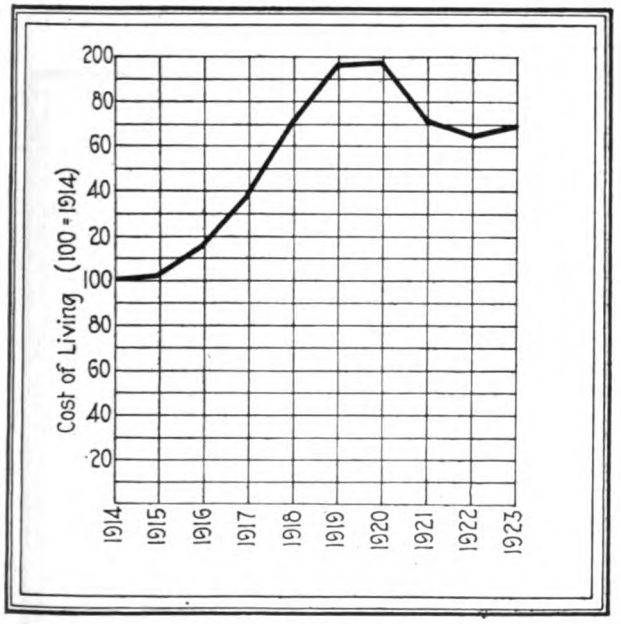


Fig. 6. Based upon 1914 as "normal," the cost of living reached its peak in 1920. Recent figures show a decline over the last year (1923) shown in the above chart.

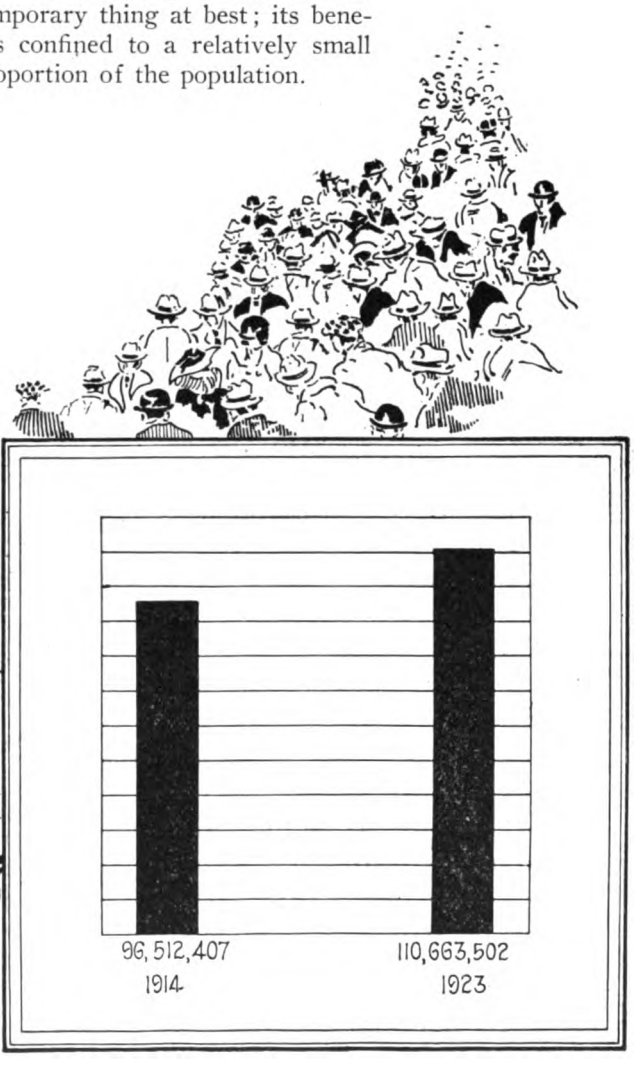


Fig. 7. Consider this population increase in relation to the statistics shown graphically in Figs. 3 and 5, and in relation also to those on the following page.

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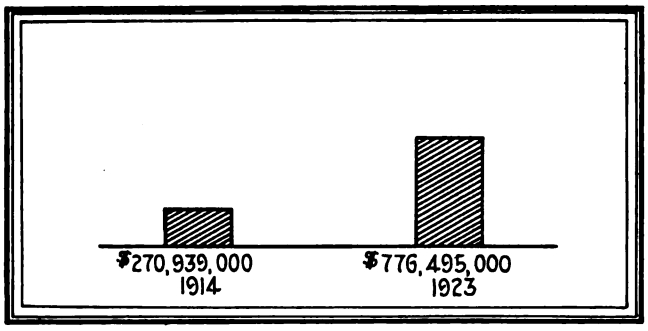


Fig. 8. Furniture production—obviously a much greater increase than the increase in population.

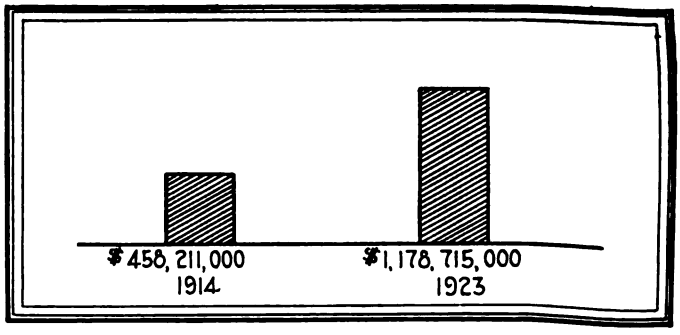


Fig. 9. A higher standard of living, made possible by higher wages, is reflected here.

On the contrary, the outstanding feature of the present situation is that the great majority of our people, and not merely a single group, are materially more prosperous than ever before. This is reflected in the statistics of sales of such things as furniture, shoes, clothing, and in the figures on savings bank deposits.

A little reflection will make it evident that, without this widespread prosperity, the automotive industry could not have reached its present enviable place; for it could not have had a market to absorb its immense production. Suppose, then, that this industry had, a few years ago, followed the time-honored custom of seeking economies through wage reduction? It would at once have narrowed the market for its own products and the products of other manufacturers. Instead, it met the demand for lower prices by better management, by intensified application of mechanical power, and by intelligent study of operations.

And, in doing these things, the automotive industry has done more than merely to assure its own success; it has shown the road to real prosperity and a higher material standard of living.

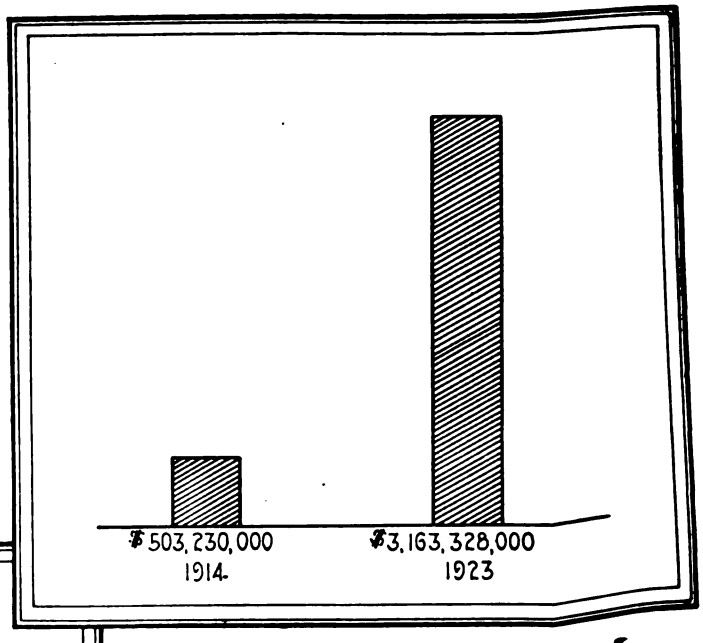


Fig. 10. Here is the biggest increase of all—the production of automobiles and motor vehicles. It is an odd coincidence that this immense expansion in the use of the automobile is simultaneous with a relatively small increase in boot and shoe production.

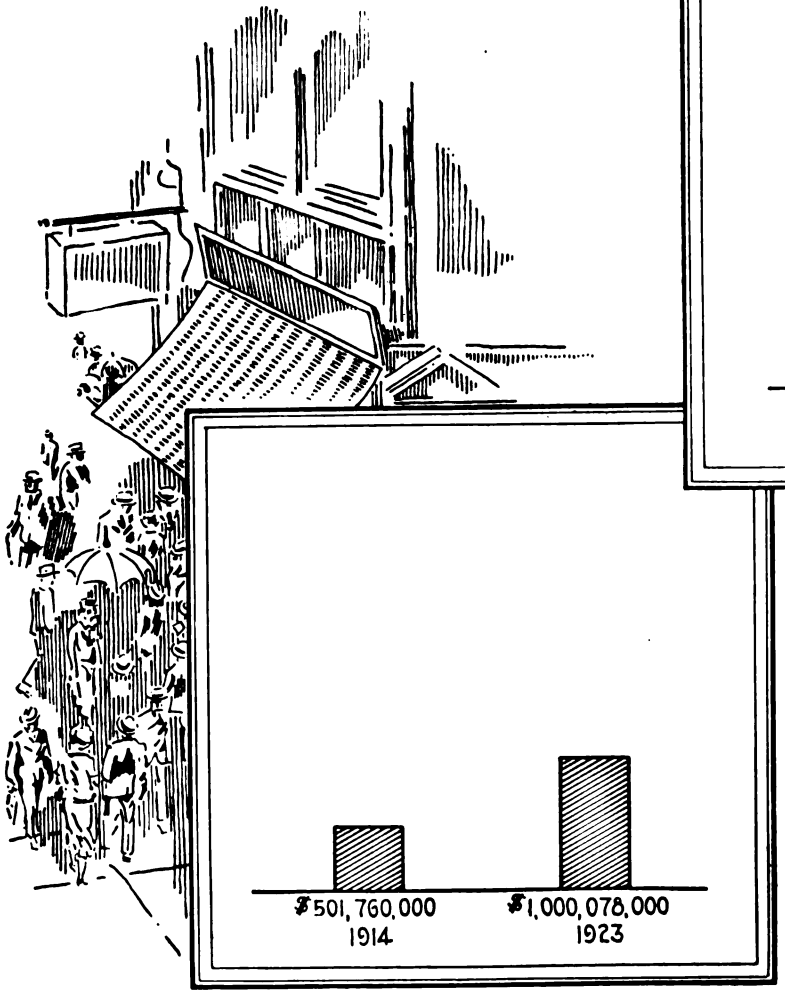


Fig. 11. Production of boots and shoes shows a smaller gain. Do people wear out less shoes because they ride more in automobiles?

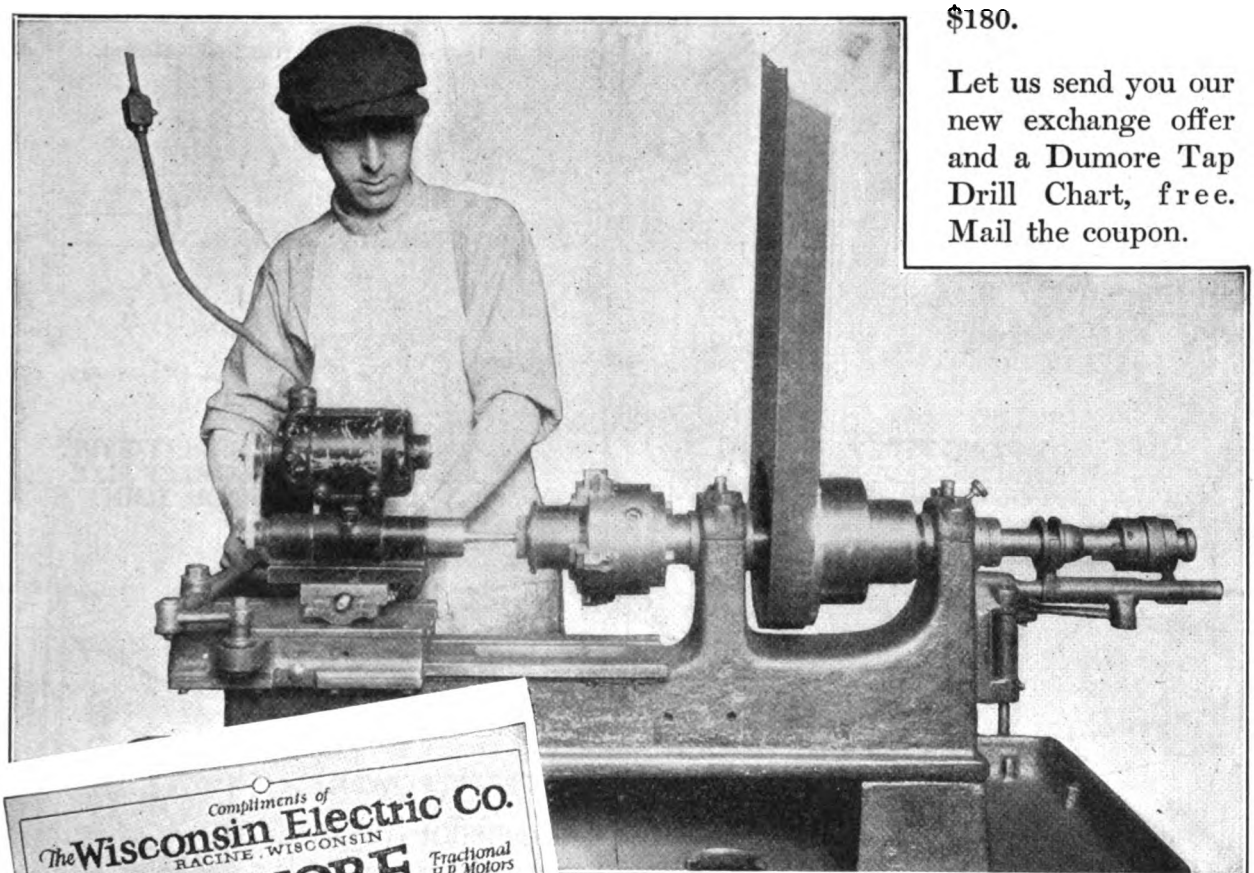
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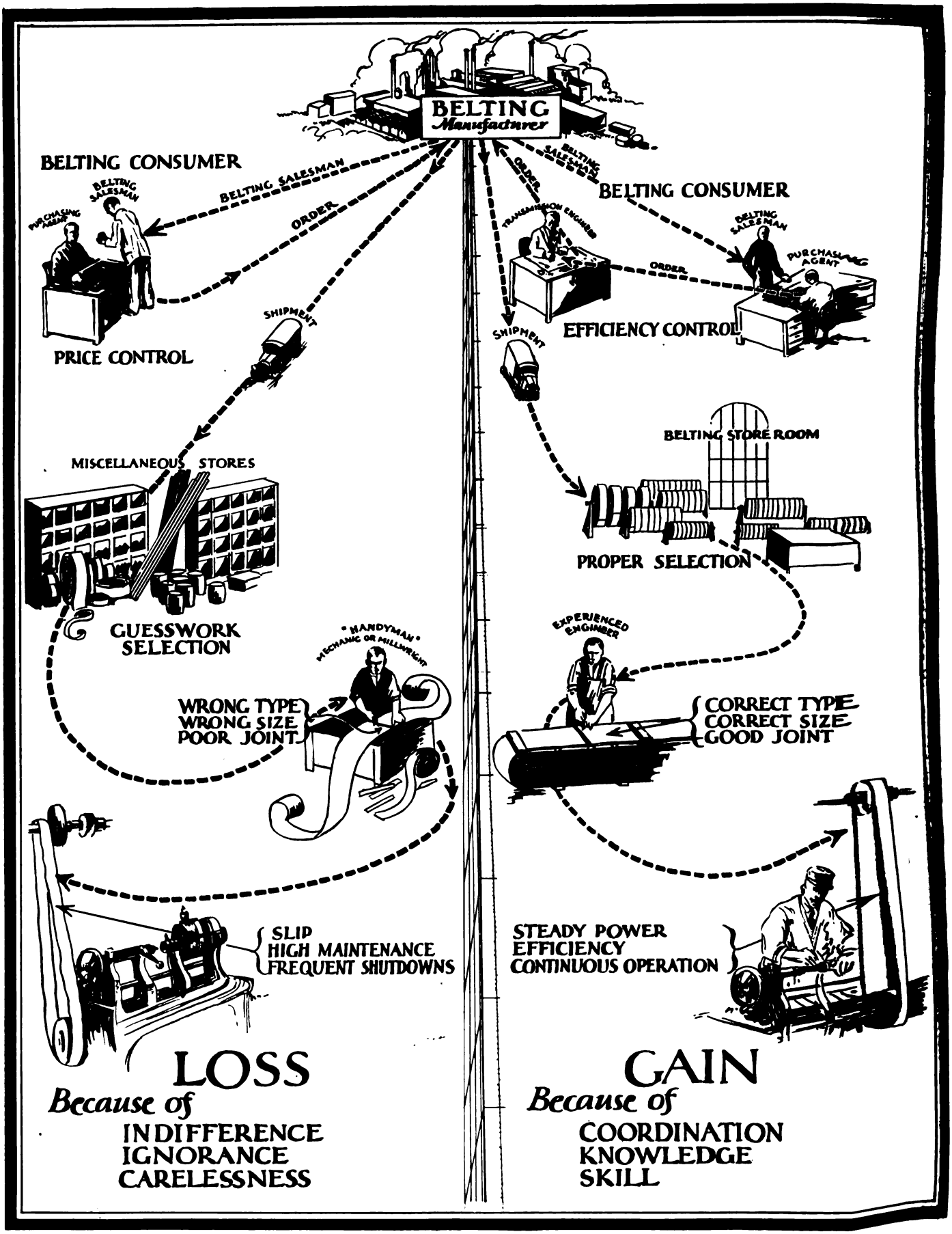
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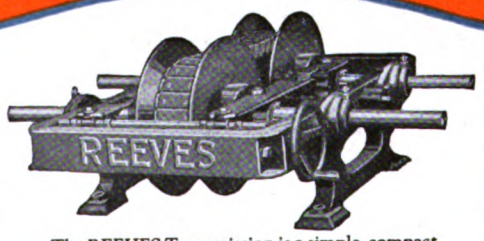
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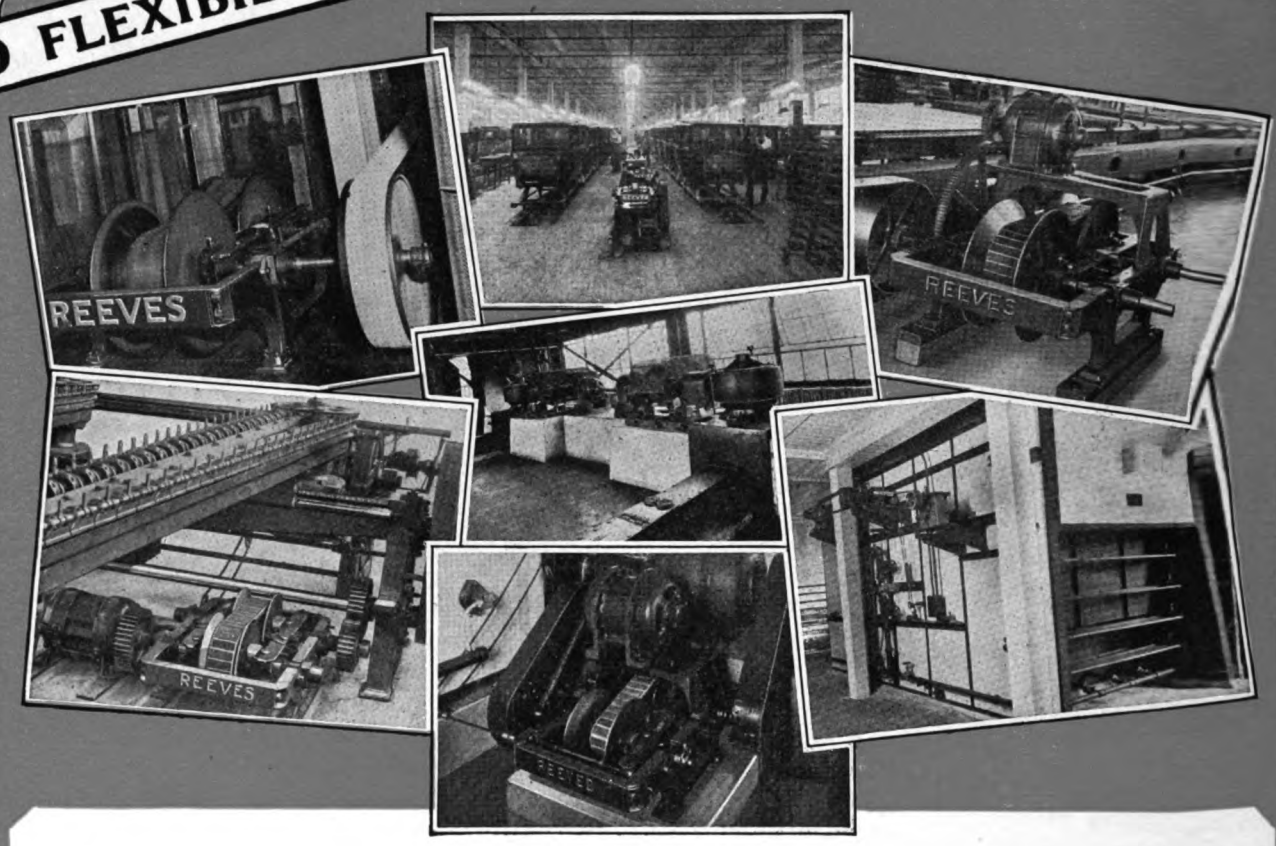
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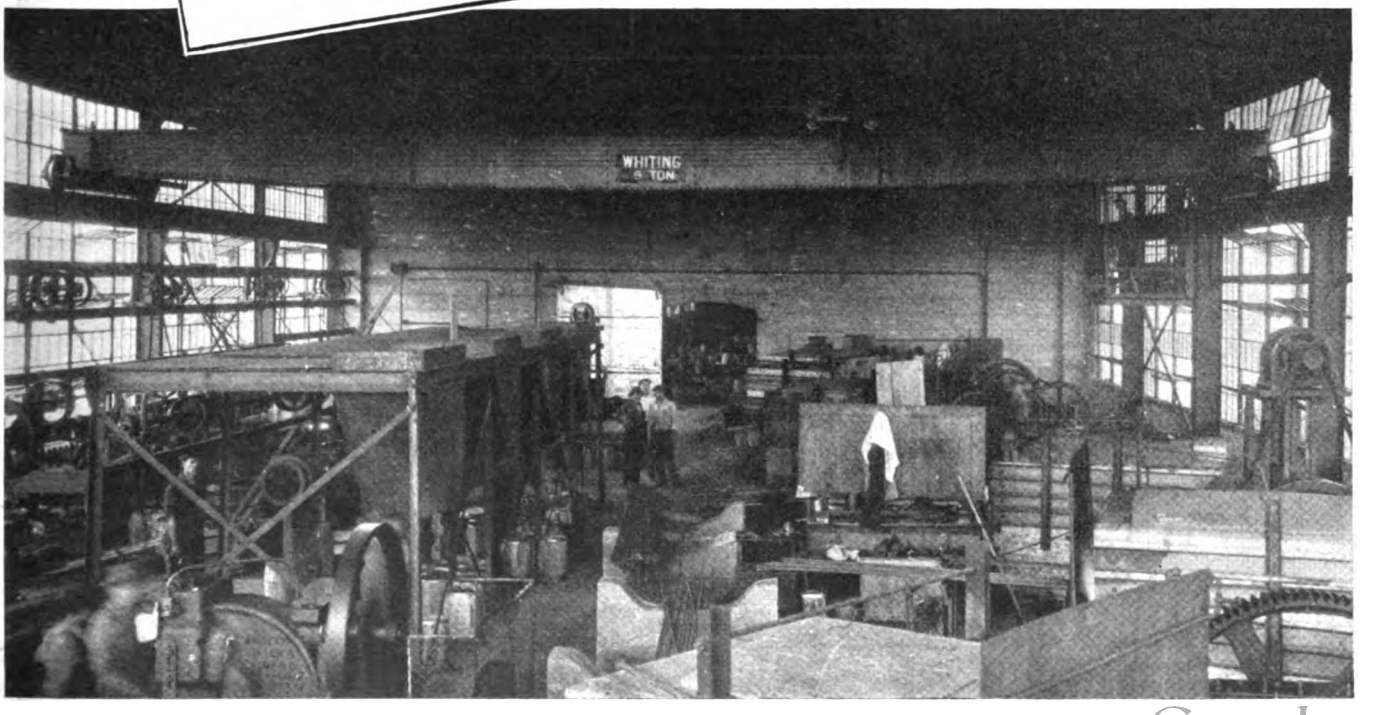
Leaves from an Engineers Note Book

Client
Problem — material handling facilities for new bolt and nut plant.

Capacity 500 tons per month. Estimated size of "hot shop" required, 35 x 142 ft. Round and square stock of various sections and lengths to be received in carload lots. Must be unloaded to stock piles and fed from there to machines.

Unloading by hand would require at least four man days per car and trucking from stock pile to machines would congest the floor space.

A 5-ton overhead traveling crane can unload a car of stock in one hour and can feed all the machines without keeping busy more than 25% of the time. Obviously the crane is recommended.



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Practical Pointers on Power Transmission

By L. H. Hopkins

Associate Editor, "Belting, Transmission, Tools and Supplies"

A NEW era in the industrial world quickly dawned upon engineers when the electric motor was introduced. But in discovering its advantages for driving equipment individually, these engineers became so over-enthusiastic that they failed to see its disadvantages. As a result, there were many installations made unwisely, without carefully analyzing the situation. In fact, for a time, in almost every kind of industry, there appeared to be a nation-wide tendency toward driving all equipment individually.

After a few years, however, when more experience was had with both individual and group drive, the many disadvantages of the former became more evident and it then ceased to be regarded as a panacea for all conditions.

Both individual and group drive are unquestionably indispensable to industry, but of paramount importance is the wise selection between the two in every case, the determining factor usually being as to which will prove the more economical in service for the particular job in question, enabling the manufacturer to produce his product at the lowest cost and thus increase the demand for it by lowering its cost to the consumer.

This thought of economical production and factory expansion should be uppermost in the minds of industrialists and applied not only in the planning of a power transmission system, but also in the selection and arrangement of every piece of equipment and in the development of every process of manufacture.

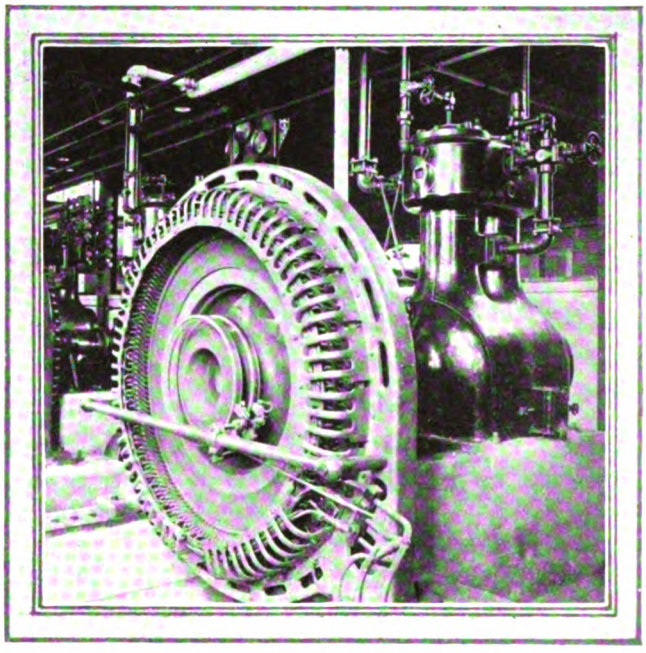


Fig. 1. This ammonia compressor is an example of a type of machine which should be driven individually. The drive motor here is a synchronous 60 cycle three-phase motor.

Probably the most emphasized advantage in favor of individual drive for the general run of equipment is that machines so driven can be installed irrespective of countershafting or line shafting in order to have them conform to the most convenient ways of transporting the material in progress. In the majority of cases, however, this advantage is more imaginary than real as the amount of equipment which cannot be so installed and still be conveniently driven in groups from line shafting is probably less than 4% of the total.

If, for some unforseen

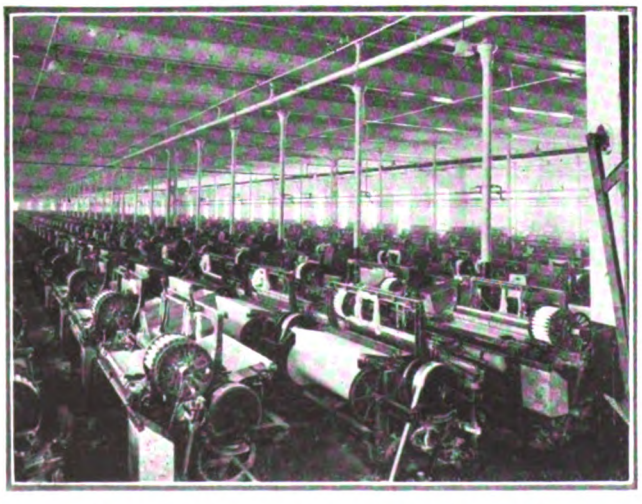


Fig. 2. One alternative, where group drive is desired, and where overhead shafting and belting is objectionable, is to drive equipment from shafting supported on the ceiling of the floor below.



Fig. 3. Machinery in shops which require overhead crane service, must obviously be driven individually, unless recourse is had to the alternative described in Fig. 2.

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cause, any one of a group of machines being arranged for progressive production cannot be driven from a line shaft as originally planned in a layout, it can usually be moved slightly one way or another so that it can be driven and still not interfere with the efficient operation of the group. Rather than sacrifice efficiency, however, these machines should almost certainly be driven individually.

In a properly balanced factory where the progressive system of production is used, the flow of material in progress is such that each piece of machinery used in each process will deliver to the next succeeding machine just the right amount of material to keep all the machinery operating at full output all of the time, and so on until the completed article of manufacture is produced.

This, however, is a condition difficult to realize in practice. It is almost invariably the case that there are one or two machines in each department that must be operated overtime. Such machines should be considered for individual drive, for usually it will be more economical to provide and operate the smaller motors that would be required for these applications than to operate a line shaft and the necessarily larger motor to drive only one or two machines. If there are a number of such machines in a plant that can be driven in a separate group without making necessary a double handling or special routing of material, it would be more economical to so drive them.

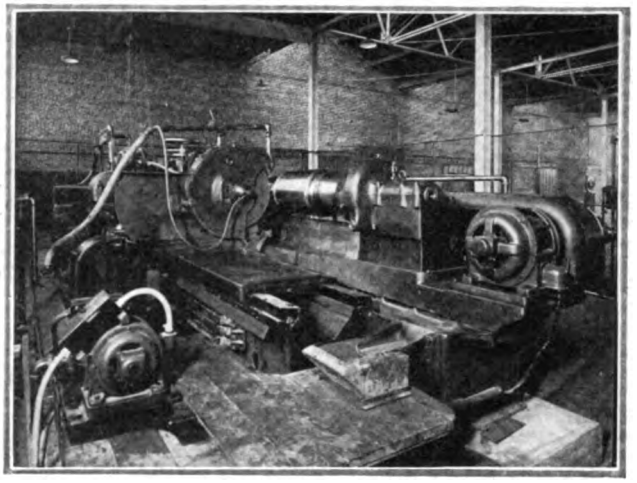
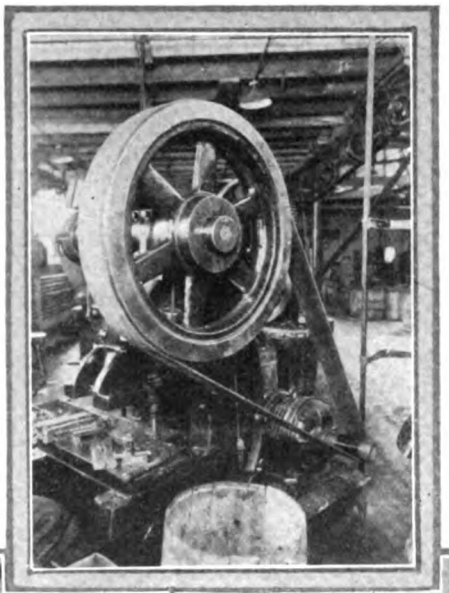


Fig. 4. Above is a case of a machine which not only must be driven individually, but requires four motors for the purpose.

Fig. 5. Below—Slow speed motors are better adapted to individual drive; but they are more expensive and less efficient than high speed motors.



In addition to machinery engaged in straight production work, this practice would apply also to any equipment which is used overtime and on Sundays by the maintenance departments. In this case, however, where in the majority of instances one or two men are called out on Sundays to do repair work necessitating the use of several machines, it is usually advisable to drive these machines individually.

Say, for example, if the maintenance machine work is done in the tool room, as is frequently the case, the general run of repair work can be taken care of on three or four machines. These machines would probably include a lathe, a grinder, a milling machine, a drill press and a shaper. With one man operating all of these machines —one at a time to do an overtime repair job—it would be profitable to have each of them individually driven. On the other hand, if these four machines were all operated at the same time, it would be advisable to drive them in a small separate group.

Any portable machines which are used in jobbing or maintenance work where it is desirable to take them to the job must, of course, be driven individually. In this class would come portable pipe threaders, rip and crosscut saws, grinders, concrete mixers, air compressors for operat-

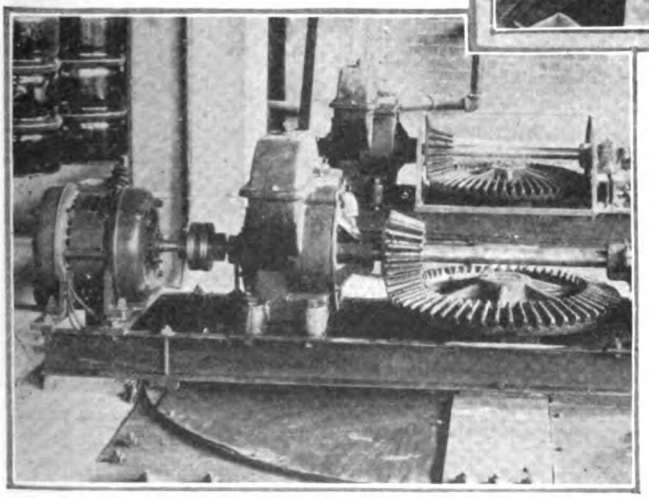


Fig. 6. The use of geared speed reducers often permits the application of the more efficient high speed electric motors to a given drive.

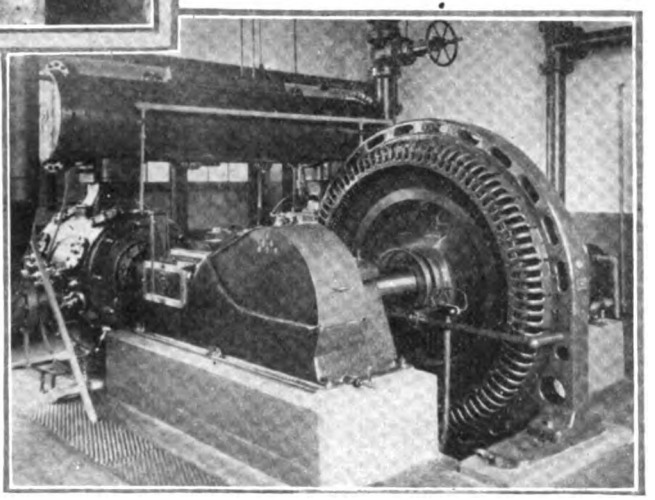


Fig. 7. An air compressor driven by synchronous motor. Synchronous motors are recommended for all loads requiring constant speed motors for 50 hp. or more.

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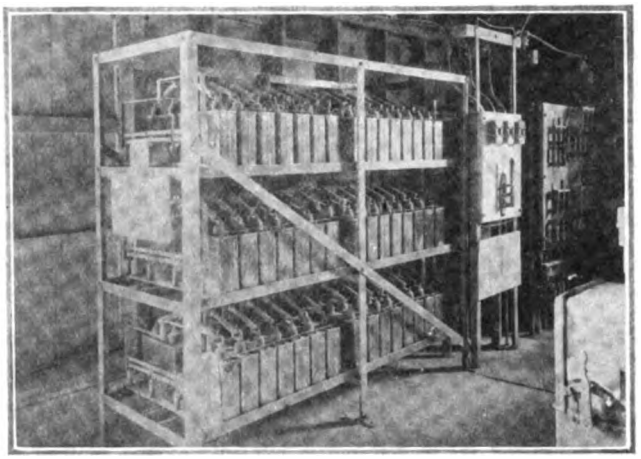


Fig. 8. Static condensers afford a means for improved power factor, where conditions prevent restoring to synchronous motors. See also Fig. 9.

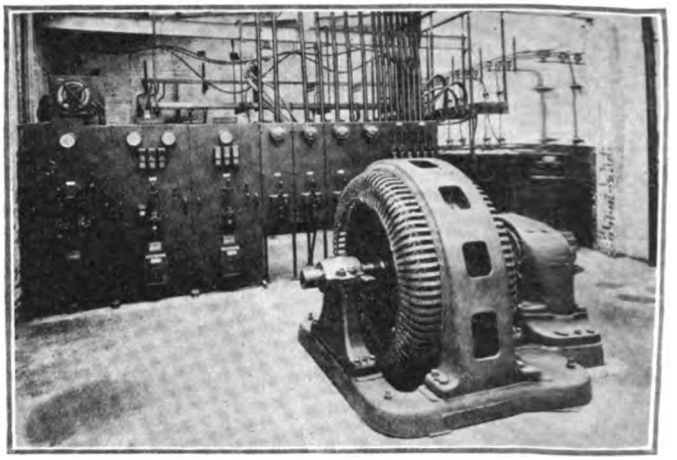


Fig. 9. Synchronous condensers should usually receive preference over static condensers, where capacities of over 1,000 kv-a. are involved.

ing pneumatic tools, paint-spraying equipment, etc. This applies also in the case of certain machinery used in heavy machinery shops where it is cheaper to move the machines to the work than to move the work to the machines.

Any machine which operates with a fairly steady load and requires 20 horsepower or more should be driven individually. Included in this class of equipment would be most of the large air compressors, milling machines, ammonia compressors, some fans and blowers, centrifugal pumps and the like.

Many machines requiring less power that operate with a fairly constant load also can be economically driven individually. Especially is this true in those instances where exceptionally high speed motors can be employed, say, for example, in the case of some blowers, centrifugal air compressors, high pressure centrifugal pumps, some wood-working machinery, etc.

Any machine which is operated on part time only and which requires considerable power, should probably be driven individually. Such a machine operated in a group with other machinery would demand the use of a larger motor, and during its idle period the motor would be only partially loaded while driving the remaining machines of the group and would be operating inefficiently. The determining factors in such cases should be the amount of power consumed by the machine and the extent of its idle period.

Machines such as heavy presses, upsetters, bulldozers, drop hammers, etc., providing intermittent or shock loads that would cause objectionable fluctuations in the speed of a group line shaft, should either be driven individually or arranged in a group of machinery which would not be objectionably affected by speed variations. However, the use of fly wheels frequently enables the speed fluctuations of a shaft serving such loads to be reduced to an unobjectionable degree. The energy which is stored in the fly wheels at periods of minimum power demand is given off at times of maximum demand, thus enabling the motor to operate with a more constant load. This practice often permits the use of a smaller motor than would otherwise be possible.

While fly wheels are frequently installed at intervals on the line shaft with satisfactory results, it is better practice to install them on the machines themselves and as near the point where the power is consumed as conditions will permit. This often enables the use of lighter and less expensive belts than could be

Fig. 12. Below—Ball or roller bearing motors more than justify their added cost, through lessened maintenance, longer life, and better operation.

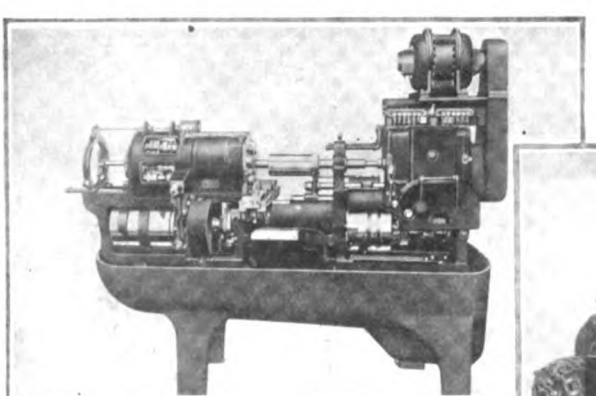
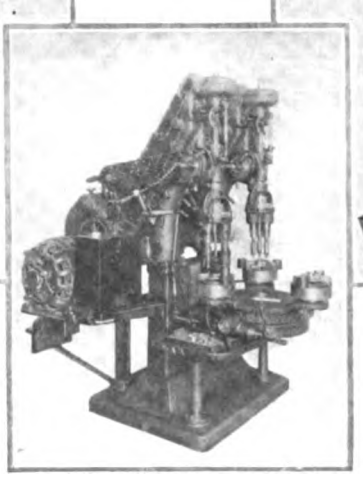


Fig. 10. In cases where individual drive is necessary, it is important to have a standard design of motor frame, so that motor interchangeability can be maintained.



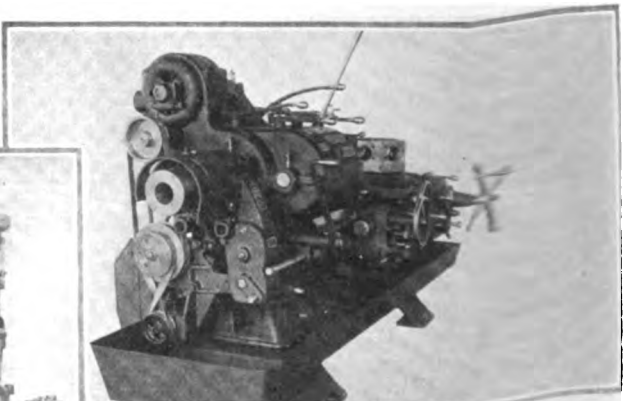


Fig. 11. It must be remembered that special motors or any machines will require the carrying of a greater number of spare parts and spare motors.

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used where the fly wheels are mounted on the line shaft. It also relieves the line shaft, belts, bearings and motor of severe shock-loads and strains.

Where overhead line shafting, countershafting and belts are objectionable, there are two alternatives: First, the most logical for the majority of cases is individual drive. The second alternative is to drive the equipment in groups from line shafts supported from the ceiling of the floor below or the basement. While the latter drive offers some objections, it has, on the other hand, found favor in certain industries and is frequently the means of overcoming many difficulties.

In textile and other industries where the machinery to be driven is comparatively light in weight and the likelihood of rearranging it is small, this arrangement is used considerably. The cutting of holes in the floor for belts naturally weakens the floor and also confines the machines to their original location. Usually the reason for driving equipment in this way is to eliminate the dust and dirt that might accumulate in the pulleys and be thrown off when starting and stopping the line shaft. In other cases it is used to save the expense of an additional line shaft, as one shaft can serve the equipment on the floor below as well as the one above.

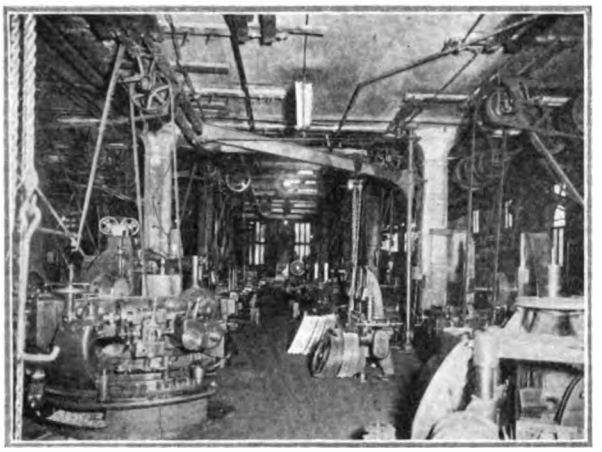


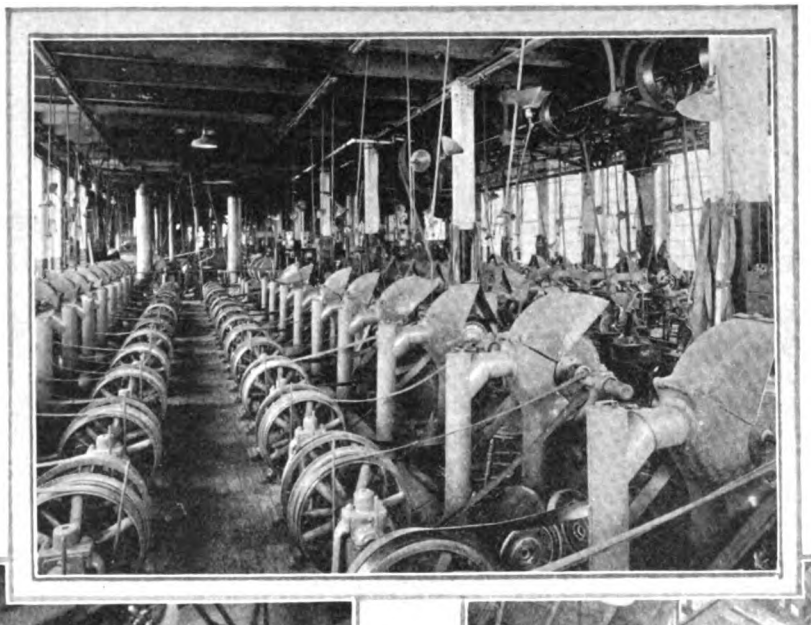
Fig. 13. Here is a typical example of group drive; twenty heavy gear cutters being operated by three 15 hp. motors.

The machinery in any shops which require overhead crane service must obviously be driven individually or in the above manner, as the presence of overhead line shafting and belts in such cases would interfere with crane service.

Other advantages which may be mentioned as in favor of individual drive are: The elimination of line shafting, countershafting, and nearly all of the belts. The absence of these improves the lighting conditions, eliminates the hazard of breaking belts and the possibility of objectionable dripping of oil or grease from the bearings. The frictional losses and maintenance of this equipment are also done away with. A shop individually driven is cleaner and generally more pleasing to the eye.

There is a tendency among machine tool manufacturers to over-motor their equipment. This is especially true in the case of metal working machine tools, and, in fact, wherever any kind of machinery may be ap-

Fig. 14. Below—A rather unusual installation of line shafts directly behind the machines; permitting short belts, accessibility, and good lighting.



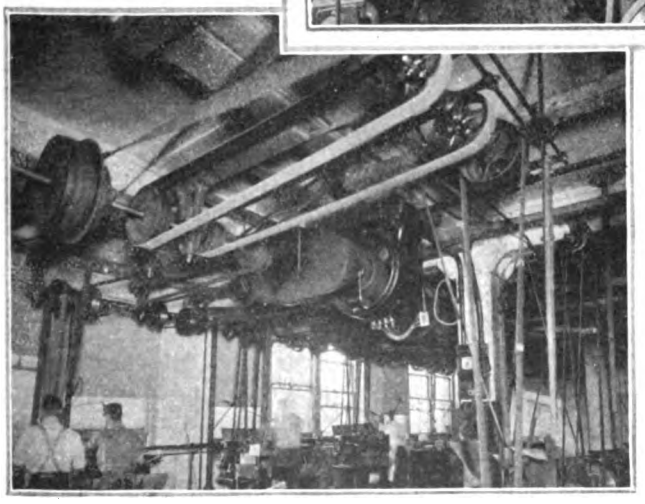


Fig. 15. A combination employing chain drive from motor to line shaft, and belts to machine pulleys.

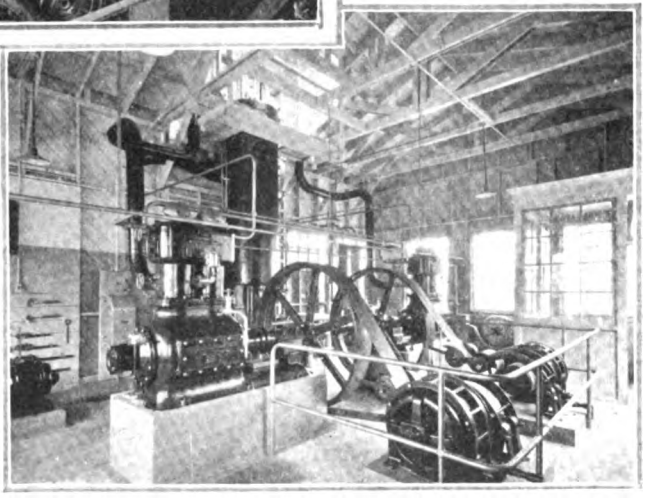


Fig. 16. Idler pulleys, increasing the arc of belt contact, permit of short center drives without bearing strain from too-tight belts.

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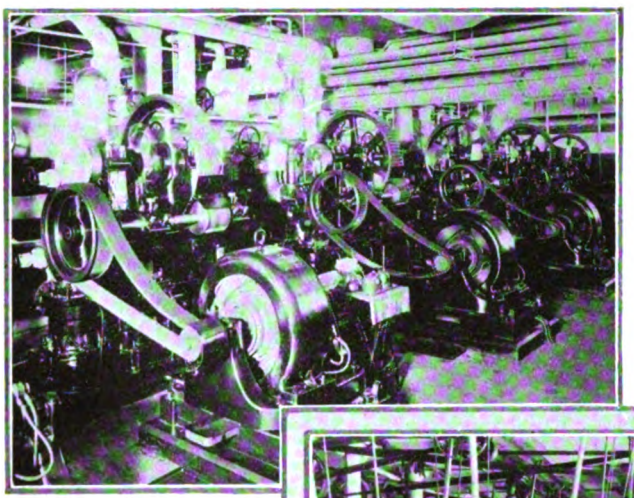


Fig. 17. Chain drive affords a means of positive drive, without slip, where speed regulation is important.

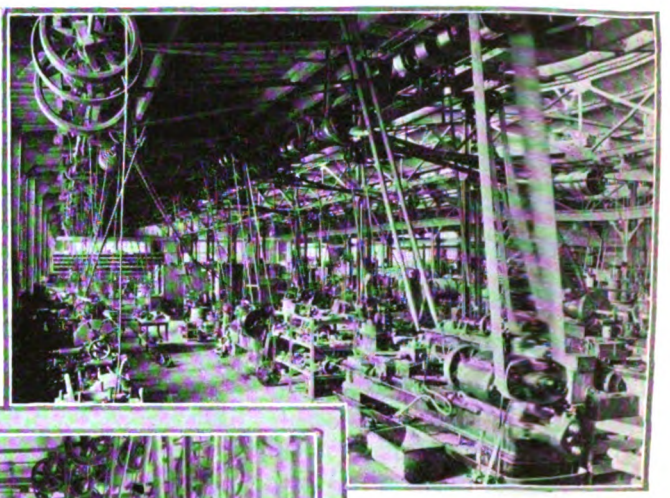


Fig. 18. Belts constitute between 50 and 75 per cent. of the continuous total investment of a group drive. It pays to select them carefully.

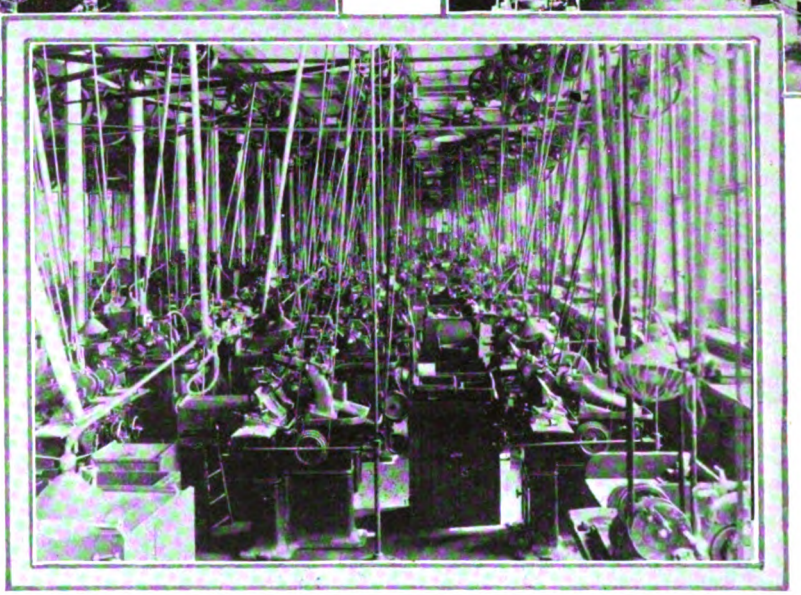


Fig. 19. Loose pulleys, too should be equipped with anti-friction bearings. Imagine trying to service the ordinary type loose pulley in such an installation as this.

plied to work of a varied character requiring a greater or lesser amount of power. The position of the machine tool manufacturer is well taken, however, when he provides motors of sufficient size to meet the maximum probable power demand, for it must be borne in mind that a single instance of insufficient power may cause the entire machine to be condemned, whereas an overabundance of power is less frequently regarded as a fault.

Over-motoring is largely responsible for the low power factor which almost invariably exists in plants where the majority of equipment is individually driven by alternating current induction motors. This phase of plant operation will be treated later in this article.

Most equipment used in straight line progressive production is of standard design and each machine has a routine operation to perform. This operation is usually much lighter and requires less power than the heaviest duty of which the machine is capable. In view of the possible economies to be gained by motors of correct sizes and the bearing that such a condition has on the general efficiency of a power transmission system, it is always advisable, when purchasing machinery direct from the manufacturer, to provide him with all available information as to the operations that will be required of each machine, so that the power requirements can be determined far enough in advance for motors to be specified of a size and type best suited for each individual job.

Where such standard machinery is purchased from the machinery dealers complete with motor for individual drive, the motor is invariably of sufficient size to meet the peak power demand on the heaviest jobs for which the machine is designed. On the other hand, for the probable lighter service to which it will be applied the motor is much too large. In some instances I have found it possible to use motors of less than one-half the size of those specified by the manufacturers. Therefore, when purchasing standard equipment from machinery dealers, usually it is good practice to purchase it without the motor, which the purchaser will in turn select of a size and type best adaptable to the particular application. This practice also presents the opportunity of using a standard motor of the same make and general characteristics as others in the factory, for there are many advantages to be had through the interchangeability of motors and repair parts.

The many economies and other advantages offered by group drive for the great majority of industrial machinery give it a much wider

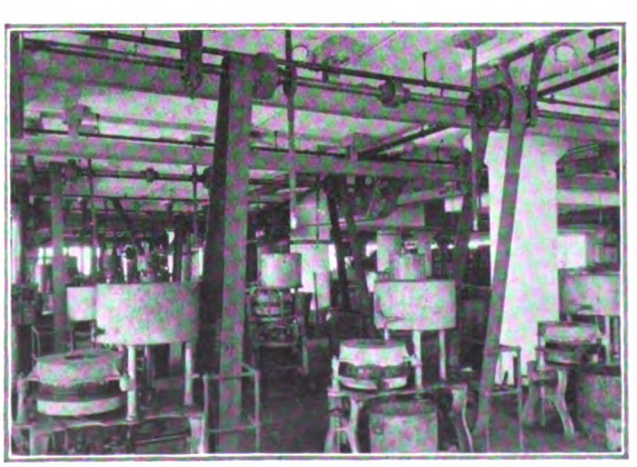
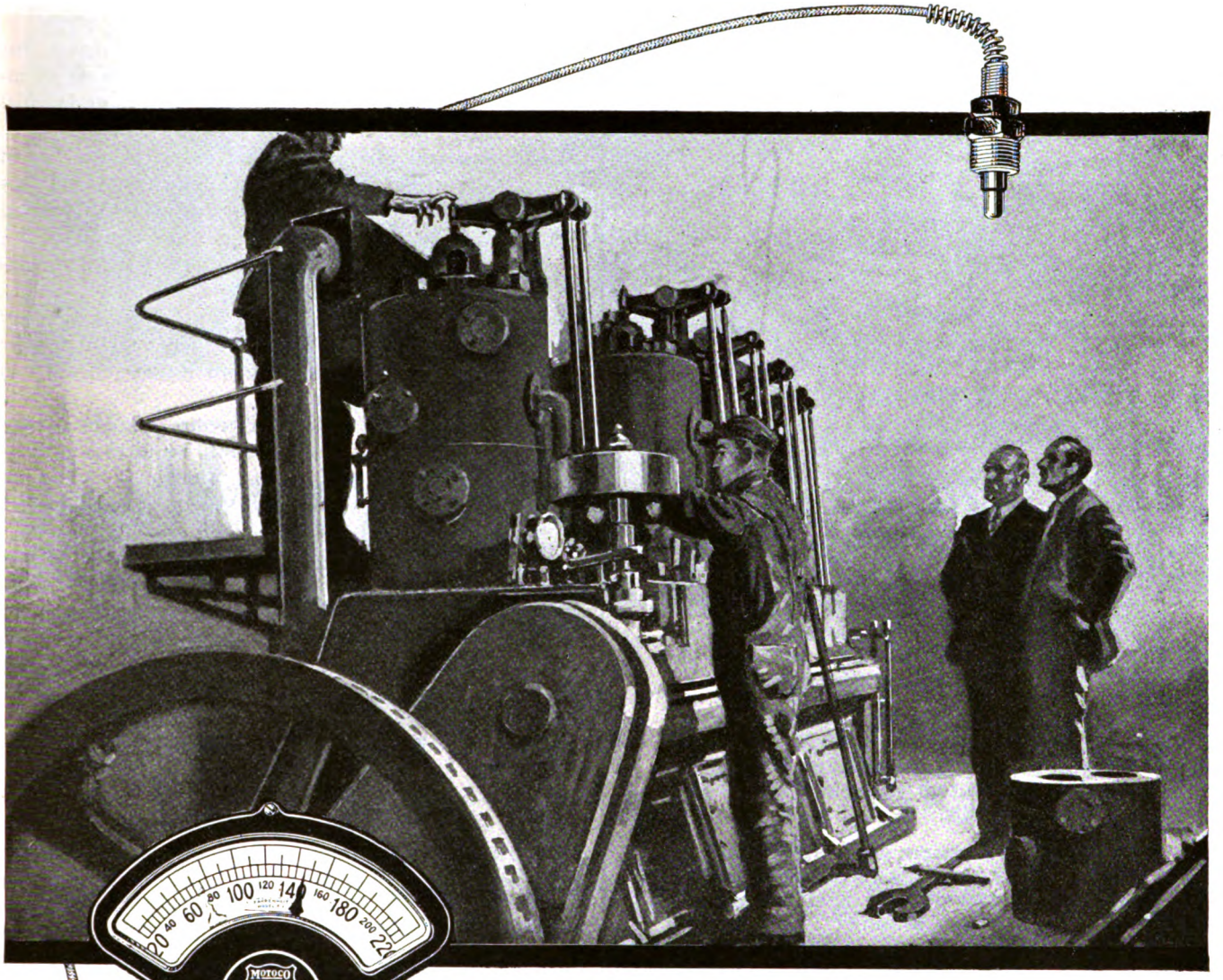


Fig. 20. Pulley clutches have been materially improved, in recent years. Here, again, the anti-friction bearing is highly desirable.

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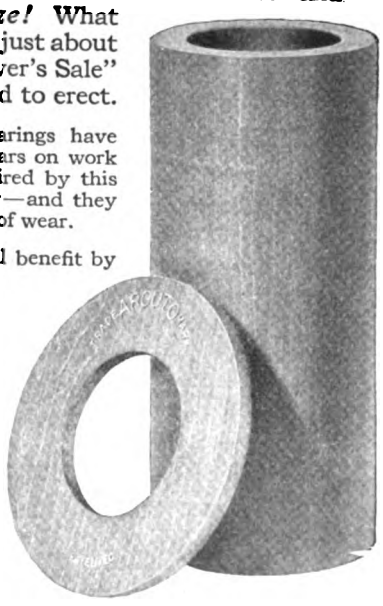
THE manufacturers of a nationally-known household appliance recently went into the hands of a receiver. Bankrupt for half a cent!

They built a good product—good in every respect but one. The bearings would not stand up, and literally thousands of machines were turned back to their distributors with a loud-voiced complaint and unpaid bills.

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field of service than individual drive. It is generally agreed by industrials who have had actual experience in the operation of both individual and group drive, that the latter is more economical from the standpoint of installation, maintenance, power consumption and initial cost.

Conditions will vary in different industries or even in different departments of the same industry, but it has been found that the size of a motor for group driving an average group of machinery is ordinarily from 20 to 25% of the total horsepower of motors needed for individually driving the same machinery.

The size of a motor for driving a group of machinery engaged in work of a jobbing nature may vary materially from that for driving the same machinery engaged in work of a routine character.

As individual drive requires a greater number of motors than group drive, it consequently requires a proportionately larger amount of wiring, starting apparatus and additional electrical equipment. Considering these and the additional labor required for installing an individually driven group, the cost ratio per installed horsepower will average about 4 to 1 in favor of group drive. Again, when considering the fact that the horsepower of a motor required for group drive is only 20 or 30½ of the total horsepower of motors for individually driving the same equipment, the cost ratio per installation will be about 10 to 1 in favor of group drive.

It may be surprising to know that the average maintenance cost of a 30 hp. induction motor used for group drive is not more than that of a small motor of say about 2 hp. used for an individual drive. While the repair parts of the larger motors are more expensive than those for the smaller motors, the latter requires much more frequent attention. Also, about 75% of this maintenance cost represents labor and not repair parts.

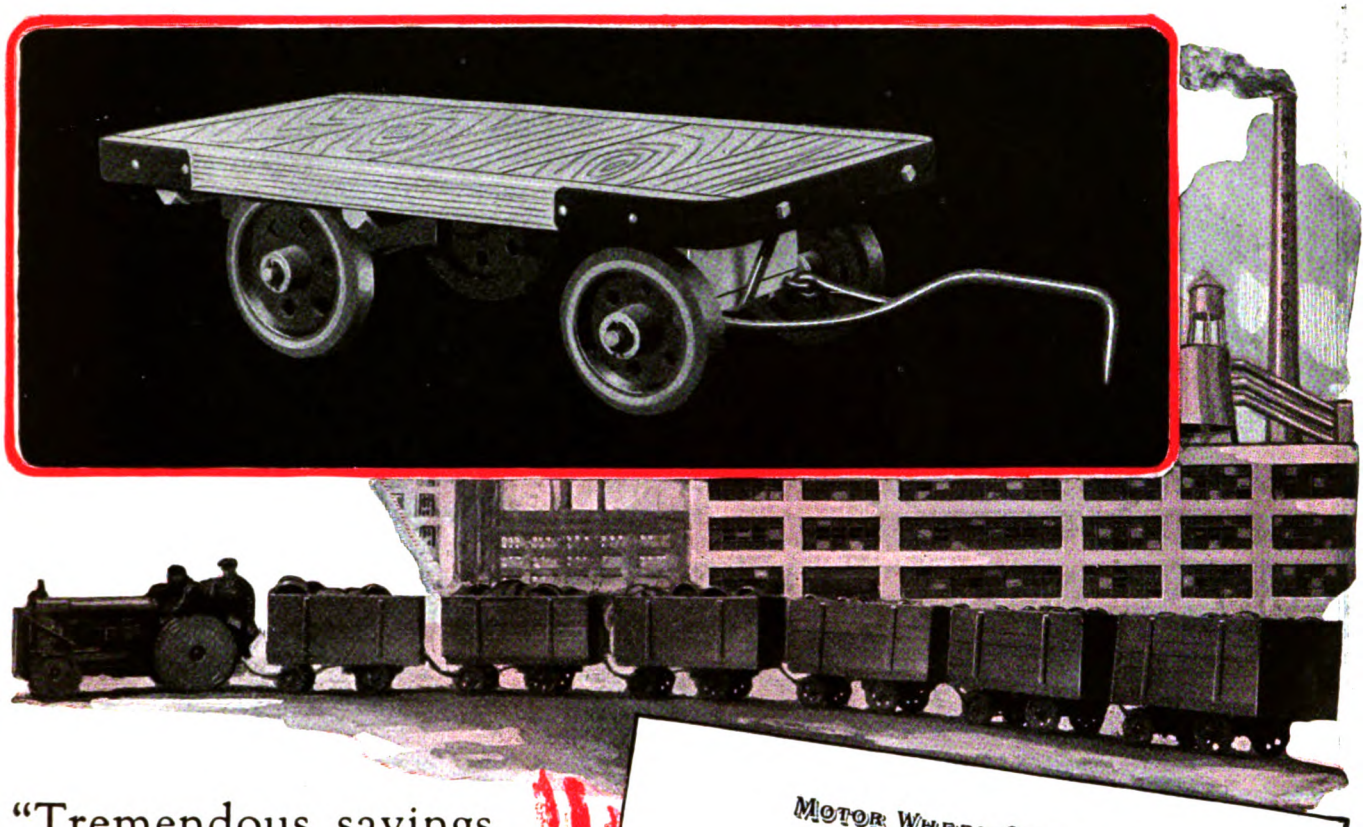
Belts are employed as power transmission mediums for most group drive installations, while either gears or chains are used for most individual drives. A belt acts as a shock absorber, relieving the motor of vibrations and shocks, whereas the chains or gears transmit them to the motor. This is especially hard on smaller motors of less rugged construction and is responsible to a large degree for the maintenance cost ratio of about 12 to 1 in favor of group drive. This ratio, of course, also covers the maintenance of the additional motors and starting apparatus made necessary by individual drive.

Another point in favor of group drive is that the cost ratio for routine inspection of motors and starters is about 10 to 1. This is true because the time required for inspecting a large motor is about the same as that for a small motor.

Slow speed motors are better adaptable to individual drive than high speed motors of equivalent horsepower. They are also more expensive as well as less efficient than high speed motors. The average efficiency of small motors as used for individual drive is about 75%, while that of the larger sizes as used for group drive is about 85%.

For the great majority of power applications, alternating current has replaced direct current. One of its chief advantages over direct current is that its potential can be raised or lowered more readily, enabling it to be transmitted greater distances and made suitable for various industrial applications at negligible losses and little cost. Also, alternating current motors and other appa-

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"Tremendous savings —small up-keep cost" typifies this sturdily constructed, easily handled trailer. It has a Michigan hardwood platform 3 ft. wide, 75 inches long and 20 inches to the top, with rounded corners bound with 4 x ¼ inch steel bars. Front wheels are 15″ in diameter with 3½″ face, rear wheels 18″ in diameter with 3″ face. They may be equipped with cast iron, cast steel or industrial rubber truck tire wheels. All with Hyatt roller bearings. Capacity 6,000 pounds, weight 685 pounds.

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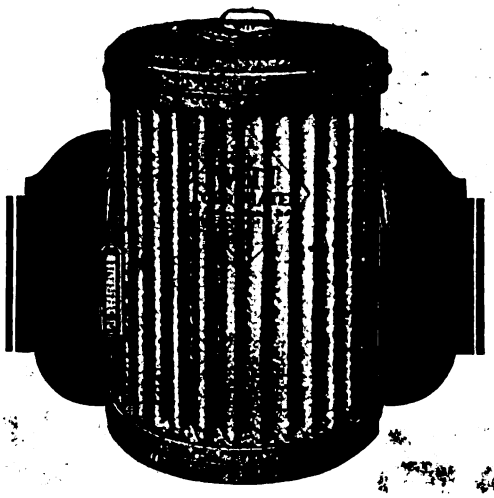
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ratus are simpler in their construction and are generally less expensive to manufacture, require less attention in operation and are in most cases more efficient.

One of the problems arising from the use of alternating current, which has caused considerable concern in industrial circles as well as in public utilities, is that of low power factor.

At unity power factor (1.00), which is the desirable condition, the current is in phase with the voltage or pressure. A lagging or low power factor means that the current is lagging behind the voltage, usually on account of the inductive or magnetizing loads of induction motors, transformers, etc. When the power factor is low the current carried in a circuit of a given load is higher than when the power factor is at unity. For example, with a power factor of 70% the amount of active current that can be carried in a circuit is only 70% of that which it would carry at unity power factor. The magnetizing current (frequently called wattless current) is reactive and lags 90 deg. behind the voltage. This reactive current has no useful purpose other than its magnetizing effect on inductive apparatus: on the other hand, it has an objectionable heating effect on the lines, transformers and switches. It lowers the capacity of these all along the line even back to and including the generators in the power station. Realizing this fact, most public utilities impose a penalty of a higher rate per kilowatt-hour upon their customers who fail to maintain a power factor above 70%.

If power factor is considered when planning an industrial power transmission system, the condition seldom becomes alarming. However, the usual case is that power factor is entirely disregarded at the time and little if any attention is given it until the condition has become so serious that the consumer begins to pay the higher rate per kilowatt-hour. It is then a matter of finding a remedy, whereas had the matter been considered and acted upon in the beginning, a preventative would likely have been less expensive and much more satisfactory generally.

Provisions which may be most economical for improving power factor in a plant where the conditions have become chronic may vary materially from the most economical means of preventing low power factor in a new plant. Skillful engineering should be had in either case.

The squirrel-cage induction motor is rightfully used most extensively for industrial drives because of its simple and rugged construction, high efficiency and low cost. Yet, it is chief among the contributing causes of low power factor. This is true because it requires almost the same amount of magnetizing current at no load as it does at full load.

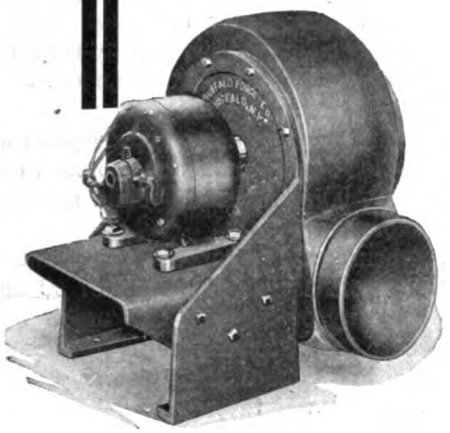
As a measure toward maintaining high power factor, induction motors should therefore be of such size that in operation they will be loaded to nearly their rated capacity at all times and never below 70% of full load.

Special conditions in industrial plants may require an unusually high ratio of starting torque. In such cases the required starting torque rather than the operating efficiency may be the governing factor in the selection of motors as to type and capacity. For such conditions it may be found that either a slip-ring induction motor having a form-wound rotor or a squirrel-cage motor with a special high resistance rotor would prove more adaptable.

By skillful engineering, motors can usually be selected

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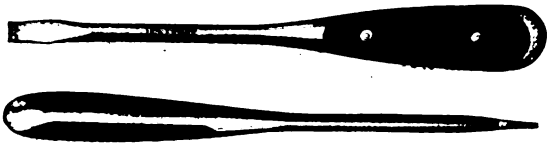
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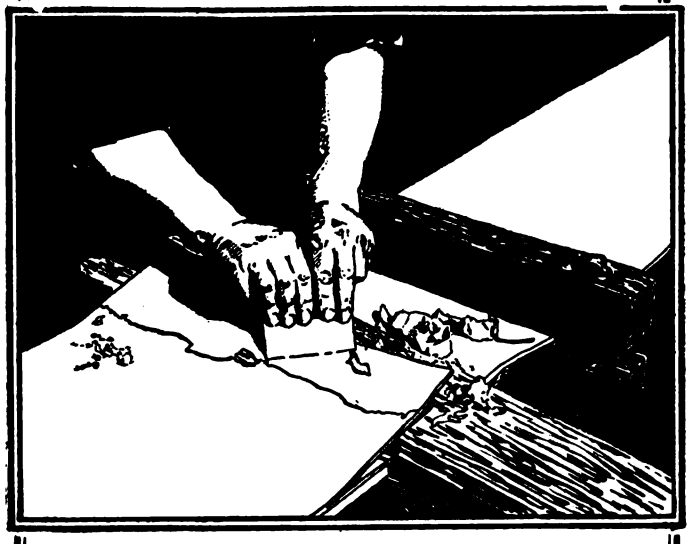
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for driving average groups of machine tools engaged in work of a routine character so that in operation they will average 90% full load. An average of 30% full load is exceedingly good in plants where individual drive is used.

This condition is responsible to a large degree for the difference in the average power factor of about 48% in plants where the equipment is individually driven, and about 80% in plants where the equipment is group driven.

In addition to such power factor improvement as can be effected by the loading of induction motors to nearly their rated capacity, it is frequently found necessary to make additional correction.

The use of synchronous motors is recommended for all loads requiring constant speed motors of 50 hp. and over. In the majority of cases, if this use is adopted as standard practice in new plants and if good engineering is used in the location of such motors, no trouble will be had from low power factor.

The objections heretofore offered against the use of synchronous motors on account of their more or less intricate operation has been almost entirely done away with. The starting equipment has been so simplified that it is now no more complicated than that of an induction motor.

The price of synchronous motors is higher than that of induction motors and for that reason in the majority of cases requiring less than 40 hp., they are not generally considered. For applications requiring motors with speeds of from 100 to 400 r.p.m., however, this type compares favorably with other motors regardless of the problem of power factor.

In industries where power factor improvement is desired but motors of 50 hp. or over cannot be used to advantage, there are these two alternatives: Use must be made of either static or synchronous condensers.

While the static condenser is a comparatively recent development, it has won favor over the latter in many instances. Its use is found more economical than that of the synchronous condenser in all cases up to 500 kv-a. capacity. There may be other cases requiring condensers of even 1,000 kv-a. capacity where this type would prove more economical, but usually synchronous condensers should be considered for all applications where capacities of over 1,000 kv-a. are involved.

Static condensers are economical in operation. They have no revolving parts and require no attention other than possibly the operation of a switch at the beginning and the end of the day. They can be installed on comparatively light structures, either overhead, on the side of a wall, or any out-of-the-way place not needed for any other purpose. They can be used to advantage in small units with individual motors, often enabling the use of smaller conductors than could otherwise be used.

Some of the principal advantages of the synchronous condenser are: that it has a tendency to stabilize voltage; with the use of a voltage regulator it will maintain a constant voltage at any desired point. With it the leading reactive kv-a. can be easily adjusted.

The degree of efficiency with which either an individual or a group drive system can be operated depends materially upon the skill with which it is engineered. This does not mean merely the proper loading of motors—it includes the selection of types and speeds best adaptable to each application. It also includes the proper placing

(*Continued on page 66*)

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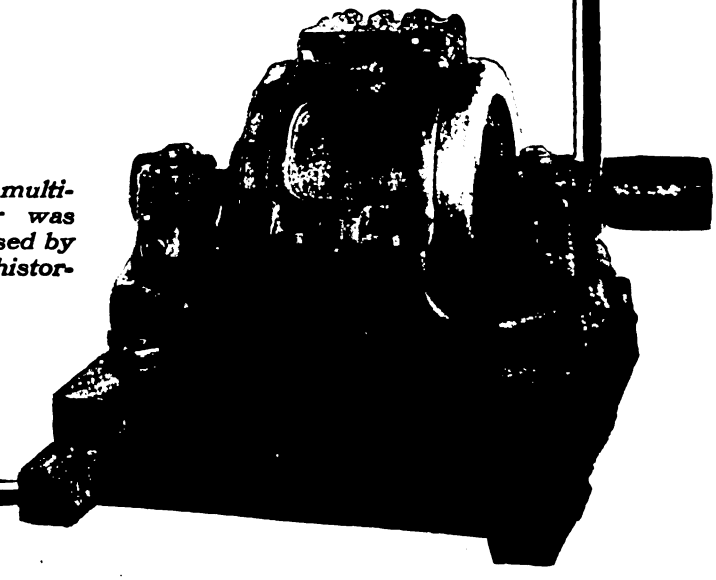
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In June 1925 this veteran multi-phase induction motor was retired from duty to be used by General Electric as an historical exhibit.

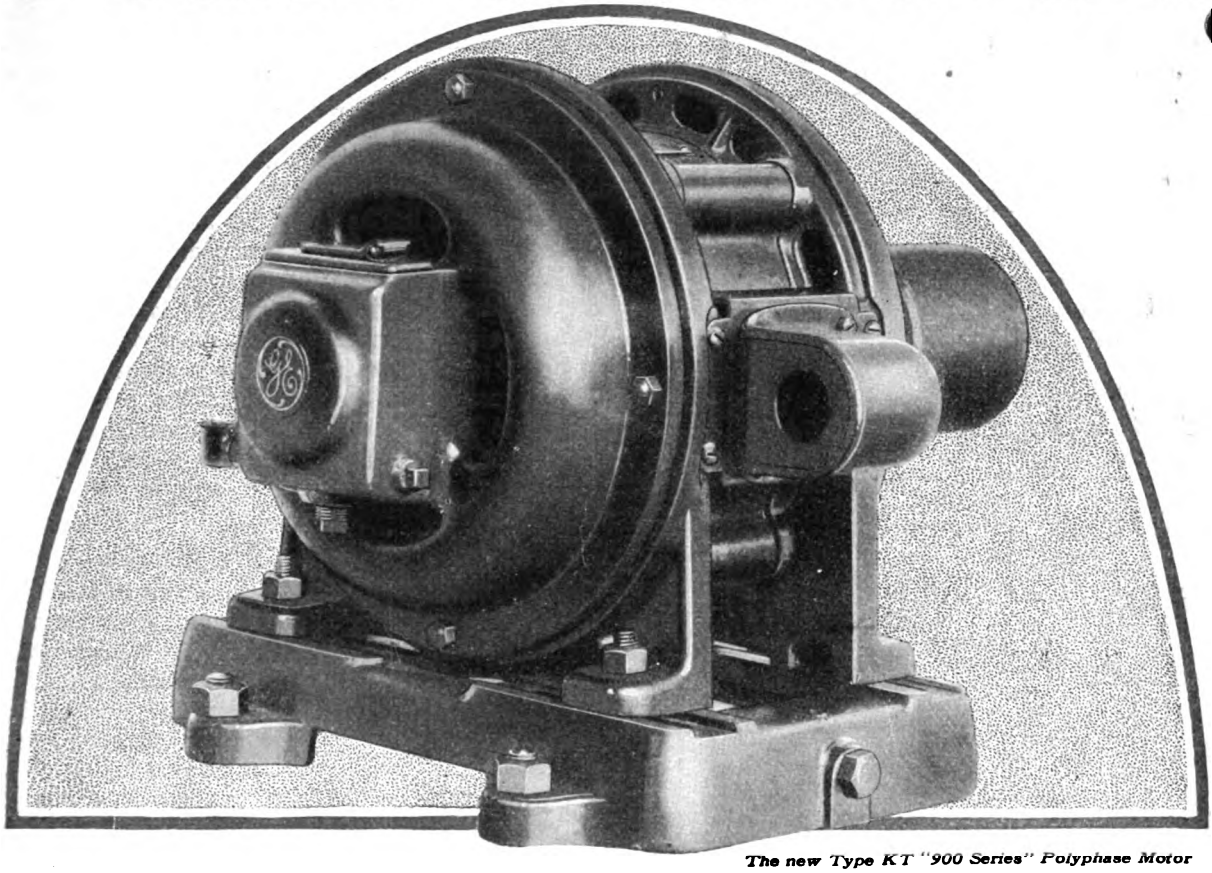
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(*Continued from page 62*)

of synchronous motors or other power factor improvement apparatus, and the selection and arrangement of all materials that go to make up a group drive system.

Standardization of Motors

Let us consider some of the most important items of material and their characteristics, bearing in mind the economic value of standardization, for its importance cannot be overemphasized.

In selecting motors it is always advisable to decide upon one good make of reputable manufacture and adopt it as standard and use as few types and sizes of motors as is practicable. This allows interchangeability and requires a smaller number of "spares" and repair parts. Where strict standardization of motors has been followed as to make, sizes and speeds, the number of spares that are required in a group driven plant is about 8% of the number in service, while where individual drive is used from 10% to 15% of the number in service is needed.

Where standardization has not been strictly followed, the number of spares may be as high as 60% of the number in service.

Motor Bearings and Lubrication

A large percentage of motor trouble can be attributed to the ordinary type ring oiling bearings, which, strange to say, are still used most extensively. A careless workman in filling the motor bearings will usually spill oil or overflow the bearings. This oil is frequently drawn into the motor and the windings become soaked, after which dust collects. This dust works its way into the slots as well as preventing free air circulation around the windings. As a result, the motor soon burns out.

Again, when the motor bearings become worn, as they do especially on gear or chain drives or where subjected to abrasive dust conditions, the rotor becomes off-center and causes heating. The rotor may even drag on the armature laminations, in which case the motor almost invariably burns out.

For these reasons I am a strong advocate of ball or roller bearing motors. The additional cost is certainly justified when considering the savings to be effected in maintenance. Especially would I recommend them in the smaller sizes used for individual drive and for any gear or chain drive applications. Lubrication three or four times a year is usually enough for anti-friction bearings, while the ordinary ring oiling types require more than this amount in a month.

The use of anti-friction bearings is of equal advantage for line shafting, countershafting and loose pulleys.

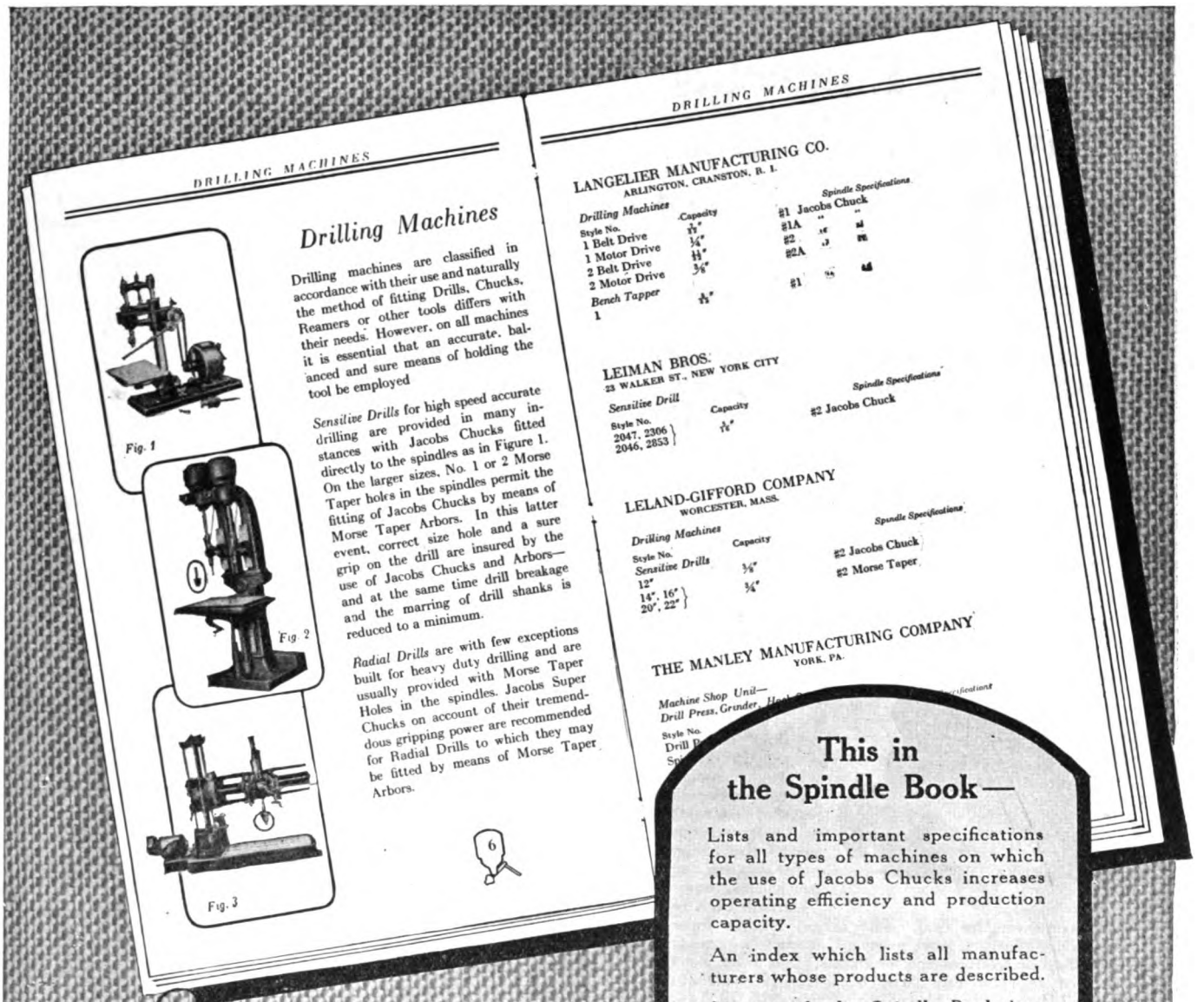
A considerable amount of the maintenance cost of a group drive system is attributable to the bearing failures in the loose pulleys of countershafts. A contributing cause is the over-tensioning of belts, which invariably takes place where too narrow or too light a belt is used. This over-tensioning also increases the frictional losses enormously, resulting in higher power bills.

If manufacturers of machinery could see how much trouble and expense the users of their product are put to by the apparent lack of interest in the design of a loose pulley, they would no doubt take immediate action to remedy the situation once and for all.

The Importance of Belt Selection

Belts constitute between 50 and 75% of the continuous total investment of a group drive system. A careful

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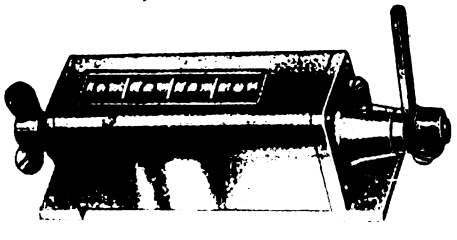
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analysis of each drive should therefore be made before specifying for it a belt of a certain material, width, ply, etc. In practice, much that should be obtained from belts is neutralized and lost by their careless selection. There is hardly a good belt on the market but which will operate more economically under some particular condition than any other belt. So it is up to the users to specify the right one for each drive. A belt is to a drive as a safety valve is to a boiler or as a fuse is to an electric circuit. If a belt driven machine should become stuck or jammed, as they frequently do, the belt will slip and probably avoid a serious breakdown, whereas with a gear or chain drive something is bound to break.

The Matter of Pulleys

It is frequently desired to make very accurate adjustments in the speed of almost any kind of machine. Such adjustments can quickly and easily be made at little expense on a belted drive by changing the pulley ratio and adjusting the length of the belt. Whereas on gear or chain drives, speed changes are more expensive and require much more time. Also such changes as can be made by applying a gear or sprocket having one more or one less teeth than the original, may be more than is desired.

Let me suggest right here, however, that so far as possible, all standard motors used on belt drives be equipped with standard size pulleys of liberal face. Such speed changes as may be desired should then, where practicable, be taken care of by changing the size of the driven pulleys.

In emergencies, this practice offers many advantages. It allows the quick interchangeability of motors. For example, one spare motor may be carried for a dozen in service. Where this spare is equipped with a standard size pulley, any delay that might otherwise be required in changing pulleys is avoided.

When machinery manufacturers design their equipment for peripheral pulley speeds of from 3,000 to 4,000 ft. per minute, which are the most efficient belt speeds, the cost of belts and pulleys can be cut in two. This is a good thought to have in mind for there are many opportunities in shops and factories of effecting economies in this line.

By the use of idler pulleys to increase the arc of belt contact, short center drives are made possible. This sort of drive conserves floor space and permits the use of shorter and narrower belts. It saves bearing friction because of reduced bearing pressure. It also permits the use of high pulley ratios up to 1:5, which is common.

When a machine using this type of drive is not in operation the belt tension is slack. This prolongs the life of the belt.

Wide single ply belts should be used in preference to narrow doubles where conditions will permit. This is especially true in cases where small pulleys are used. Worth while economies can be effected by applying this thought in most any factory or shop.

The design and construction of pulley clutches have been improved materially in recent years. Their present state of development permits them to be safely placed on a line shafting for driving machinery in groups, thus eliminating the use of countershafts. Their friction parts can now be changed without removing them from the shafting. Most failures heretofore in clutches were confined to the bearings. Such failures usually necessi-

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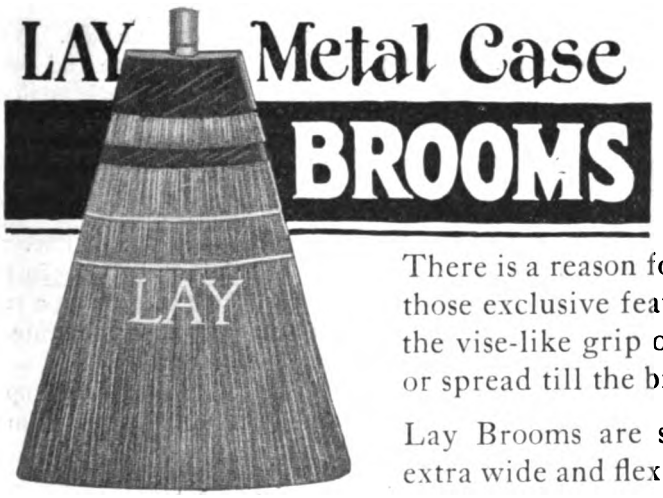
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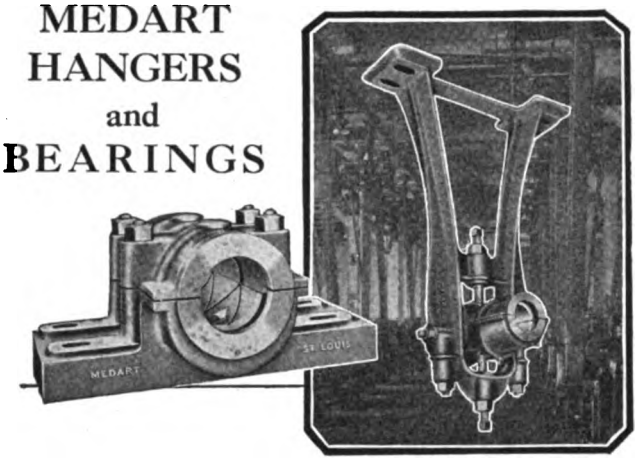
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MEDART
Everything in Line Shafting Equipment

tated the removal of the line shaft from its bearings in order to take off the damaged clutch for repairs. For line shaft use I would recommend no clutch other than those having ball or roller bearings, for these can be filled with grease twice a year and will render uninterrupted service.

Don't Neglect the Shafting

Among the least expensive items of a power transmission system is the shafting. Shafting to be used for this purpose should be purchased, handled and installed with extreme care. When ordering shafting it is good practice to specify the purpose for which it is to be used, and that it should be perfectly straight. It is also well to have it crated for shipment to avoid its becoming bent in handling.

Belt shafting cannot be expected to run true, and it is hard to straighten when once bent. In operation, bent shafting consumes more power, is hard on bearings, causes vibration which is frequently transmitted through the belts to the machines and is often responsible for turning out a low quality of work. In operation it fatigues itself and the hangers or structure by which it is supported, and it also embodies a hazard endangering the lives of those near it.

I have found that it always pays to purchase a commercial group shafting for line shaft duty; not only because of its more uniform size, but also that it is usually handled with greater care than the ordinary cold-drawn steel shafting and is therefore usually obtainable in straight lengths. The cost of such shafting is less than might be supposed.

Faulty workmanship in installing and lining up shafting is frequently responsible for its running out of true. Couplings that are not pulled up evenly are a common fault.

A frequent source of error in lining up shafting, after it is once in the hangers, is to stretch a string parallel with and on about the same horizontal plane with the shafting at a distance of 6 ins. or so from one side. With this distance accurately established at the two end bearings, an effort is then made to adjust the horizontal set screws supporting all of the remaining bearings, so as to bring all points on the shaft to the same distance from the line—this distance usually being measured with a rule.

The reason that this is improper is that the line, regardless of how tightly it may be drawn, will sag in the center from its own weight. Readings taken with a rule under such conditions are seldom sufficiently accurate to insure a true running shaft.

While there are several accurate ways of lining up a shaft, one of the simplest and best ways is to use a small size piano wire and a good plumb bob.

Truing-Up the Shaft

First, the shaft should be leveled with a spirit level and the two end bearings securely located in the center of the hanger frames by adjusting the set screws for that purpose. This being done, a small size piano wire should be placed plumb with one side of the shaft at the two ends by hanging the plumb bob line over the shaft at these two points. The position of the piano wire thus accurately established with relation to the shafting, it should be securely fastened to avoid the possibility of its shifting.

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No matter where you are located, there is a mill supply dealer within a few miles who can deliver from stock any one of 26 different models.

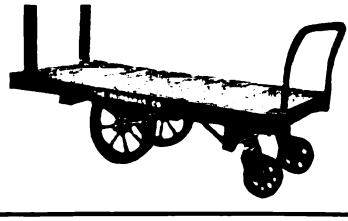
Just keep in mind in ordering factory trucks that *the best will always be made of wood—steel-bound,* and that "best" can be delivered at your door the same day you telephone.

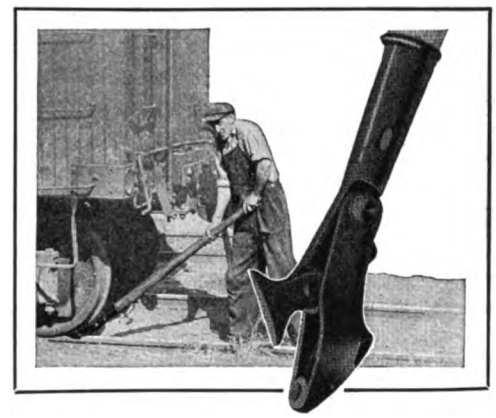
Order by number from our truck catalog.

THE FAIRBANKS COMPANY

Broome and Lafayette Sts., New York, N. Y.

Fairbanks





SPOT CARS THIS WAY

One man can spot loaded or empty cars quickly and easily with a New Badger Car Mover. Your crew wastes no time in waiting for the switch engine to move cars to and from the docks. Work continues with but little delay. A New Badger will pay for itself in a short time through time thus saved. Order from your jobber.

THE ADVANCE CAR MOVER CO.

934 E. John Street

APPLETON, WISCONSIN

NEW BADGER

SLIP-PROOF CAR MOVERS

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Which of these advantages interest you?

PERHAPS one of the instances of savings cited below is right in line with your work. And just as it PAYS more than 18,000 concerns in over 300 different industries to use Oakite materials and methods, so too, have you the reasonable assurance that with them YOU can benefit through some saving in time, money or labor, or other worth while accomplishment that comes with their use.



One big railroad has cut its paint stripping cost on tenders more than 25%—at no expense of quality.



An ice-cream can manufacturer who formerly experienced trouble in removing a sludge of metallic deposit from his cans before tinning, tells us that with Oakite methods "—we are now getting satisfactory results all along the line."



In removing an exceptionally adherent film from their equipment, a good sized dairy now uses 60 pounds of Oakite and gets quicker and better work than formerly with 300 pounds of their old cleaner. Hand scrubbing is entirely done away with.



A western oil company with Oakite methods cleaned an 80,000 barrel oil tank so clean that the gasoline, with which the tank was refilled, showed no discoloration after several months storage.



Four weeks is a fair average service for any good paper making machine felt. But in a certain mill, a felt cleaned the Oakite way lasted six weeks, in all, 2,000,000 lbs. of paper passed over it.



A power laundry owner says that since using Oakite, his business has increased more than 10% due to the higher quality of work he was able to produce with it.

We would be pleased to have you tell us about your cleaning work. Surely we can help you, as we have so many others.

Oakite Service Men, cleaning specialists, are located at

Albany, Allentown, Pa., *Atlanta, Ga., Baltimore, *Boston, Bridgeport, *Brooklyn, Buffalo, Camden, Charlotte, N. C., *Chicago, *Cincinnati, *Cleveland, *Columbus, O., *Dallas, *Davenport, *Dayton, *Denver, *Des Moines, *Detroit, Erie, Flint, Mich., *Grand Rapids, Harrisburg, Hartford, *Indianapolis, Jacksonville, Fla., *Kansas City, Los Angeles, Louisville, Ky., *Milwaukee, *Minneapolis, *Montreal, Newark, Newburgh, N. Y., New Haven, *New York, *Oakland, Cal., Philadelphia, *Pittsburgh, Portland, Me., *Portland, Ore., Providence, Reading, *Rochester, Rockford, Rock Island, *San Francisco, *Seattle, *St. Louis, Springfield, Ill., Syracuse, *Toledo, *Toronto, *Tulsa, Okla., Utica, *Vancouver, B. C., Williamsport, Pa., Worcester.

**Stocks of Oakite Materials are carried in these cities.*

OAKITE

TRADE MARK REG U.S. PAT. OFF.

Industrial Cleaning Materials and Methods

OAKITE IS MANUFACTURED BY OAKITE PRODUCTS, INC.

formerly OAKLEY CHEMICAL CO. 40A THAMES ST., NEW YORK, N.Y.

While this wire, like the line, will sag in the center from its own weight, regardless of how taut it is pulled, all points of its entire length are in the same vertical plane. By the use of a high grade plumb bob, each point of the shaft can be easily and accurately adjusted to the same vertical plane. It is always advisable to recheck for both horizontal and vertical misalignment, as making adjustments at one point almost invariably throws the shaft out of alignment at another point.

In planning a group drive system for a manufacturing plant, a careful analysis of the probable production requirements for the various periods of the year should be made. As most manufacturing establishments have their annual rush and slack seasons, the motors for driving the groups of equipment are of sufficient capacity to meet the peak requirements; while during the slack seasons, when only a portion of the equipment is in operation, these motors are only partially loaded and are therefore operating inefficiently. By planning the transmission system with this thought in mind, a considerable saving can be effected.

Where practicable, the line shafting of the various groups should be arranged in a straight line and all driven at the same standard speed. This speed depends upon the character of the equipment to be driven, keeping in mind the most efficient belt speed as well as pulley sizes.

The distance between the shafting of one group and the one following should not exceed ¼ in. On the end of one or the other shafts at this point, a spare coupling should be carried.

An advantage of this arrangement is that in case the power requirements at a slack season are such that one motor of any one of the groups in the line can be eliminated temporarily, the load can be shifted to the remaining motors by coupling up the shafting at any desired point and uncoupling it at any other point or points.

The belts of the motor and the machines being taken out of service temporarily should be removed from the line shaft pulleys. If the motor belt is made endless, it should be rolled up loosely and supported in order to avoid its contact with the revolving shaft or pulleys.

Arrangement of the building in which line shafting is to be installed should be considered in the selection of shafting as to sectional lengths. For example, it is seldom necessary to install a pulley on a line shaft directly opposite or in line with a building column or post. It is therefore, in the majority of cases, advisable to procure shafting in lengths equal to the distance from center to center of the columns and install it so as to place the couplings in line with the columns.

Standardize on Shaft Sizes

Standardization of shafting is important, as it makes possible the interchangeability of bearings, collars, couplings, pulleys, etc., and therefore requires a smaller stock of spare parts at a relatively small investment.

Three sizes of shafting are usually sufficient for even the largest of manufacturing plants. These sizes may vary in different industries, but for the average machine tool service 2 11/16 ins. are sufficient for most line shaft requirements, while 1 15/16 and 1 7/16 ins. will answer for most counter and jack shaft service. Of course, it may be necessary to carry a few other sizes in stock as

(*Continued on page 76*)

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Detail—

BIG accomplishments are bulwarked by small things.

It's the quality in small things that make the big things possible.

The CLEVELAND TWIST DRILL COMPANY
CLEVELAND
NEW YORK-CHICAGO-LONDON

TRADE MARK REG. U. S PAT OFF AND FOREIGN COUNTRIES

TRADE MARK REG. U.S PAT. OFF.

Manufacturers of Carbon and Cle-Forge High Speed Drills for every purpose; "Mezzo" Super-Carbon Drills; Hand, Jobbers' and Shell Reamers; "Peerless" High Speed Reamers; "Paradox" Adjustable Reamers; "Quick-Set" Reamers; "Spirex" Machine Taper Pin Reamers; Chucking Reamers for Turret Lathes; Counterbores; Countersinks; Sockets; End Mills; and the "Ezy-Out" Screw Extractor.

TRADE MARK REG. U.S PAT. OFF.

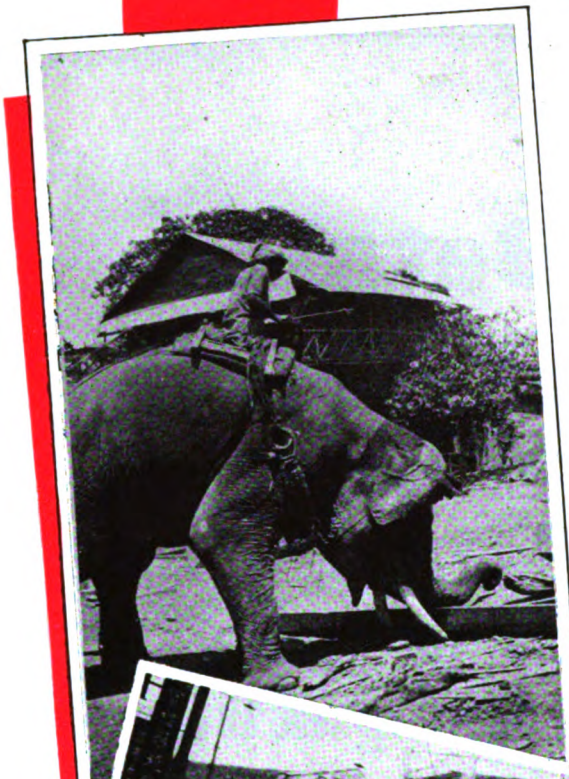
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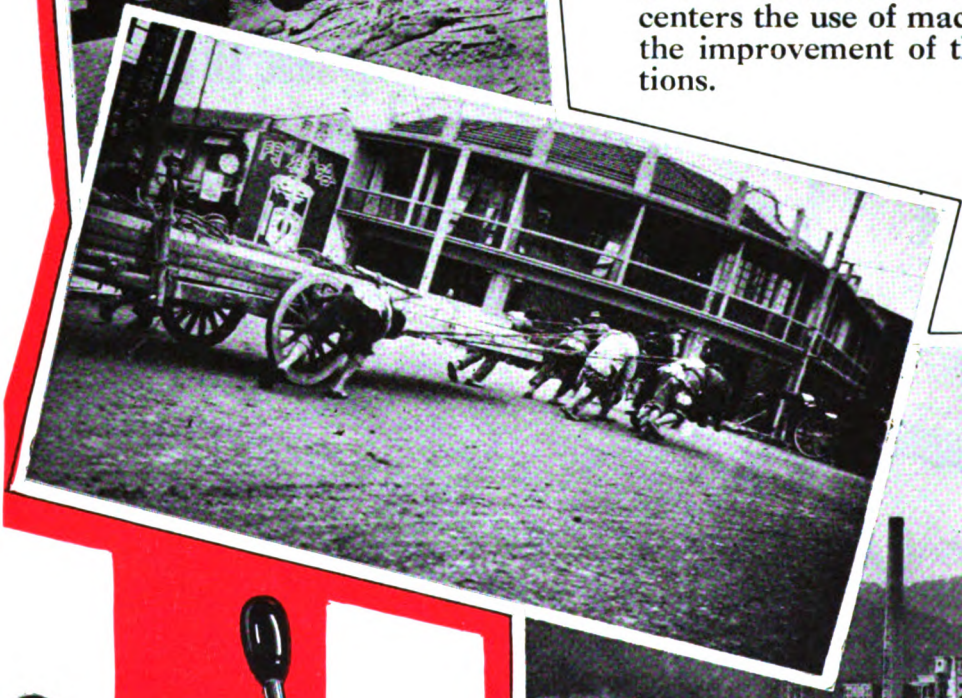
WORK~

In these days of mechanical achievement it is interesting to note that in many sections of the world the most primitive methods of industrial accomplishment are still in vogue.

With the exception of certain parts of the Orient, where manufacturing conditions are as far advanced as any in the world, primitive methods of doing all kinds of work are employed East of Suez. Not until these crude methods are contrasted with our own advanced ways can we realize the great improvement that has been made in just plain work.

Lack of adequate machinery and the use of manual labor keep workers in that part of the world on a low wage and living scale, whereas in the United States and other large production centers the use of machinery ever tends toward the improvement of the worker and his conditions.



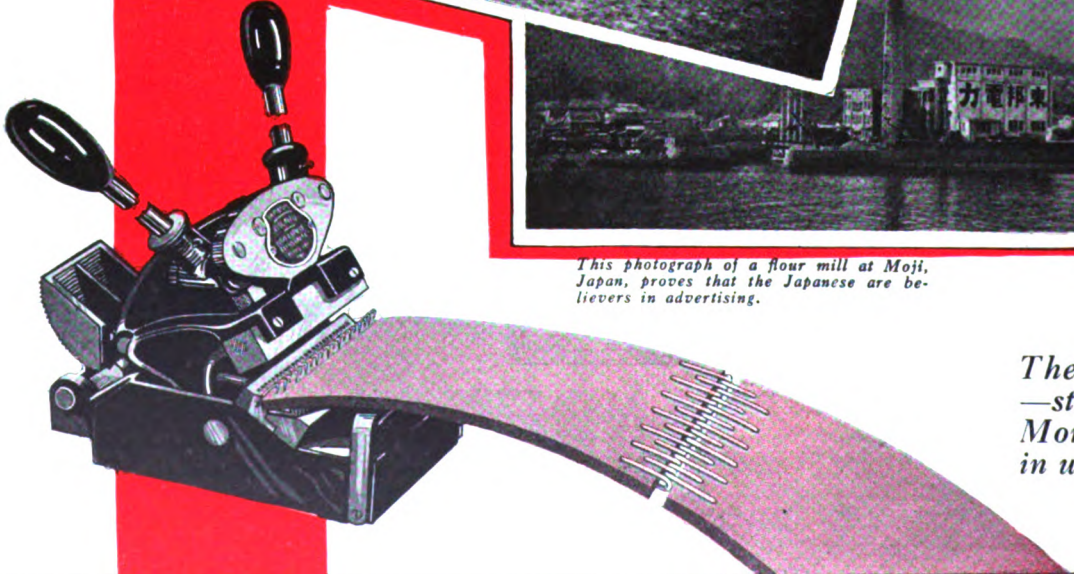


Upper left—A work elephant in Rangoon, India, moving timber. His tusks are forced under the timber while his trunk goes over it, securely holding it.

Left—A load of timber on two wheels being moved through the streets of Shanghai, China. One man with a tractor could do the job very well.



This photograph of a flour mill at Moji, Japan, proves that the Japanese are believers in advertising.



The Clipper Belt Lacer —standard of the world. More than 225,000 now in use.

For products not advertised in this issue write Industry Illustrated

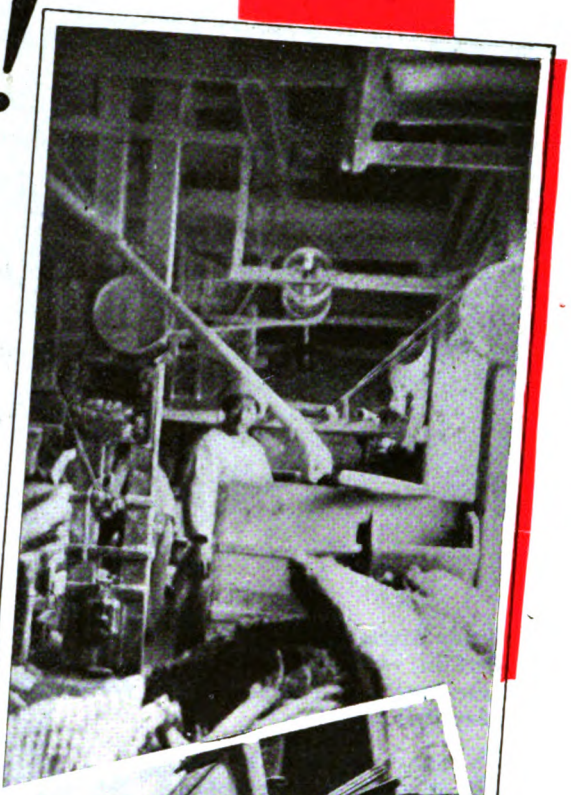
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east of Suez!

While manual labor still predominates in many parts of the world, machinery is found in the advanced sections, often determining the degree of civilization. Wherever we find machinery we generally find belting and wherever we find belting we almost invariably find a *Clipper* machine like the one below. This machine embeds belt hooks into each end of a belt so that when the *Clipper Pin* is inserted the belt ends are flexibly and securely joined.

Clipper Lacers may be found in far off Java. They may be found in many other far away places, where they insert the thousands of hooks that are exported daily from this country expressly for these machines. It goes without saying that enormous quantities of *Clipper Belt Hooks* are used in this country, daily shipments often exceeding four millions.

Clipper Belt Lacer Company
GRAND RAPIDS MICHIGAN



Upper right—The interior of a grist mill at Seoul, Korea. A slight resemblance to a modern factory.

Right—A nice job for a warm day. A man carrying hay in Buitenzorg, Island of Java.



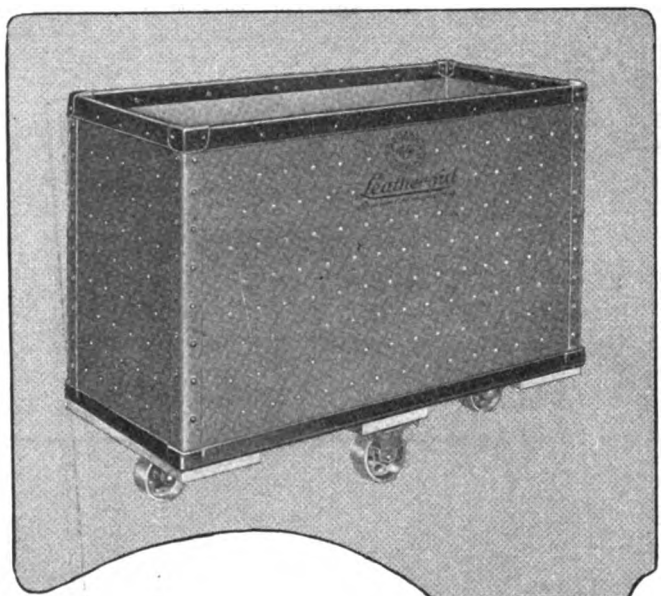


A saw mill at Iamaichi, Japan.

QUALITY Clipper BELT LACING

Clipper

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A trade mark name acquires a certain reputation earned by the merits of the product it identifies.

With many people a known trade mark is an accepted assurance of value. For many years the name Leatheroid has identified a line of receptacles — trucks, cans, boxes and barrels—and is today an acknowledged standard in material, construction and serviceability.

We might use many words and say no more than simply this—Leatheroid receptacles are honest value.

SEND FOR CATALOG OF

Leatheroid Line

ROGERS FIBRE CO.

121 Beach Street, Boston
78 Fifth Avenue, New York
1024 Filbert St., Philadelphia
326 So. Church St., Charlotte, N. C.

(*Continued from page 72*)

repairs, as the machine tool manufacturers have not yet standardized on shafting sizes.

Before adopting shaft sizes as standard, however, it is advisable to consult your mill supply dealer to determine what sizes, as well as pulleys, bearings, couplings, collars, etc., are carried in his stock. This is important, as emergency breakdowns may at any time require that any one of these items be picked up on short notice.

The direction of rotation of a line shaft should be such as to allow the use of the greatest number of open belts. Crossed drives consume more power than open drives and are harder generally on belts.

Where possible, a motor for driving a group of machinery should be located so as to have the bottom strand of the main drive belt in tension. This makes possible a greater arc of belt contact than where the top strand is in tension.

Power for driving a group of machinery should be applied to the line shaft at the load center. This may be three feet from the end of the shaft or it may be in the exact center. This is especially important where shafting is loaded to nearly its capacity. Also in locating the motor, an effort should be made to allow free access, enabling it to be changed in the shortest possible time. Where motors are installed overhead, as is most frequently the case, the floor space below should for this reason be left clear.

Ability to change a motor quickly is of vital importance, especially in plants where the progressive system of production is used. Here, the shutdown of a single machine may stop the flow of material through the entire department and thereby incur considerable expense.

Maintenance Equipment

In large plants it pays to have in the storeroom of the maintenance department a hand truck containing all equipment necessary for changing motors. This equipment should ordinarily consist of two ½-ton high speed chain hoists, two small sets of rope blocks, a ½-in. by 25-ft. hand line, four strong rope or cable slings, two pinch-bars, one large and one small pulley or gear puller, an electric light extension cord, one large and one small screw driver and two wrenches of each size that might be required.

This equipment should be sufficient for handling most conditions. With it, two well trained men should be able to change a large motor supported from the ceiling in a surprisingly short time.

In plants where ladders are not available in every department it may be well to add this item to the list of equipment. Special conditions may necessitate additional or less equipment, but there is hardly a piece of apparatus in a large factory that pays higher dividends than a completely equipped emergency cart of this kind. The importance of its completeness should be borne in mind as a single trip back to the department for an additional tool may cost in delayed operations more than the entire cart and its contents.

All the points brought out in this article have direct bearing upon factory overhead. To some they may appear to be of minor importance, especially during periods of prosperity. But there comes a time in most every industry when its entire overhead must be absorbed by a comparatively small production.

During such periods the dividing line between profit

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Which Window Cleaner Should You Use?



Avail Yourself of this new Service!

This New CHART Tells You

A number of different cleaners may be effective in cleaning your windows, but one certain cleaner will be at once the *most effective,* most *economical* and *satisfactory.* Our research laboratory has covered every conceivable plant condition; and from exhaustive tests over a period of years, we have developed a chart that shows you at a glance the ideal window cleaner formula for you to use. If in doubt as to kind of deposit send us details or sample of your glass and we will advise. Owners, superintendents and managers are finding this new cleaning chart a valuable aid in determining which cleaner is best suited to the needs of their plants. Sent to you gratis on return of coupon below.

THE GERSON-STEWART CORPORATION

3541 E. 76th Street, Cleveland, Ohio

We manufacture a complete line of cleaners and disinfectants for industrial use—covering every requirement of your plant. Write for information, samples and prices.

Free Trial Offer

SUNBURST Cleaner, liquid or paste, sent in barrel, half or quarter barrel lots on the following unqualified guarantee—use enough to satisfy yourself of its superiority. If it does not perfectly satisfy you, return unused portion collect and we'll cancel the entire invoice.

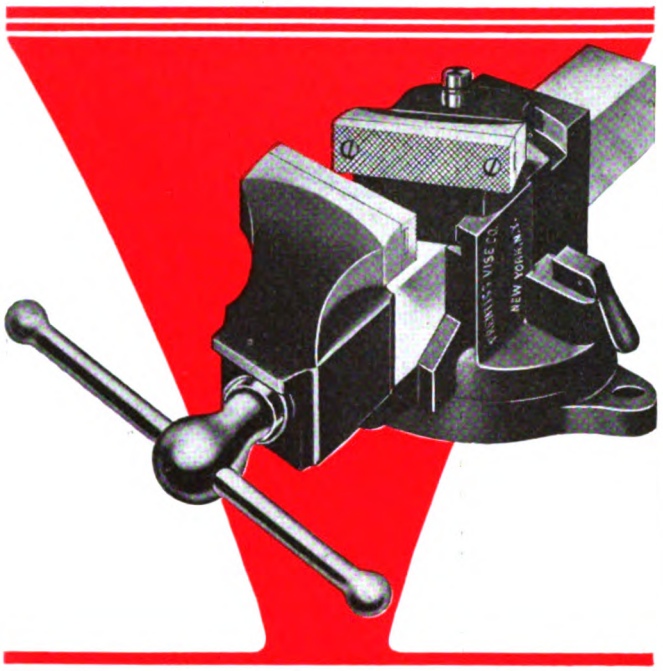
Send us copy of G-S Chart

Company .....

Individual .....

Address .....

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Men are strong for a Prentiss

A PRENTISS VISE is a sure hit with men who need tools that will stand up under hard work—and lots of it.

The castellated collar fastening on a Prentiss—an exclusive feature eliminating the old set screw arrangement—keeps the front jaw firmly in place; the press-forged lever and press-forged head on the screw, as well as every other part of a Prentiss Vise, are specially designed to resist the wear and tear that's bound to accompany real work.

For over half a century men have stood by the Prentiss Vise just as the Prentiss has stood by them in many a tight place.

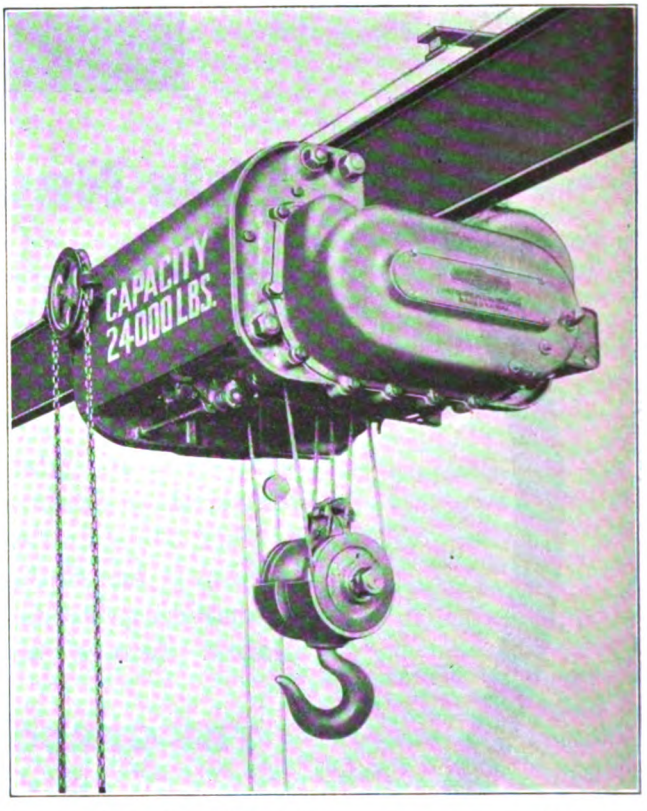
PRENTISS VISES 160
PRENTISS
106-110 LAFAYETTE ST. NEW YORK CITY
VISE CO.
CHENEY HAMMERS

and loss may depend directly upon the steps taken toward efficient operation during periods of prosperity. The problems of power transmission should, therefore, be carefully considered in every industry and acted upon far enough in advance to secure the maximum of operating economy.

Six New LO-HED Electric Hoists

SIX new electrical monorail hoists, ranging in capacities from three to twelve tons, are announced by the American Engineering Company, of Philadelphia, as additions to its line of LO-HED hoists. Each of the new hoists is made in types for bolt suspension, hand geared trolley, motor trolley and cab control. Open cabs are provided for indoor use and closed cabs for outdoor service. The hoists can also be supplied with Y push-button control or remote control. Foundry-type control is provided when desired.

These hoists, which are designated as "Class J, LO-HED" electric hoists, embody the same principles of design that characterize the other models of LO-HED

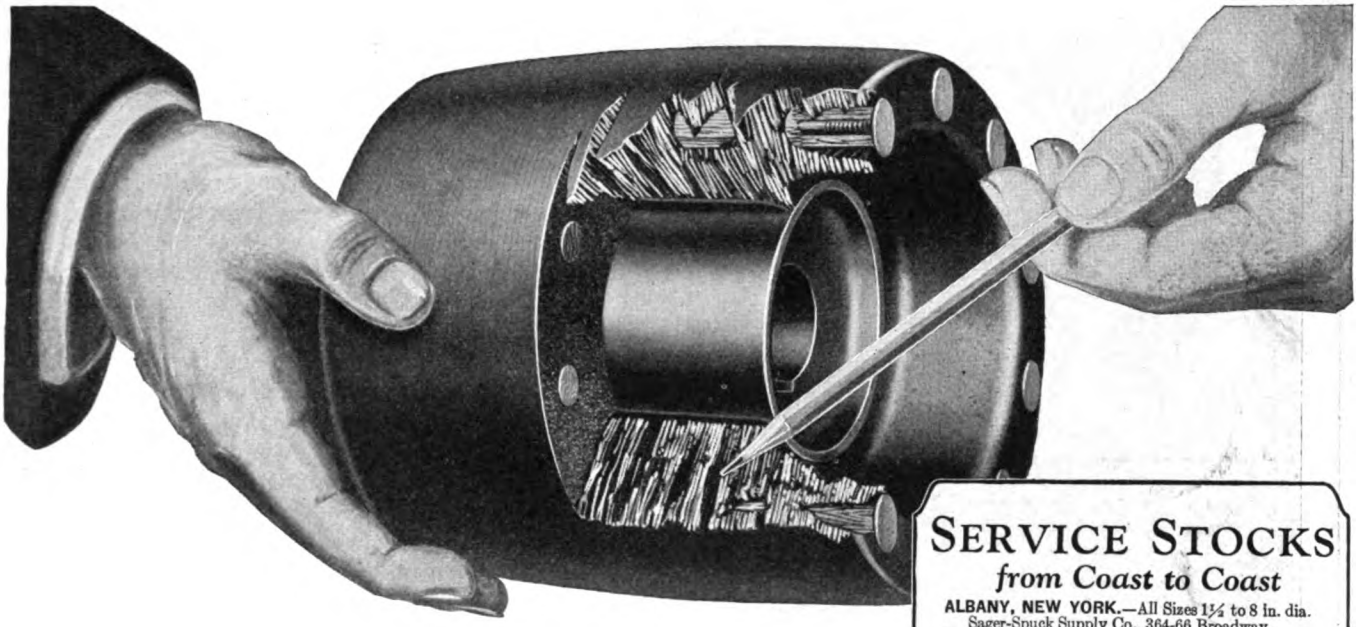


hoists, with such additional features as are made necessary by the higher speeds at which they operate and the heavier loads they are designed to handle. Rated capacities are 3, 5, 6, 8, 10 and 12 tons, so that the complete LO-HED line now includes hoists from ½-ton to 12-ton capacity.

In all LO-HED hoists the drum and motor are placed on opposite sides of the I-beam track, so that the load block can be drawn up between them until it almost touches the rail. This, the makers point out, utilizes all the available headroom and enables these hoists to handle larger loads and stack goods higher than would be possible for any hoist requiring more headroom in which to operate.

The hoist operates on standard I-beams, through switches and around curves. Hyatt roller bearings on

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This End Grain Fibre

Makes Rockwood Paper Pulleys Grip Hardest and Slip Least

Forty years ago— in the early days of power driven machinery, Rockwood conceived the idea of a better belt pulley—a pulley that would transmit more power—*a pulley built of paper!* By compressing layer upon layer of tough, wear-resisting fibre with the end grain exposed as a surface to grip the belt—Rockwood *originated* the paper pulley. Its success was immediate. And today that same pulley—constantly improved through the years—is the accepted standard for electric motors and other high grade belted machinery.

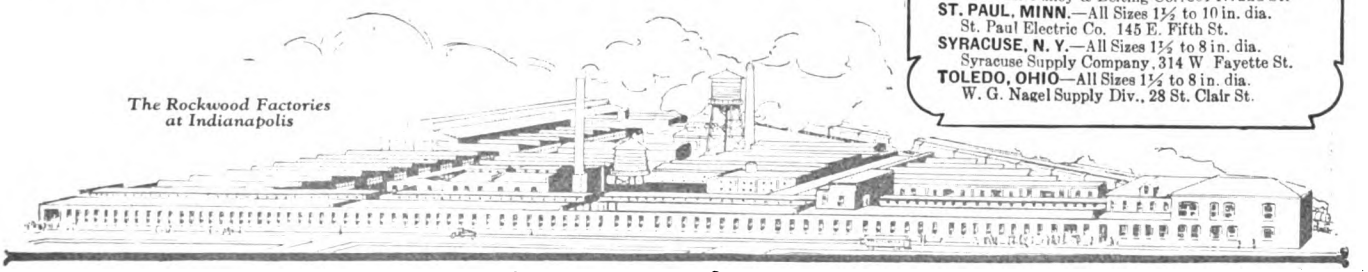
But Rockwood was not satisfied! Innumerable pulley sizes manufactured after receipt of the order and then shipped from the factory necessarily meant slow deliveries. So 2194 of the more popular sizes in a phenomenal range of 1½ to 14 inch diameters were selected and manufactured in quantities. These 2194 *standardized* pulley sizes were then mobilized in service stocks from coast to coast, each pulley packed ready for instant demand. Now any pulley user anywhere in the United States can get immediately from a nearby service stock the Rockwood Paper Pulley of the size required. No waiting for the pulley to be made special after the order is received—no waiting for a factory shipment.

Rockwood Paper Pulleys and Rockwood service have set a standard unapproached by any other pulley manufacturer. You or your dealer may telegraph, telephone or write for the Rockwood Paper Pulley that you need—and in a few hours at most it will be in your hands. Order from the nearest service stock listed on this page, giving diameter of pulley wanted, width of belt to be used, size of shaft and dimensions of keyway in shaft.

THE ROCKWOOD MANUFACTURING CO., INDIANAPOLIS, U.S.A.

SERVICE STOCKS
from Coast to Coast

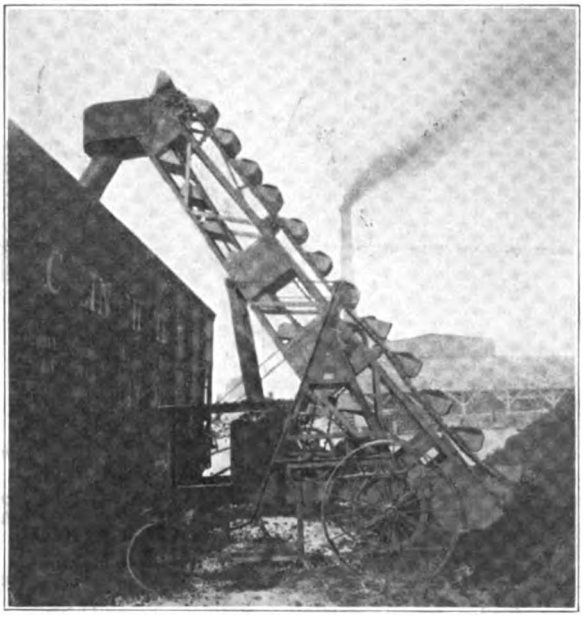
ALBANY, NEW YORK.—All Sizes 1½ to 8 in. dia.
Sager-Spuck Supply Co., 364-66 Broadway.
ATLANTA, GA.—All Sizes 1½ to 12 in. dia.
Fulton Supply Co., 70 Nelson St.
BALTIMORE, MD.—All Sizes 1½ to 10 in. dia.
Carey Machinery & Sup. Co., 119 E. Lombard St
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Matthews Electric Supply Co
BOSTON, MASS.—All Sizes 1½ to 14 in. dia.
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BUFFALO, N. Y.—All Sizes 1½ to 10 in. dia.
Root, Neal & Co., 178-180 Main St.
CHICAGO, ILL.—All Sizes 1½ to 14 in. dia.
Chicago Electric Co., 740 W. Van Buren St.
CINCINNATI, OHIO—All Sizes 1½ to 10 in. dia.
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CLEVELAND, OHIO—All Sizes 1½ to 14 in. dia.
Strong, Carlisle & Hammond, 1394 W. Third.
DALLAS, TEXAS—All Sizes 1½ to 14 in. dia
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DENVER, COLO.—All Sizes 1½ to 8 in. dia.
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DETROIT, MICH.—All Sizes 1½ to 14 in. dia.
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INDIANAPOLIS—All Sizes 1½ to 14 in. dia.
Rockwood Paper Pulley Stores, 1801 English.
JACKSONVILLE, FLA.—All Sizes 1½ to 8 in.
Cameron & Barkley Co., 336 E. Bay St
KANSAS CITY, MO.—All Sizes 1½ to 10 in. dia.
Webb Belting Co., 1501 West Twelfth St.
LOS ANGELES—All Sizes 1½ to 24 in. dia.
Illinois Electric Co., 313 S. San Pedro St.
LOUISVILLE, KY.—All Sizes 1½ to 8 in. dia.
E. D. Morton & Co., Inc., 516 West Main St.
MILWAUKEE, WIS.—All Sizes 1½ to 10 in. dia.
Julius Andrae & Sons Co., Broadway and Mich.
NEW ORLEANS—All Sizes 1½ to 8 in. dia.
Woodward, Wight & Company
NEW YORK CITY—All Sizes 1½ to 14 in. dia.
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Interstate Mchy. & Sup. Co., 1006 Douglas St.
OKLAHOMA CITY, OKLA.—All Sizes 1½ to 8 in. dia.
A. W. White, 424 West Reno St.
PHILADELPHIA, PA.—All Sizes 1½ to 14 in. dia.
Charles Bond Company, 617 Arch St.
PITTSBURGH, PA.—All Sizes 1½ to 12 in. dia.
Transmission & Belting Co., 325 Second Ave.
ROCHESTER, N. Y.—All Sizes 1½ to 8 in. dia.
Rochester Electrical Sup. Co., 240 St. Paul St.
SALT LAKE CITY, UTAH—All Sizes 1½ to 8 in. dia.
Capital Electric Co., 310 W. Second South St.
SAN FRANCISCO—All Sizes 1½ to 20 in. dia.
Buzzell Electric Works, 130 8th St.
SEATTLE, WASH.—All Sizes 1½ to 14 in. dia.
Seattle Hardware Co., 501 First Ave. South.
ST. LOUIS, MO.—All Sizes 1½ to 14 in. dia.
Teuscher Pulley & Belting Co., 801 N. 2nd St.
ST. PAUL, MINN.—All Sizes 1½ to 10 in. dia.
St. Paul Electric Co. 145 E. Fifth St.
SYRACUSE, N. Y.—All Sizes 1½ to 8 in. dia.
Syracuse Supply Company, 314 W Fayette St.
TOLEDO, OHIO—All Sizes 1½ to 8 in. dia.
W. G. Nagel Supply Div., 28 St. Clair St.



The Rockwood Factories at Indianapolis

ROCKWOOD *Instant* PULLEY SERVICE

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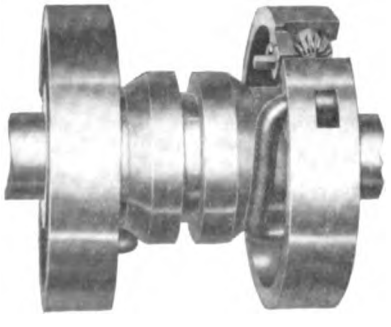


CONWAY CLUTCHES

have as salient features

Easy Engagement
Instant Release
Drag free Idling
One point Adjustment
Interchangeable Parts
and power always for that extra effort of overload.

One single Conway Clutch at work in your plant or on the machine you build will be the forerunner of efficient start, go and stop, with standardized clutches, ever after.



Bulletins 26 and 35 should be on hand always.

The CONWAY CLUTCH CO.
1943 West 6th St., Cincinnati, Ohio

the trolley wheels and ball thrust bearings between the wheels and the trolley frames, combined with the straight spur gear drive and the fact that wheels on both sides of the I-beam are driven, are said to make the hoist move easily along the rail. The trolley trucks are swiveled for going around curves of short radius.

The ball-bearing hoisting motor is totally enclosed and drives the drum by spur gears running in oil. Hyatt bearings are provided on the ends of the shafts. The working parts are accessible for inspection and care by simply removing the cover of the hoist. Motor and pinion can be removed as a unit without taking off the gear cover or draining the oil from the gears. A swivel hook on the load block makes it easy to turn the load and guide it. Safety features stressed by the manufacturer include a factor of safety of five in the design of the hoist; upper limit stop and a powerful, quick-acting brake that is automatically applied the instant the current is turned off, either accidentally or intentionally, and stops all movement of the load without drift.

THE Cleveland Section of the Society of Automotive Engineers accepted an invitation of The Timken Roller Bearing Company to be their guests September 16. About one hundred members of the society availed themselves of the opportunity. Nearly all were from the Cleveland district, although a number came from more distant points.

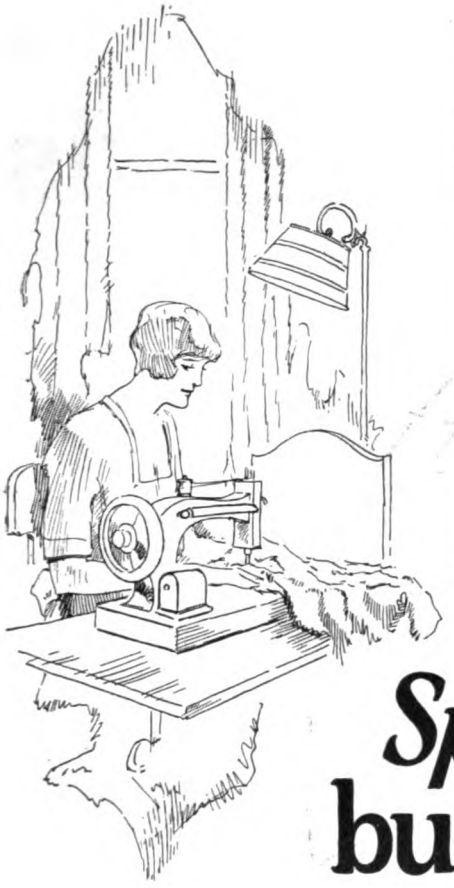
As the visitors arrived and registered, small groups were formed and were taken through the Timken Plant. Every important process was shown from the manufacture of the electric furnace steel in the largest plant of its kind in the world; the modern 35" blooming mill; automatic machines which simultaneously grind the end of the roll and sort them into sizes differing by only .0001"; multiple perforating and winging machines which make the one-piece precision cage; the world's largest grinding department and all the other precise operations which go to make the Timken Bearing; down to the final assembly of the finished product.

Immediately after the inspection trip, which took about two hours, lunch was served at Congress Lake Country Club.

A blind handicap golf tournament featured the athletic program, which included golf driving and putting contest, races and other events. Prizes were given for first, second and third place. Dinner was served in the main dining room of the clubhouse after which the prize winners were announced.

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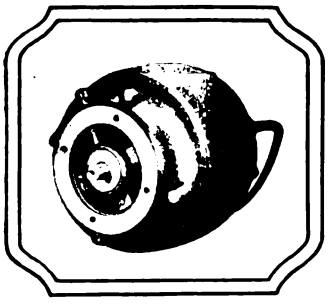
Special Engineering but no Price Penalty

The reasons why Domestic *special* motors are "abreast the rest" in price are clear and simple.

Special motors, built in the few types most widely applicable to the fractional horsepower field, are a routine production proposition with us. Domestic Electric research, sales, production and service departments are organized for this business only. Every motor order is followed through as an individual unit from the time the first contact with the purchaser is established until the finished motors are in operation.

Yet the advantages of this individual service are not reflected in the cost of motors to either the appliance manufacturer or the consumer. The Domestic Electric Company is organized and operated to produce *special* motors as other manufacturers produce *stock* motors. Factory equipment was designed and developed in the Domestic plant to build according to Domestic methods. Short-cuts and economies of production are thus made possible that could not be effected under any other policy.

If you have a problem in the application of motors to household, commercial or industrial appliances, call upon our engineers for this service. New economies and greater efficiency, such as have resulted in other fields, are yours for the asking.



THE DOMESTIC ELECTRIC COMPANY
7209-25 St. Clair Ave. CLEVELAND, OHIO

Manufacturers of fractional horsepower motors exclusively

(79-I)

Domestic Electric Motors

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"One of the hardest drives in our plant is the bias cutting machine, where a motor is often subjected to terrific overload. The 5 H. P. Howell Red Band Motor doing this work has already outlasted two other motors."
—Henry L. Venn, Secretary, Century Rubber Co. Chicago, Ill.

"We have had six Howell Red Band Motors in our creamery since December, 1918—these motors are still in service and giving good satisfaction."
—E. G. Cooper
The Beatrice Creamery Co., Detroit, Mich.

"We are pleased to state that Howell Red Band Motors have given us more continuously satisfactory service than any other motors we have ever used."
—Jule B. Smith
The Fort Worth Elevators Co. Fort Worth, Texas

"At the beginning of the heavy ice cream season, our Howell Red Band Motors are started and run 24 hours a day seven days a week—they have been running continuously now for five months and three days. Our Howells have never given us the slightest trouble, and we will order more Howells as our production demands."
—C. R. Glasser,
The Chappell Ice Cream Co., Chicago, Ill.

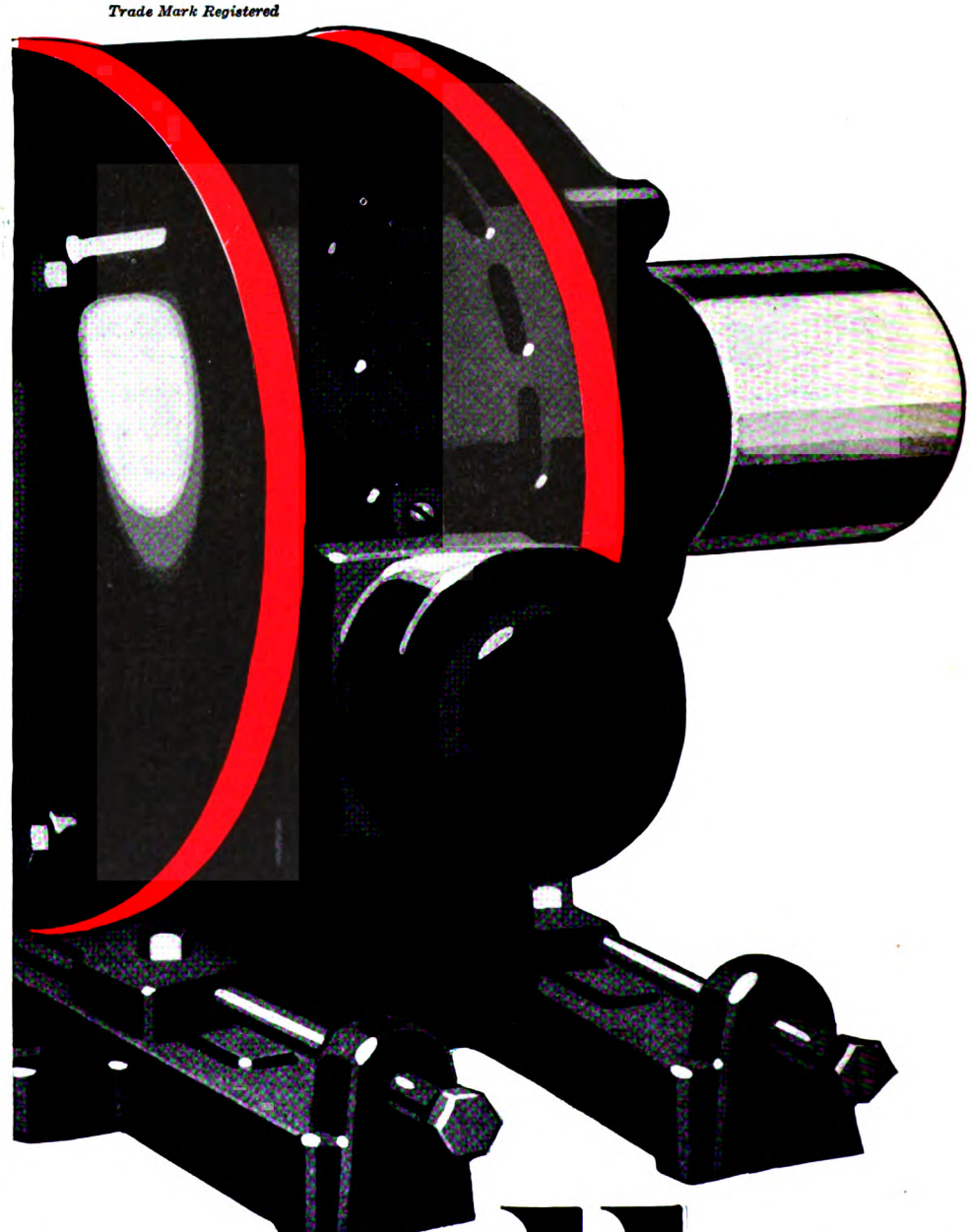
"All our Howells get hard service. But in spite of dust and moisture Howells enable us to maintain our production."
—A. W. Schaeffer,
Penrod Walnut & Veneer Co., Kansas City, Mo.

"In our cast-cut stone factory the Howell Red Band Motors get the hardest service in the world. Dust, dirt and water prevail throughout the plant and are mighty hard on a motor. For reliable service we wouldn't hesitate to recommend Howell Red Band Motors."
—C. D. Griffin,
The Benedict Stone Corp., Crestwood, N. Y.

"Our work tests a motor's ability. The fine sawdust will get inside the motor. Conditions vary instantly from no load to overload. Some machines are started and stopped 150 times a day. The Howell Red Band Motors operate perfectly with no attention but ordinary lubrication.
—M. C. Mallin,
Mallin Bros., Inc., New York City

Let the of thousands

Trade Mark Registered



Howell

RED BAND

Make Good on

For products not advertised in this issue write Industry Illustrated

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Verdict

prove the value of Red Bands to YOU

"The hardest job in our plant is done by a Red Band motor running under the adverse conditions of continual water and dampness," reads but one of thousands of letters of appreciation from Howell owners.

Results like this, coming from practically every type of installation, prove the true worth of an electric motor.

In the Howell business policy the customer stands first. Every Howell motor is built to make good on the hardest job—every Howell motor carries with it the reputation of the Howell organization—every Howell motor contains the best material that money can buy and features that are not found in other motors regardless of price.

We know no other way to serve a public which has a *right to expect* the best.

Howell Motors are sold and serviced in all the principal cities. They cost no more than ordinary motors. Write for complete data, prices, etc., or get in touch with the nearest Howell representative.

HOWELL ELECTRIC MOTORS COMPANY,
HOWELL, MICHIGAN

"For four years Howell Red Band Motors have been working in our mills under extremely unfavorable conditions. We manufacture hog feed from table scraps which makes greasy, dirty machinery unavoidable—with this heavy load and practically no attention these motors run in grease and dirt 24 hours a day, six days a week."

—*K. L. Brown,*
Pan American Feed Milling Co.,
West Toledo, Ohio

"For two years we tried out Howell Red Band Motors alongside other motors. Although two-thirds of the Howells ran at 3600 r. p. m. they required no repairs. Howells are now standard with us."

—*L. J. Maurer,*
Brambach Piano Co.,
New York City

"In driving the conveyor system at our three pits, the Howell Red Band Motors are not only running at heavy loads but they are also operating where there is constantly a great amount of sand and gravel grit which gives them the hardest service to which a motor can be subjected."

—*Geo. Jennings,*
American Sand & Gravel Co.,
Chicago, Ill.

"The very satisfactory operation of the Howell Red Band Motors and the prompt and efficient service of your organization assured us of continued operation under the severe conditions encountered in a creamery."

—*Harold I. Nordly,*
Franklin Cooperative Creamery,
Minneapolis, Minn.

"We would emphasize that we are lovers of good machinery and what we like most in Howell motors apart from the excellent electrical features are the perfectly made long bronze bearings and the terrific shafts and rotor construction."

—*The Dominion Electric Co., Ltd.,*
New Zealand

"Many of our Howells, especially the 7½ H. P., in the sugar mill run in the presence of much sugar dust but are always ready to go. The 10 and 25 H. P. Howells on the mixing kettles are frequently subjected to overloads with no excess heating."

—*D. M. Phillips,*
Green Circle Products Co.,
Chicago, Ill.

(80)

ELECTRIC *the Hard Jobs* **Motors**

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Is Yours Quality Equipment?

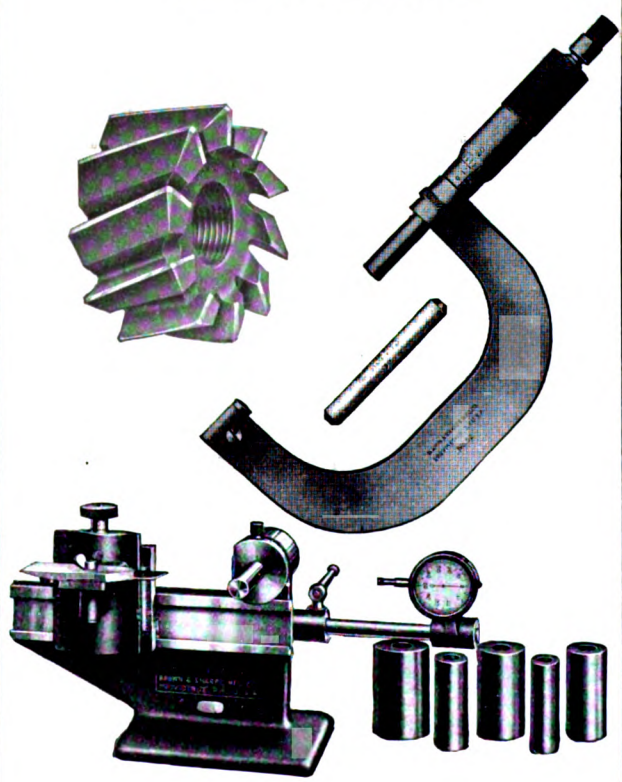
Quality Equipment is equipment which performs with the greatest efficiency the work for which it is intended. *Perhaps* that work is measuring metal by thousandths of an inch: Perhaps it is milling steel rapidly at coarse feeds: Perhaps it is accurately testing clearances on formed cutters. Whatever the work may be, Brown & Sharpe Quality Equipment will do it most efficiently and accurately.

The Brown & Sharpe No. 30 Catalog is a buying guide for quality equipment. You should have a copy for reference purposes. If your dealer cannot furnish a copy, write us direct.

Dept. Ind. I.

Brown & Sharpe Mfg. Co.

Providence, R. I., U. S. A.



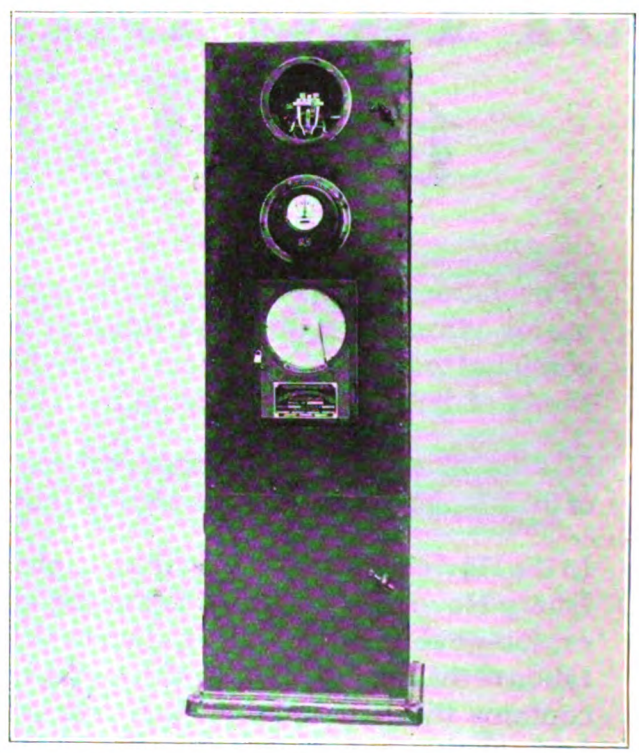
BROWN & SHARPE

"Standard of the Mechanical World"

A New Gas Measuring Device

A NEW device for use by the smaller gas companies and for large customer service, where accurate measurement of gas flow is required, has recently been brought out by the Cutler-Hammer Mfg. Company.

It is called the Cutler-Hammer Thomas Meter and is made in sizes capable of measuring from 2,500 cubic feet up to 200,000 cubic feet per hour. The instruments show results in standard units, corrected for pressure and temperature. All corrections for pressure and temperature are claimed to be made automatically, thereby eliminating mistakes. The instrument panel carries an integrating wattmeter with improved, easy-to-read dials; and a recording wattmeter which gives a graphic continuous record of the rate of flow from each twenty-four hour period. In customer service, this chart gives



an accurate record for setting demand rate. The charts are the usual circular shape.

The instrument panel can be installed any place in the plant where records are most useful. It is pointed out that installation of the instrument panel is a simple matter as no special foundation is required. The meter housing is installed in the existing piping so that no special piping is necessary. The current regulator is incorporated in the instrument panel for convenience. The glass door in this panel facilitates inspection and easy access to all moving parts. Space is provided in the lower part for storage of ink, charts and tools.

The Thomas Meters are made in the following sizes:

For 110 Volt A. C. Service

25,000 cubic feet per hour

50,000 cubic feet per hour

For 220 Volt A. C. Service

100,000 cubic feet per hour

150,000 cubic feet per hour

200,000 cubic feet per hour

These sizes fill practically every need for industrial service. The equipment is said to be extremely simple to wire, to operate and to maintain.

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Are your repair bills still too high?

Then these five products will help you reduce them

1 Protect your concrete floors against wear with Lapidolith, a concrete floor hardener that puts an end to dusty, easily-worn-down concrete floors. It is fully described below.

2 Add years of life to your wood floors with Lignophol, a preservative dressing that keeps wood floors from splintering, rotting, or drying out. Further details are below.

3 Make your repainting jobs less frequent by using Cemcoat, a remarkably economical paint that may be washed again and again without turning yellow. Read more about it below.

4 Make your buildings proof against dampness. By treating your exterior walls with Hydrocide Colorless you are assured of warm, dry interiors. Full description is given below.

5 Stop roof leaks before they become serious by using Stormtight. Stormtight stops leaks quickly and easily. If used on the entire roof it gives permanent leak insurance. Stormtight is described in detail below.

1 Lapidolith, a liquid chemical compound, is the original concrete-floor-hardener. It may be applied to concrete floors as easily as water. A floor treated at night is ready for business in the morning. Lapidolith penetrates the porous cement, binds the loose particles together, and fills up the voids. The result is a fine, close-grained surface that is dustproof and wearproof. One treatment lasts for years.



2 Lignophol is just as easily applied to wood floors. It keeps wood floors from splintering or drying out. It penetrates the wood fibres and restores the natural gums and oils. It gives you a wood floor that is hard, smooth, and sanitary. It does away with the use of floor oils entirely. One treatment will last for years.





3 When your next repainting job comes around, try Cemcoat. The wearing qualities of this paint are remarkable. Even on brick, plaster, or concrete walls it will not crack or peel. It may be washed again and again. Because of its unusually heavy body it generally requires one less coat to a given surface than most paints. Cemcoat comes in whites and colors for exteriors and interiors.

4 Hydrocide Colorless. This waterproofing compound is applied to the exterior of a building. It may be applied with either brush or spraying machine. It will not detract from the beauty of the walls, as it is absolutely invisible when applied. It will accomplish its purpose in a most thorough and permanent manner by penetrating and filling the surface pores with a compound that is absolutely resistant to the elements.





5 Stormtight stops leaks instantly. If it is applied to the entire roof it will add years of wear to even an apparently worn-out roof. Stormtight is a thick, adhesive, rubber-like substance. It may be applied by anyone to any roofing material. Stormtight has often saved manufacturers the cost of a new roof. It can be secured in either the semi-liquid or plastic form.

L. Sonneborn Sons, Inc.

114 Fifth Ave., New York City

The above products have helped many manufacturers reduce their maintenance expense. Concerns such as the Ford Motor Company, Swift and Company, and the Bethlehem Steel Company have used some or all of these products for years. On the left is the plant of the H. E. Varran Co., Stamford, Conn., also a user of Sonneborn products. J. W. Ferguson, contractor. Let us send you free samples and literature that will tell you more about them. Use the coupon.

Lockwood Greene & Co., New York, Architects and Engineers.



L. SONNEBORN SONS, INC. J-2
114 Fifth Avenue, New York City

Please send me, without any obligation, demonstration sample and literature on:—Lapidolith....; Lignophol....; Cemcoat....; Hydrocide Colorless....; Stormtight..... (Check those products that interest you)

Name .....
Street .....
City ..... State .....
Company .....
Position .....

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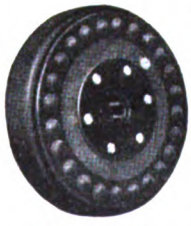


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your trucking and floor maintenance expense


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A Road to Straight-Line Thinking

By C. C. Hermann

A PROMINENT engineer sat opposite my own place at the table. I had visualized a wonderful story of his unusual success, and craved the opportunity of writing his story. Imagine my astonishment and disappointment, therefore, when he advised that he had nothing to say for publication.

"But you have made an unusual success," I urged. "The profession would be pleased indeed to learn something about yourself."

"Nothing at all unusual," he replied. "Just concentration and hard work."

"Then allow me to write up your latest accomplishment," I urged.

"That is impossible. The project of which you speak involves principles which I have spent days and days in evolving. With a few strokes of the pen I would give to the world what I have labored long to obtain."

It reminds me of a certain individual down my way who has worked for sixty years. Up to a few months ago he was the object of pity. Everyone thought he was destitute and assisted in every way possible to make his declining years pleasant. An investigation, however, disclosed that he was wealthy beyond the wealth of all his benefactors together; a miser.

In what way does society profit through the grace of this type of individual? He may accomplish things; but, in the final analysis, such accomplishments are of little moment. He may evolve a great principle and lock it up in his mind. It does not follow that some other individual will not arrive at the same terminal. No machine, no invention, no principle has been brought forth but that sooner or later some other brilliant mind is going to eclipse that machine, that invention, that principle with a greater. Science does not stand still. It is not locked up in the heart or mind of a single individual.

On the other hand, think what is to be gained by publishing abroad one's accomplishments. Instead of being branded a miser such a man is known as a benefactor to his profession. The harder he must work in order to produce successfully, the greater will be the glory in divulging his device, the underlying principles thereof, to the profession.

Odd, how some individuals detest to allow the least glimpse into their workshops. Inside the doors lies the accumulated knowledge of years of constant application. Wonderful storehouses filled to the roof with facts, research and data which would serve to enrich the technical literature of the day; but denied. For what reason? For fear that, by yielding the information, his fellow men would be as wise as he himself.

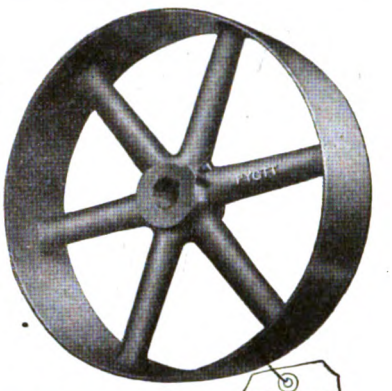
An example of how an art can be held back is depicted in the malleable iron industry. Hidden in the minds of men for centuries, handed down from one trusty to another like the secret of a lodge, it was destined to be shrouded in mystery until the light of publicity began to chase away the shadows. It came to the front by leaps and bounds until today it would be difficult to find an industry that is so well founded on sound principles.

Industrial policies have much to do with the miserly

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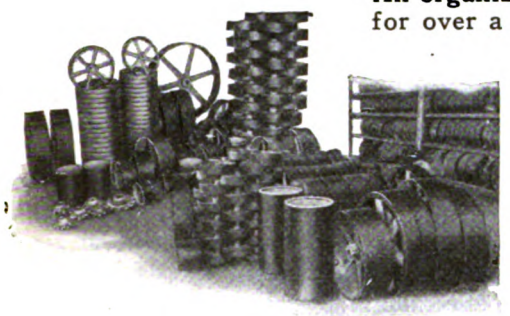
Sudden Service—

A shop accident—a fire—may mean a demand for an assortment of pulleys—*quick*. A "time contract" may insist on immediate receipt of hundreds of pulleys a day, without question of delivery. Those are cases where the wise ones always wire for





PYOTT *Red Face* PULLEYS



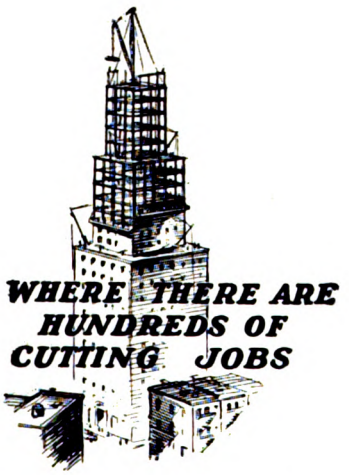
An organization that has been making quality pulleys a specialty for over a quarter of a century, is geared to give fast service—dependable service. Thousands of patterns enable us to meet *any specification*—instantly. Within the limits of human endeavor, we meet any demanded delivery date.

Our catalog on your desk is a help in emergency ordering. Write for it

PYOTT FOUNDRY CO.

Makers of quality pulleys for over a quarter of a century

332 N. Sangamon St. Chicago



In the metal working field where there are hundreds of small cutting jobs and a reliable and dependable cutting source must be had, there you will find Victor an essential factor.

Let us send you samples of this Wonder Blade

VICTOR SAW WORKS, Inc.

MIDDLETOWN, N. Y.

The New

Ettco

Keyless Ball Bearing Drill Chuck



An Offer:

Send us your Drill Chucks regardless of conditions or make and we'll allow a discount of 15% off list on an accompanying order for Ettco Drill Chucks.

We believe that any fair trial of Ettco drill chucks, made in any shop, on any work, will result eventually in a complete Ettco drill chuck equipment in that shop. To interest manufacturers in testing Ettco drill chucks in their own shops is the reason we make the exchange offer.

Eight good reasons for using Ettco drill chucks are:

1. Hand Operated
2. Keyless
3. Ball Bearing
4. Continuous Grip
5. All Parts Hardened
6. Light Weight
7. Self-centering
8. Simple Construction

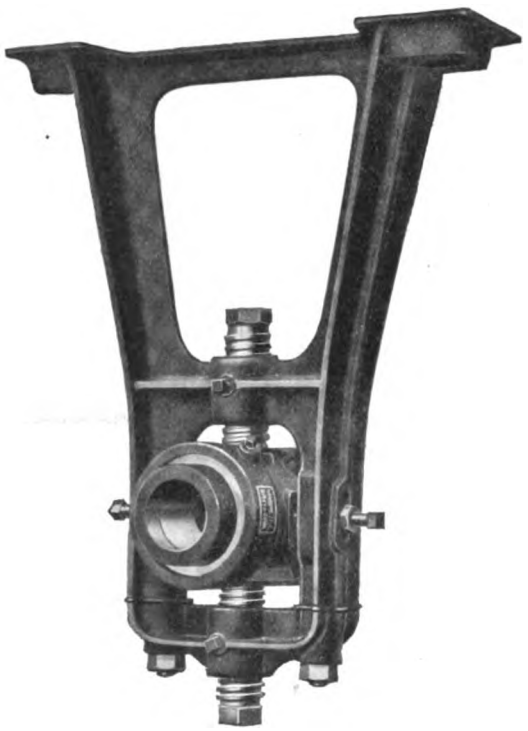
No. 1-A Ettco—0 to 1/4 in....$5.50
No. 1½-A Ettco—0 to 5/16 in. 6.00
No. 2-A Ettco—0 to 3/8 in.... 6.50
No. 3-A Ettco—0 to 1/2 in.... 9.00
No. 3½-A Ettco—1/8 to 5/8 in. 11.00

ETTCO Chucks Increase the Value of Your Electric Drills

EASTERN TUBE & TOOL COMPANY, Inc.

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Between the power producing plant and the operating machine often will be found great losses of power. That costs money.

The problem of securing proper Power Transmission for continued, economical performance finds a happy solution in the selection of Wood's Power Transmission Appliances. That saves money.

There are definite, tangible power savings effected when you install the T. B. Wood's Line of Power Transmission Machinery equipped with or without the smooth running, oil saving, money saving Wood-Fafnir Ball Bearing.

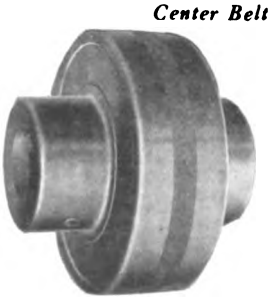
There's a Wood's Product that helps to solve any Power Saving problem and there's a Wood's dealer near you who is equipped and competent to assist you on any Power Transmission question.

T. B. Wood Sons Co.
Chambersburg, Pa.

NEW ENGLAND BRANCH: **Cambridge, Mass.** *SOUTHERN BRANCH:* **Greenville, S.C.**

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Shafting, Hangers, Pulleys, Flexible Couplings, Friction Clutches and the U. G. Short Center Belt Contactor.



NOTE:—Illustrate at top with Wood-Fafnir Hanger box and at bottom with assembled flexible coupling.

tendencies with regard to technical publication of engineering accomplishments. Trade advantages, they are called. To divulge how this, that and the other thing is done, means playing into the hands of competitors. A strong censorship must be established, and he who would deign to ignore the censorship cuts his own throat so far as that industry is concerned.

I have been in active practice for fifteen years, ten of which I have yielded to the force of the pen. Nothing has been held back. I have given without a thought of injury to my own standing and I have not regretted. I have not lost through the press. Financial gain, it is true, has been small; practically nothing. My gain has been principally in knowledge. Some one once said, "if you want to know how much you know about a given subject write about it." It is a sure way of discovering that one really knows very little about a given thing. It shows up the vast amount there is still to learn.

College courses turn out an individual who is taught to study along certain lines. Writing in that profession teaches him to think along those lines. Writing provides the ground for concentration. It eliminates the tendency to ramble in matters of thought. Even though not a word of the millions I have produced during these years had been published I would still be the gainer because it has taught me to think in a straight line. The straight line is the most efficient thing in the world. To think in a straight line is to think efficiently. One never knows what crooks and bends the thought takes in its course from cause to effect until the subject is written.

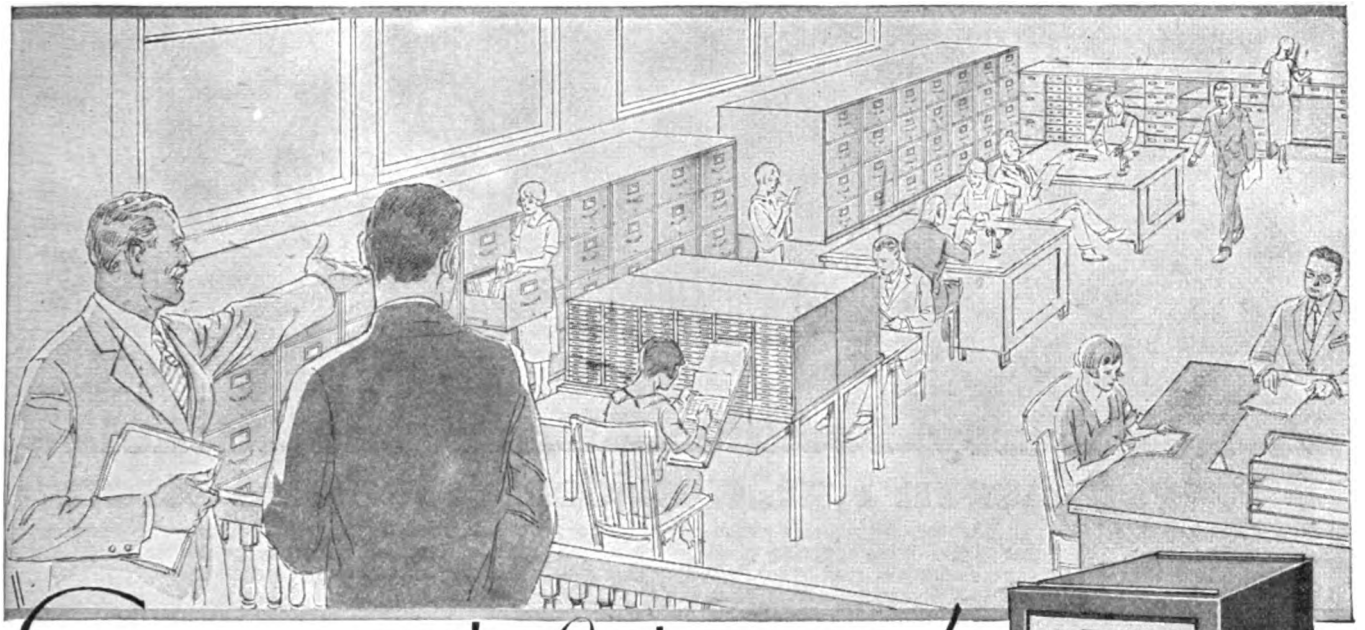
The man who has something to say will always find an audience. Likewise, the fellow who has something to write will always find a reader. Perhaps that reader will never be any other than the publisher who returns the manuscript with a polite note that the space is not at present available. However, there has been a decided gain on the part of the writer. He has learned that he must present his subject in an acceptable form in order to meet the requirements of the press. He may feel that his effort has not been appreciated; however, in this he is mistaken. He has not learned to write, as yet. Just as it has taken years to learn to do the work of an engineer, so will it take some time to learn to do the work of a writer. But while he is learning, he is broadening his knowledge. He is investigating phases of his subject which he never dreamed of before.

He is forging forward, steadily, surely. Were he to retain all that he knew and could find out about a particular thing, he would be no wiser in any but his own estimation. And we are wise, only as others know we are wise. We have knowledge, only as others know we have knowledge. We are honored, only as others know how to honor us.

So, make use of the pen to unveil the mysteries of your accomplishments for the furtherance of your profession. Forget about the theory of scientific selfishness which produces scientific misers who bury their investigations in their own casket.



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Congratulations!

"THERE—*Is a Real Installation*"

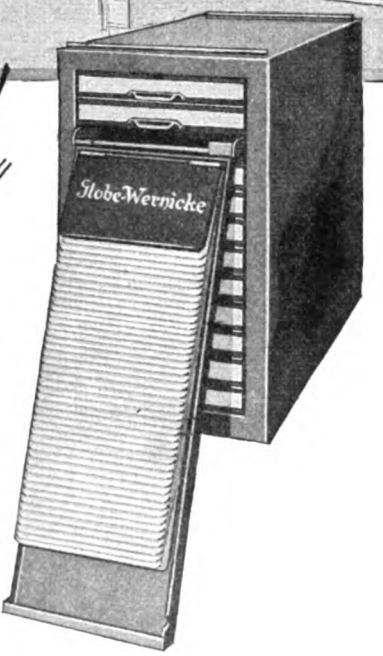
Seasoned business men appreciate the intimate knowledge of system, the perfect regard for space value and the time and labor economies Globe-Wernicke Dealers are able to put into their installations.

The Globe-Wernicke Dealer is an Office Equipment expert. At their command is not only a product aged in efficiency—but a service born of actual contact with business problems for 45 years. Such a source of information has proven mighty valuable to G-W equipment users.

From steel uprights, built with the "276,000 trip" drawer slide, to cork-cushioned desk trays—there is no equipment more economical to buy nor efficient to use. Almost everyone knows Globe-Wernicke value.

Seeing is believing—phone your dealer for a copy of "Checking Your Filing Costs"—or mail the coupon—today.

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Cincinnati, Ohio



Easy—Even reading margins.
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Gentlemen:
How long should a good file last? Send me a copy of "Checking Your Filing Costs"

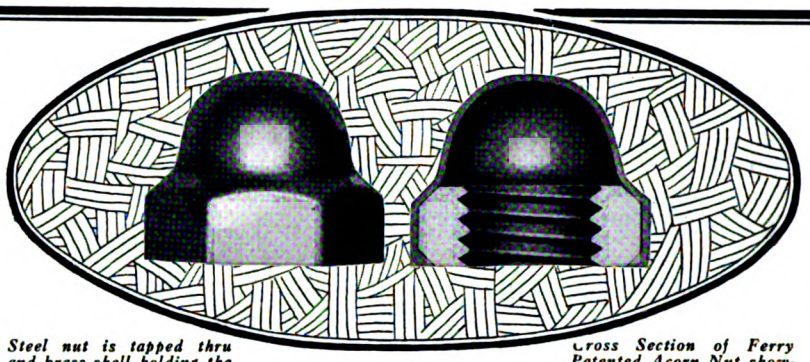
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Material: Brass — Steel Hex. Nut Centers.
Size: 3/4" Across Flats.
Tapped: 1/4", 5/16", 3/8", 7/16" and 1/2" inclusive. USS and SAE thread.
Size: 15/16" Across Flats.
Tapped: 1/2" — 9/16" and 5/8" inclusive— USS and SAE thread.
Plain Brass Finish
Nickel Plated — Barrel Finish
Nickel Plated — Hand Polished



Steel nut is tapped thru and brass shell holding the steel nut allows nickel-plating over brass.

Cross Section of Ferry Patented Acorn Nut showing how steel hexagon nut fits snugly into brass shell.

Material: Nickel Silver-Steel Hex. Nut Centers.
Size: 3/4" Across Flats.
Tapped: 1/4", 5/16", 3/8", 7/16" and 1/2" inclusive— USS and SAE thread.
Size: 15/16" Across Flats.
Tapped: 1/2", 9/16" and 5/8" inclusive— USS and SAE thread.
Plain Finish
Burnished
Hand Polished

A New Ferry Product—Brass and Nickel—Silvered Acorn Nut, non-corrosive and strong

The Hexagon Steel Nut is covered with sheet metal, either brass, copper, or nickel silver. This covering gives the nut a beautiful appearance, making it rust-proof, and lends itself to any finish desired. It can be plated, burnished, polished and buffed or left in its original color.

The steel nut is tapped all the way through and inspected for any defects before the covering is put on, eliminating any chance of a misfit.

These nuts are used largely for ornamental purposes, such as cylinder head nuts in the manufacture of gas engines, automobile bumpers, switchboards, plumbers' supplies, etc.

The only ornamental nut with the strength of Steel and the non-corrosive qualities of Brass, Copper, Nickel Silver, or other non-ferrous metals.

Write for prices. They will interest you.

THE FERRY CAP & SET SCREW CO., Cleveland, Ohio

FERRY
PROCESS SCREWS

Your Fingers Are Safe



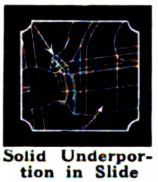
No, sir! The Parker Vise handle won't slip through and pinch fingers. Why? Because the exclusive feature of the spring and set screw (see cut) keeps the handle just where it is put. This means no lost time from avoidable accidents, and satisfied workmen. It will pay you to use Parker Vises.

Write to W. R. B. for Catalog 57B

THE CHARLES PARKER COMPANY
Master Vise Makers
Meriden, Conn., U. S. A.

PARKER VISES

Other Exclusive Features of Parker Vises


Solid Underportion in Slide


Renewable Steel Jaws


Swivel Base 360° Gripping Power


Handle Stays Put

GRIP LIKE A GRIZZLY

Est. LUDLUM 1854

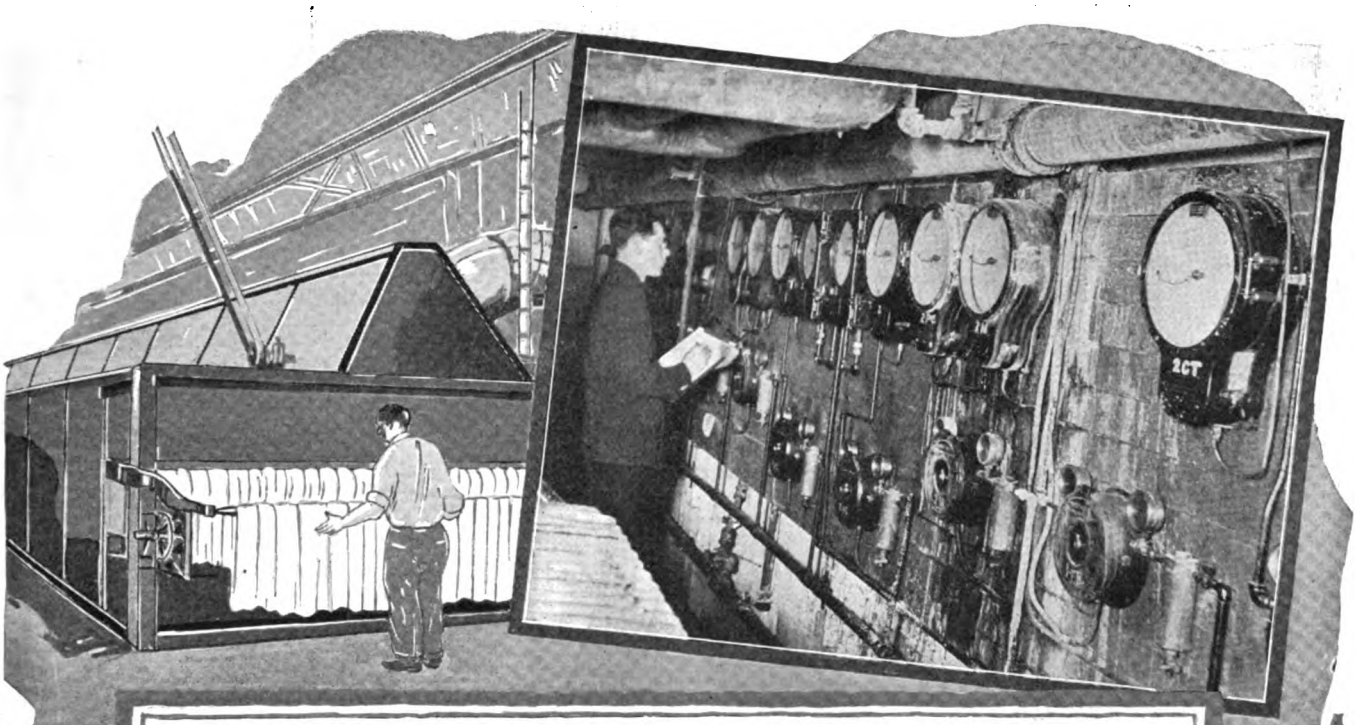
MOHAWK EXTRA

The Master tool steel for milling cutters, boring tools, etc.

WE HAVE A SPECIAL TOOL STEEL FOR EVERY SPECIFIC PURPOSE

LUDLUM SPECIAL STEELS LUDLUM STEEL COMPANY — STEELS SPECIAL PURPOSES WATERVLIET-N.Y.-U.S.A.

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$22,000 Additional Labor Costs could not give the Equal Control of these *Tycos* Instruments

At the plant of Cupra, Inc., Athenia, New Jersey, where the manufacture of silk by the cupra-ammonia process requires very delicate and very accurate pressure and temperature control through every step, about 100 *Tycos* Instruments are used.

O. G. Pratt, Vice-president of this concern, writes us as follows:

"The successful operation of the entire plant, which is the only successful cupra plant in the country, is absolutely dependent upon the accurate and regular operation of *Taylor* Instruments ..... There are 52 *Taylor* instruments on one panel alone.

"For the year they have been in use, these instruments have proved eminently satisfactory. They eliminate the human factor because they do their job automatically. Without such instruments, men would have to be employed to constantly watch and control all valves. And at its best, the human element introduces inaccuracy.

"The labor which would be required in this case would amount to at least 20 men. This would mean a tremendous additional payroll of about $22,000 a year. In all respects, therefore, the instruments are the only satisfactory method of securing temperature control."

In every industry *Tycos* Instruments have helped to maintain the quality of products and have resulted in lower labor costs.

The *Tycos* Catalog explains the advantages of accurate temperature control. Write for a copy.

Taylor Instrument Companies

ROCHESTER, NEW YORK

Manufacturing Distributors
in Great Britain
Short & Mason, Ltd., London

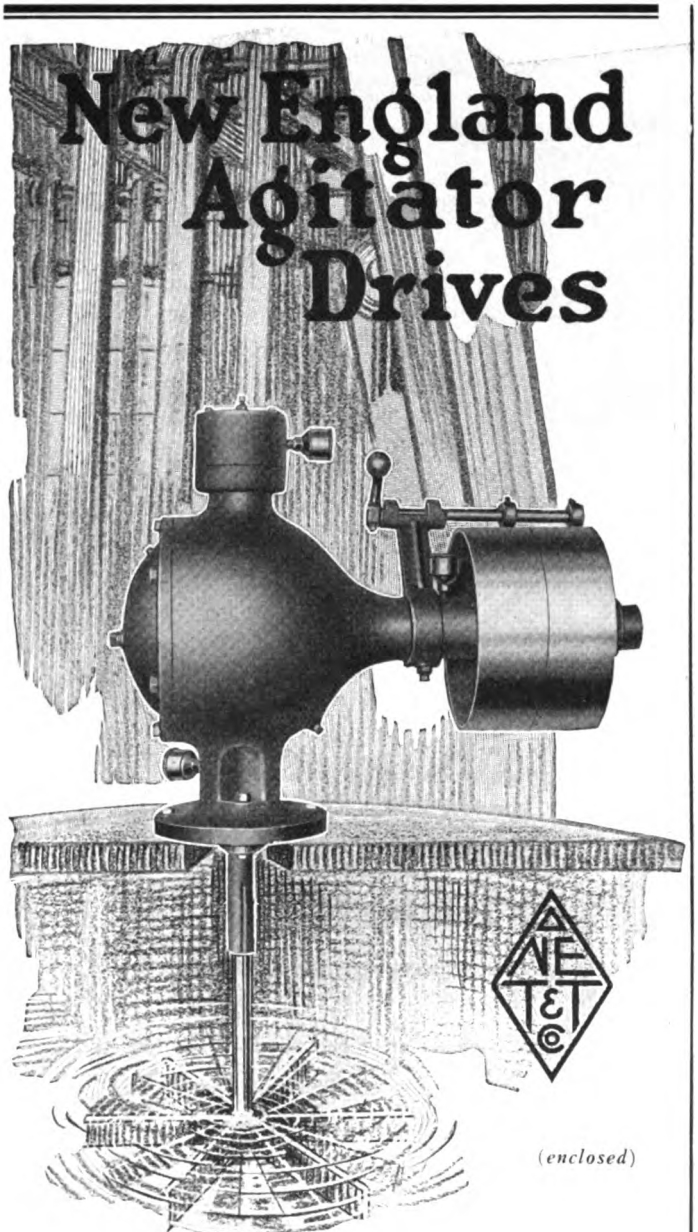
Canadian Plant
Tycos Building
Toronto

Tycos Temperature Instruments

INDICATING · RECORDING · CONTROLLING

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New England Agitator Drives



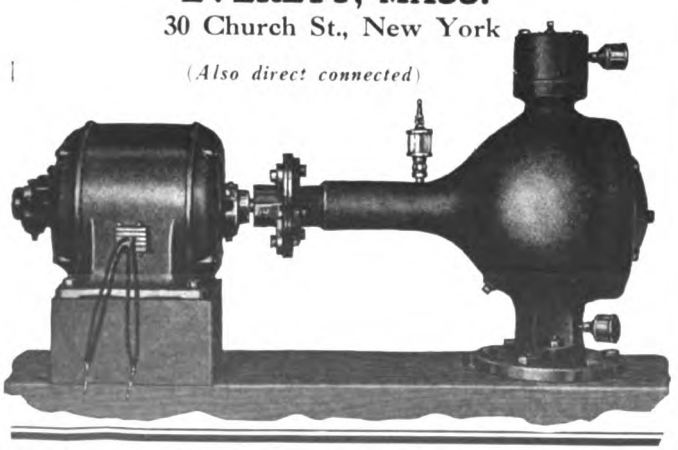
(enclosed)

Standard Units for All Types of Stirrers—
Rugged — Adaptable — Trouble-proof—
Wide Range of Capacity

Send for Complete Specification Portfolio

NEW ENGLAND TANK & TOWER CO.
EVERETT, MASS.
30 Church St., New York

(Also direct connected)



Simplicity



Only *One* Moving Part!

The more parts, the more chance for trouble. In the Paracoil Steam Trap there is only one moving part—the solid recessed sphere which rotates over the valve seat. Even after long wear, this simple construction cannot cause trouble and it always assures a tight contact.

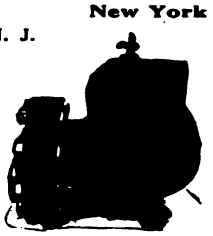
You can save big money and end steam trap troubles by installing tested Paracoil Steam Traps, which are guaranteed against repairs for two years, if installation and operating instructions are followed.

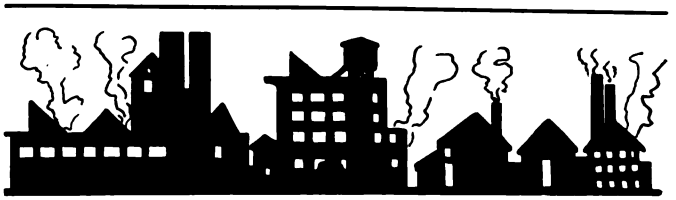
Designed for capacities up to 40,000 lbs. of water per hour. Stock pressures 30 lbs., 125 lbs. and 200 lbs. Other pressures furnished upon application.

Write for catalog A-12

DAVIS ENGINEERING CORP.
90 West Street New York
Factory—Elizabeth, N. J.

Paracoil STEAM TRAP





A size for every Industry

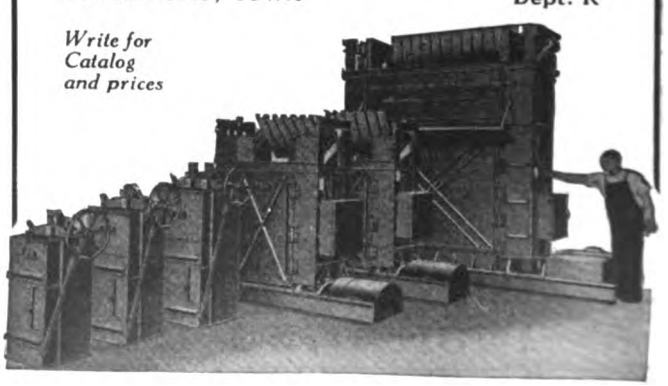
ALL STEEL Schick FIREPROOF Balers

Hand or Power Types

Every concern, small or large can dispose of its waste material profitably by the use of a Schick Baler. This baler constructed entirely of steel, indestructible and easy to operate is supplied in 8 convenient sizes: Hand balers 125 to 375 lbs. capacity, Power balers 350 to 1,500 lbs. capacity. Specify a Schick for every baling requirement. It is your guarantee of complete satisfaction.

DAVENPORT MFG. CO., Inc.
DAVENPORT, IOWA Dept. R

Write for Catalog and prices



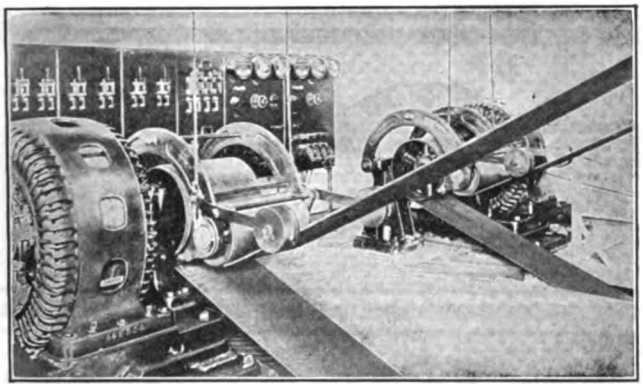
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In **1913,** a Lenix user said:

"The Lenix Drive which you supplied me with is not alone worth the money you charge for it but is worth a great deal more. In the first place it is worth a whole lot to know that a belt driven over a Lenix Drive will deliver all the power any engine gives it and without straining the belt.

"I am running two of your Lenix Drives three years and never had a penny's worth of trouble."

In **1926,** the reply to our questionnaire is that the same drives are "VERY SATISFACTORY"



2-225 H.P. Generators equipped with Lenix Drives

These Lenix Drives have been in daily service since January, 1911. Their low cost of upkeep is evidenced by the fact that the only repairs necessary in 15 years of service were the renewal of bearing bushings in 1923.

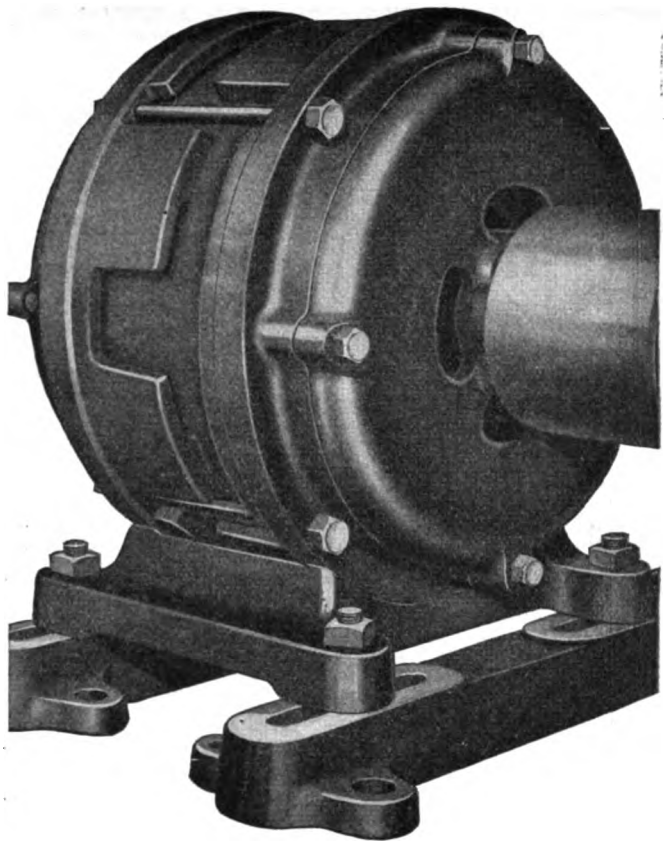
Our engineers have installed more than six thousand Lenix Drives, ranging from 1 H.P. to 1400 H.P. in practically every industry. Our experience in handling belt drive problems is at your disposal. Why not take advantage of it?

Send for catalogs.

See our Exhibit in the Fifth National Exposition of Power and Mechanical Engineering, Grand Central Palace, New York, December 6th to 11th, 1926.

F. L. SMIDTH & CO., Inc.
Engineers
50 Church St., New York, N. Y.

The LENIX DRIVE
TRADEMARK REG.



Long Life in the Bearings

BALL Bearings, used in the Valley Motor, distribute wear so evenly over the entire friction surface that the life of the entire motor is greatly prolonged.

Tests have shown that for every 100 watts necessary to overcome friction in a babbit bearing motor, only 25 watts are required by Valley Ball Bearing Motors.

That is one reason why we can say that Valley Motors cost less to operate—and do more.

Polyphase ¼ to 40 h. p., and Single Phase ¼ to 3 h. p. Write for descriptive bulletin.

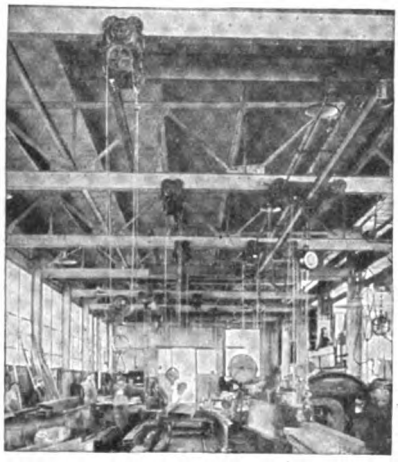
VALLEY ELECTRIC CO., ST. LOUIS, MO.
District Offices: Boston, Chicago, Indianapolis, Kansas City, Minneapolis, New York, Philadelphia, Cleveland, San Francisco

Valley

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Bought Seven—Now Use 20

"Eight years ago we bought 7 Euclid Cranes—and today we have 20. That speaks pretty loud as to our satisfaction with Euclids. And furthermore, the original 7 are still in operation and are in just as good condition as when they were installed. We are glad to say they are standard with us."

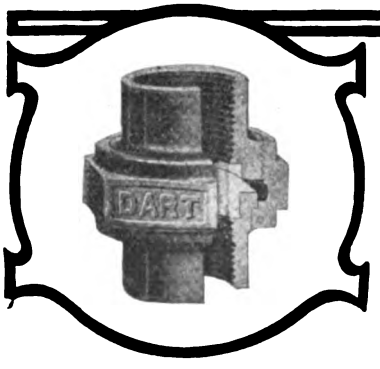


The above excerpt from a letter from one of the largest iron works in the country, is typical of the experiences of Euclid users in all parts of the country. Almost invariably, the installation of a Euclid Crane or Hoist is followed by such gratifying results that Euclids are adopted as standard equipment.

Write today for our catalog and our booklet, "Euclid Utility," which proves beyond a doubt the superiority of Euclids.

The EUCLID Crane & Hoist Co.
Chardon Rd. EUCLID, O.
Offices in all principal Cities

EUCLID
CRANES & HOISTS
"RAISE PROFITS"



Use them Over Again!

DART UNIONS ARE ALWAYS EFFICIENT

Dart Unions stay tight—they can't rust and you are sure that the steam can never escape.

The reason—Bronze to bronze seating surfaces ground to a perfect and absolutely tight seating ball and socket joint makes them leak proof.

That is why they can be used over and over again.

And we guarantee them—Two Dart Unions for every one that proves defective.

Prices and catalog on request. Also sample if desired.

E. M. DART MFG. CO.
Providence, R. I.
Sales Agents: The Fairbanks Co. *"New York and Branches"*
Canadian Factory: Dart Union Co., Ltd. Toronto, Canada

DART UNIONS

Try it Yourself!

TAKE any piece of rusty metal—dip it in water just as it is—give it a coat of Nitrose—then to make the test still harder, hold it under the faucet. Nitrose isn't affected by water at all. It penetrates rust and moisture alike. It gets right down to the surface and sticks.

That's How it Conquers Corrosion

Nitrose comes in 5, 10, 30 and 55 gallon drums —Give it a trial—Apply the most severe tests. The results will surprise you.

THE NITROSE COMPANY
Peoria Life Building, Peoria, Illinois
See phone books for representatives in:

Chicago	New York City
Cleveland	Rochester, N. Y.
Detroit, Mich.	Saginaw, Mich.
Kansas City, Mo.	San Francisco
Los Angeles	Seattle, Wash.

See Booth No. 744, the New York Power Show

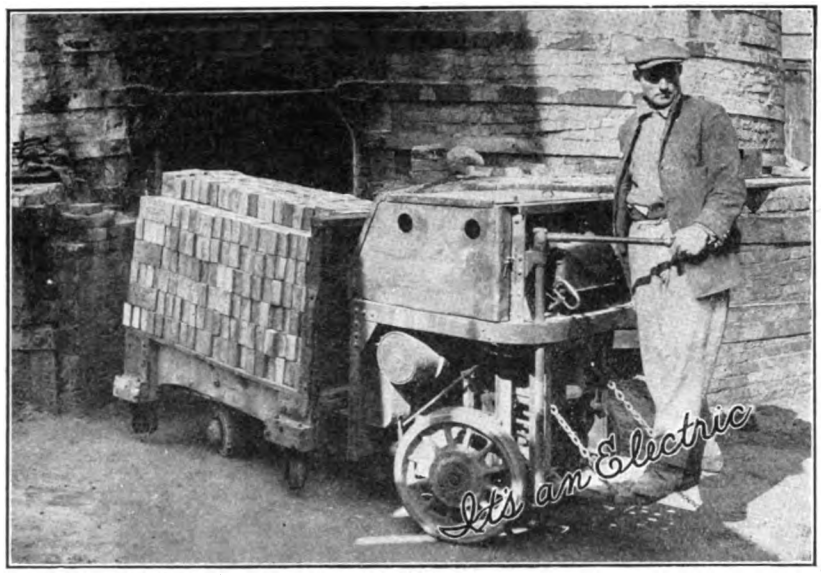


NITROSE *Metal Coating*

H10-Gray

For products not advertised in this issue write Industry Illustrated

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In the morning your electric industrial trucks start out freshly charged, and full of pep and speed. But as the day wears on and the battery is discharging, that speed begins to lag. Can it be made to hold up all day long? It can. Read below.

How to get more speed out of your electric trucks

in the afternoon

Scores of truck users now find it easy to get good speed on afternoon handling service. You can do it, too

WHEN a storage battery is fully charged, its voltage is at par and the speed at which it will drive an electric truck is at a maximum. As the truck travels, the battery is discharging and the speed is somewhat reduced. But if the battery maintains a high voltage during the discharge, the truck will travel at a good rate of speed right up to quitting time.

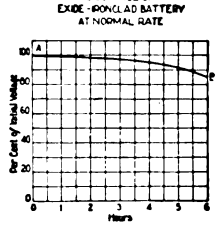
There is one battery whose voltage remains unusually high to the end of the discharge period. Its name is the Exide-Ironclad. When your trucks are equipped with this battery, they maintain a good speed all through the afternoon as well as the morning.

Scores of truck users will tell you that. And you can see the evidence for yourself in the accompanying chart, showing how the Exide-Ironclad Battery retains its voltage. You don't have to be an engineer to understand this.

The good speed that the Exide-Ironclad maintains is only one of many advantageous characteristics. It is packed with so much power, for one thing, and is so well able to deliver this power in a rush when badly needed, that it has little difficulty with steep hills or extra heavy loads.

The Exide-Ironclad is built so rugged, the way our thirty-eight years of experience have taught us to make it, that it hardly ever sees the repair shop. It charges quickly and easily, using current very economically. Its life is long and its first cost reasonable.

It will pay you to know all about this remarkable cost-cutting battery. Write now for a copy of our booklet, "Facts for consideration in selecting a Storage Battery," Form No. 2865. It gives full details.



Speed up your "electrics" with Exide-Ironclad Batteries. This chart shows that they maintain a high voltage throughout the entire day's operation.

Member SERVICE THE SOCIETY FOR ELECTRICAL DEVELOPMENT INC. SAFETY

Move It Electrically

Exide
IRONCLAD
BATTERIES

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

Exide Batteries of Canada, Limited, 153 Dufferin Street, Toronto

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Manufacturers' Bulletins and Catalogs

Helpful new literature for the man who selects and directs industrial equipment

Projected Sash

Catalog No. 12, issued by David Lupton's Sons Co., Philadelphia, Pa., contains 24 pages of illustrations and description of Lupton Projected Sash for offices, schools and commercial buildings.

Gas Year Book

The Peoples Gas Year Book for 1926, covering the history and operations of The Peoples Gas Light and Coke Co. in 1925, has been issued by this company whose main offices are in Chicago.

Wire Rope Users' Handbook

The Wire Rope Users' Handbook and General Price List has been issued, in the form of an 88-page book with illustrations and description of wire rope making, including special reference to recent developments on the subject, by the American Cable Co., Inc., 105 Hudson St., New York. How to measure wire rope; how, and how not, to uncoil or unreel wire rope; how to make an endless splice; how to properly seize rope, etc., are also included in this book.

"Dynamic Balancing Simplified"

is the title of a new treatise containing 62 pages of illustrations and description of the Gisholt Method of Balancing. The Gisholt (Precision) Balancing Machine is also described in this booklet, which has been issued by the Gisholt Machine Co., of Madison, Wis.

Trailer Transportation

The Economics of Trailer Transportation is the title of a 32-page booklet which illustrates and describes Lapeer Trailers and which has been issued by the Lapeer Trailer Corp., of Lapeer, Mich. Another booklet issued contains a special survey, made by the A. C. Nielsen Company, on the subject of Lapeer Semi-Trailers used by the Fedders Mfg. Co.

Industrial Chain Drives

A 36-page booklet containing illustrations and description of Industrial Chain Drives for economical power transmission has been issued by the Boston Gear Works Sales Co., Norfolk Downs (Quincy), Mass.

"Putting Quality Into Concrete Products"

is the title of Bulletin 315, which contains data based on extensive tests conducted at the government laboratories at Rock Island, Ill., and which were presented at the last meeting of the American Concrete Institute. This has been issued by the National Lime Association, 918 G St. N. W., Washington, D. C.

Heaters, Hot Water Storage and Fluid Meters

Three bulletins which illustrate and describe Cochrane Deaerating Heaters, Hot Water Storage in connection with exhaust steam heaters, Cochrane Fluid Meters for steam, water, air and gases in pipes, V-notch meters, weighing meters and volumetric meters, have been issued by The Cochrane Corp., 17th St. and Allegheny Ave., Philadelphia, Pa.

Gear Problems and IXL Speed Reducers

Catalog No. 200, containing 621 pages of illustrations and description of speed reducers, sprockets, chains, worm hobs, couplings, conveying equipment, gears of all kinds, mathematical tables, and information on mechanical engineering subjects, has been issued by the Foote Bros. Gear and Machine Co., 215 N. Curtis St., Chicago, Ill. A very complete cross referenced index is included in this book.

Regulators and Transformers

A 55-page publication, No. 1734, contains illustrations and description of Regulators for Generator-Voltage Control, and has been issued by the Westinghouse Electric and Mfg. Co., East Pittsburgh, Pa. Another bulletin issued is L.20288, which describes Westinghouse Shovel-Type Transformers.

Riveters

"Transportation Depends on Riveting" is the title of an illustrated circular which describes the Hanna Riveter being used on steel locomotives, steel cars, steel bridges, etc., and which has been issued by the Hanna Engineering Works, 1765 Elston Ave., Chicago, Ill.

Modulating Valve

Jenkins Fig. 700 Modulating Valve for low pressure steam, vacuum and vapor heating, is described and illustrated in a bulletin which has been issued by Jenkins Bros., 80 White St., New York.

Hand Cranes

Book 104, containing 32 pages of illustrations and description of Morris Hand Cranes for trolleys and chain-blocks, has been issued by Herbert Morris, Inc., Buffalo, N. Y.

Electric Cargo Winch, Soldering Iron, Motor Drive in Textile Mills, etc.

Several pieces of literature which illustrate and describe respectively a new Electric Cargo Winch; a new G-E Soldering Iron; Motor Drive in Textile Mills in a 20-page booklet; G-E Electric Heating Equipment for Industrial Ovens; G-E Helicoil Sheath Wire Unit; Constant Speed Induction Motors for Elevator Service, and Multi-Speed Induction Motors for Elevator Service, have been issued by the General Electric Co., Schenectady, N. Y.

Electric Ventilation and Fans

Electric Ventilation is described and illustrated in a 32-page booklet; American H. S. Fans, Class 15 M, are described in Bulletin 7003, which contains 28 pages of illustrations of these fans, and an illustrated circular describes the American Blower Man-Cooling Fans. This literature has been issued by the American Blower Co., of Detroit, Mich.

Steam Generator and Fin Furnace

Two booklets, one illustrating and describing the Combustion Steam Generator and the other, Catalog FF-1, describing in its 20 illustrated pages the C-E Fin Furnace—a water-cooled furnace which eliminates wall maintenance and increases boiler capacity—have been issued by the Combustion Engineering Corp., Broad St., New York. Catalog U-2 has been issued on the C-E Unit System for Burning Pulverized Fuel, and replaces U-1.

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"Which Oils Do We Need?"

The shop door swings open to the Bowser man, for he is an experienced adviser on oils, as well as on leak-proof, waste-proof storage equipment.

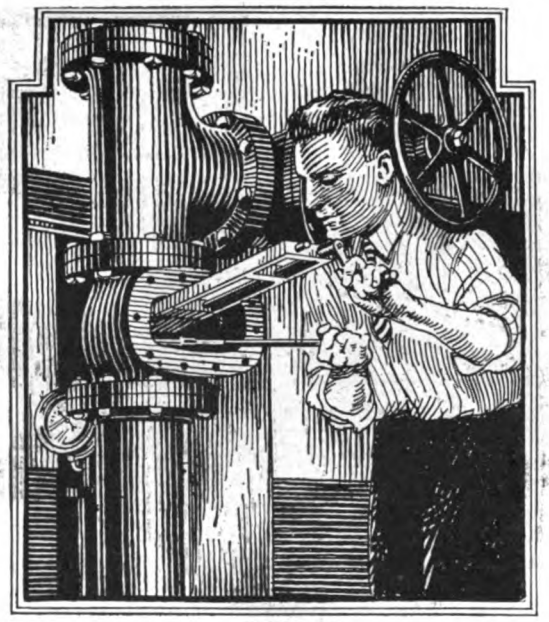
All over the world, Bowser men are being consulted as to the part that good oil plays in maintaining production. This experience is passed on to the home office, which is why our engineers are able to help you so effectively.

What we have learned about oils and about oil storage, in forty years of contact work, in making hundreds and thousands of Bowser installations, is at your service. Bowser engineers can supply short-cuts, economies in storage, ways to speed up service. They can help you handle the oils that best fit your needs. They can intelligently advise you as to practical ways for decreasing extravagant oil bills.

The next time a Bowser man calls, ask him to help you. Or, write to the home office for details—addressing Dept. 35, please.

S. F. BOWSER & COMPANY, Inc.
Dependable Pumps and Tanks
FORT WAYNE, INDIANA, U.S.A.

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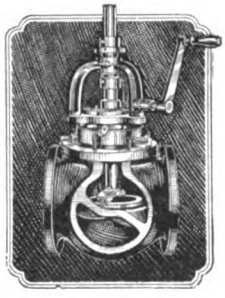
Maybe You've Overlooked This Way To Save Money

Valve replacement and repair expense is a mighty important item in your operating budget.

Do you know that you can cut it 90% or more by simply equipping your maintenance department with a Dexter Valve Reseating Outfit?

If there is an appreciable number of globe valves, gate valves or reciprocating pumps in your plant we can quickly prove to you that a Dexter Outfit will pay for itself "right off the bat."

Catalog 23 tells the story. Are you willing to be shown?



Dexter Globe Valve Reseating Machine

THE LEAVITT MACHINE CO.

27 East River Street, Orange, Mass., U. S. A.

Canadian Agency: Darling Bros., Ltd., 120 Prince Street, Montreal.

British Agency: Cromil Engineering Co., E. Floor, Milburn House, Newcastle-on-Tyne.

111

Valve Reseating Dexter Machines

Valve Reseating Machine

Catalog 23, containing 48 pages of illustrations and description of the Dexter Valve Reseating Machine has been issued by the Leavitt Machine Co., Orange, Mass. The first part of the booklet describes machines for reseating globe valves, the second part, machines for reseating gate valves, and the third part machines for refacing pump valve seats.

Arc Welding, Squirrel Cage Motors and Control Equipment

Several pieces of descriptive literature describing Arc Welding in G-E Factories; G-E Squirrel Cage Motors "500" Series; Wound Rotor Induction Motors, Types MT and MQ "900" Series; Type MT Control Equipment for direct current series wound crane bridge and trolley motors, have been issued by the General Electric Co., of Schenectady, N. Y.

Centrifugal Pumps, Electric Generators and Gasoline Power Units

Bulletins E, F and G, describing and illustrating Climax Gasoline Power Units, of the Portable and Stationary Types, Electric Generators (direct connected), and Direct Driven Centrifugal Pumps, respectively, have been issued by the Climax Engineering Co., Clinton, Iowa.

Equipment for Foundry, Steel Plants, Power Stations, etc.

A 48-page illustrated catalog, No. 175, which is a condensed catalog of equipment manufactured by Whiting Corp. and subsidiaries, includes description of Cranes, Foundry Equipment, Railway Equipment, Special Machinery, Evaporators, Crystallizers, Pulp Mill Machinery, Sugar Machinery, and Pulverized Coal Systems. This booklet has been issued by the Whiting Corp., of Harvey, Ill.

Tramrail Systems

The Cleveland Tramrail System is described in an illustrated circular, which has been issued by the Cleveland Electric Tramrail Division of the Cleveland Crane & Engineering Co., Wickliffe, Ohio.

Loading Machines and Coal Crushers

The Mayne Loader, a simple loading machine which loads increased tonnage of ore in the mine tunnels at reduced cost per ton, is illustrated and described in Catalog No. 45, which has been issued by The Webster Mfg. Co., Chicago, Ill. Webster Coal Crushers for crushing lump or run of mine coal to stoker sizes at the mine and in the boiler house are described in Catalog No. 44, issued by this company.

Steam Trap

The Armstrong Steam Trap is illustrated and described in Catalog E, which contains 33 pages, and which has been issued by the Armstrong Machine Works, Three Rivers, Mich.

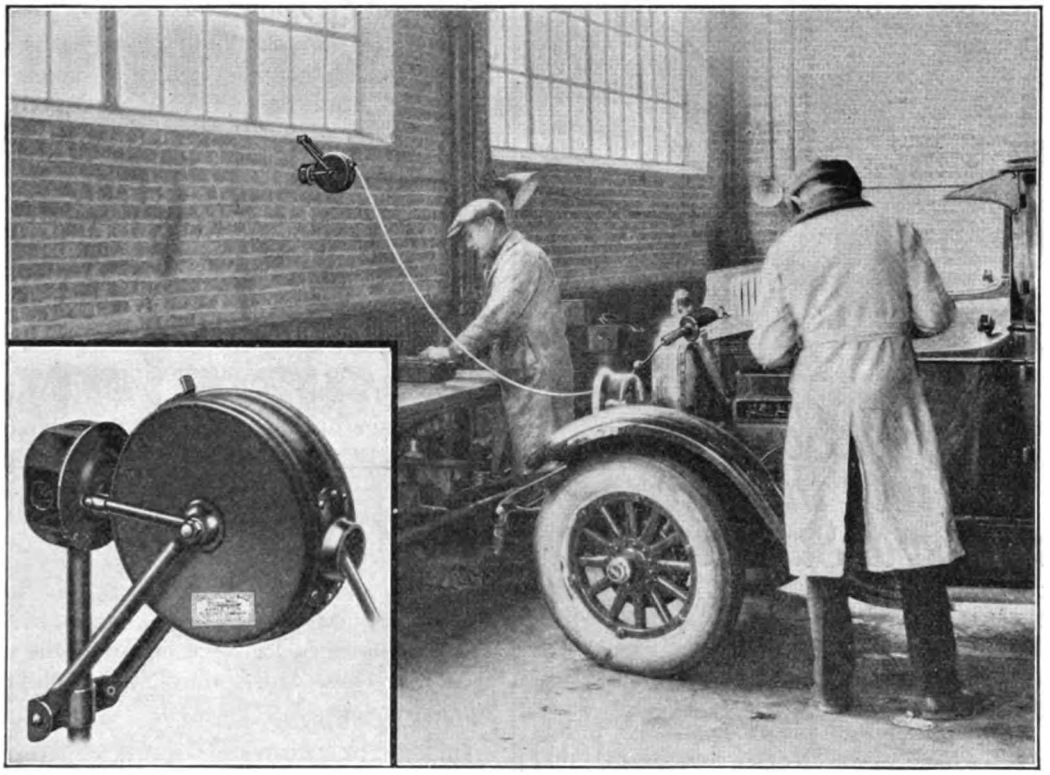
Fountain of Illuminated Oil

The Bowser Fountain of Illuminated Oil is illustrated and described in a booklet which is entitled "Show Your Colors!" This has been issued by S. F. Bowser & Co., Inc., Fort Wayne, Ind.

Truck Wheels and Casters

"A Book of Truck Wheels and Casters" is the title of a 16-page illustrated booklet which describes Howlett Canvas and Rubber Tired Wheels, and which has been issued by The Howlett Co., Utica, N. Y.

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Portable type Reelite supplied with supporting bracket to mount at side-wall outlet box instead of overhead. Brackets can be ordered separately or integral with Reelite.

Put a Reelite in a handy place and forget your lighting troubles

IT LOOKS after itself, keeps the cord off dirty floors, keeps the bulb out of harm's way, is always ready for instant duty.

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And wherever they are, they are paying their cost many times over by saving cord-renewals, bulb-renewals, loss of time.

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The Handy Light on a Reel

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No pit to dig, no platform to build, no leveling or skilled labor needed to install the No. 9 Sarco Steam Trap. Just screw it into the line anywhere, so long as it is in a vertical position.

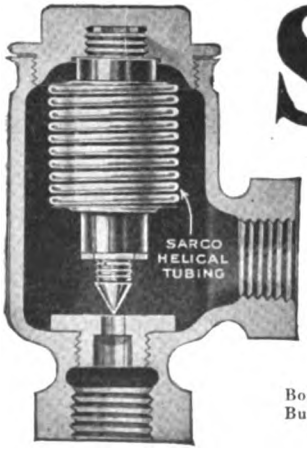
The Sarco is so easy to install and so inexpensive to buy (only one-third the cost of bucket and float traps) that you can profitably trap steam lines throughout your plant—lines where, with the ordinary steam trap, the cost of installation would have eaten up the gain due to trapping.

And the Sarco requires little more space than an elbow. Can be placed at steam-wasting points where the bulkiness of most traps would prevent their use.

The Sarco has only one moving part. No intricate parts to get out of order. Cannot air bind. Is made entirely of bronze and hence can't rust or stick.

It works without adjustment on any steam pressure from 0 to 100 lbs.

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(Check) Please send:
☐ No. 9 Sarco Steam Trap, size..... on 30 days' free trial.
☐ Booklet R 268.

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Address .....
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Automatic Pumping

Bulletin 400a, containing 21 pages, is on the subject of Automatic Pumping, which is taken from a paper delivered before the A. I. E. E. in March. This booklet has been issued by Barrett, Haentjens & Co., Hazleton, Pa.

Flexible Tread Cranes

Orton Flexible Tread Cranes, Models "T" and "E" Convertible, are described and illustrated in Bulletin No. 41, containing 24 pages, which has been issued by the Orton Crane and Shovel Co., Transportation Bldg., Chicago, Ill.

Blower Systems

A 49-page illustrated booklet describing Kirk & Blum Blower Systems for collecting, ventilating and conveying, has been issued by The Kirk & Blum Mfg. Co., Cincinnati, Ohio.

Thermometers and Hydrometers

Catalog No. 417A, containing 20 pages of illustrations and description of TAG "Laboratory" Thermometers and Hydrometers, has been issued by the C. J. Tagliabue Mfg. Co., 18-88 Thirty-third St., Brooklyn, N. Y.

Flexible Coupling

Bulletin 108 illustrating and describing the Poole All-Metal Flexible Coupling has been issued by the Poole Engineering & Machine Co., Baltimore, Md.

Portable Elevators

Delta Portable Elevators are illustrated and described in a circular which has been issued by the New Jersey Foundry & Machine Co., of 90 West St., New York.

"The Spindle Book"

is the title of a catalog which illustrates and describes Drilling Machines, Portable Tools, Tapping Machines and Attachments, Lathes, Screw Machines and Centering Machines, Woodworking Machinery, Valve Refacing Machines, Drill and Tap Grinders and other special purpose tools, etc. This book has been issued by The Jacobs Mfg. Co., Hartford, Conn.

Air Operated Devices

"Logan" Air Operated Devices, such as Chucks, Arbor Presses, Cylinders, Pressure Gauges, Valves, Automatic Lubricators, etc., are illustrated and described in Catalog R-22, which has been issued by The Logansport Machine Co., Logansport, Ind.

"Industry's Electrical Progress"

is the title of Publication No. C-37, which contains 35 pages. The author emphasizes that the competitive advantages which electric power brings to industry lies in the effectiveness with which electricity is utilized. He states that the consumption of electricity for industrial purposes has increased 3000% since 1905, and almost doubled since 1921, and also points out the progress which has been made in electrical equipment. This has been issued by The Cutler-Hammer Mfg. Co., Milwaukee, Wis.

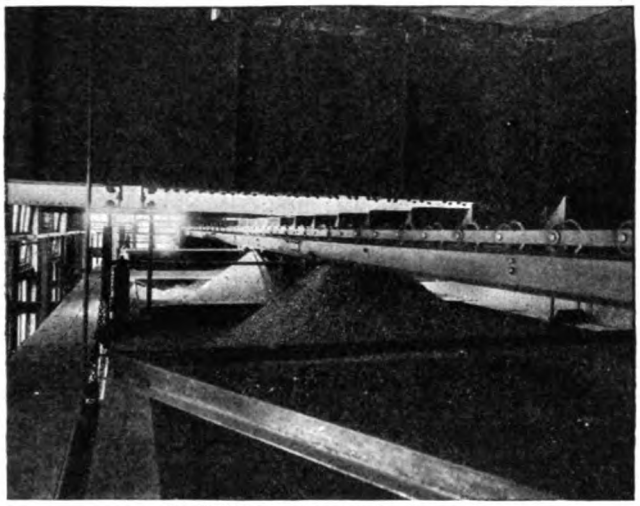
Awards of Medals

A booklet commemorating the award of the John Scott Medals to members of the Norton Co., namely, to Aldus C. Higgins in 1914, and to Charles H. Norton in 1925, has been issued by the Norton Co., of Worcester, Mass.

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What's coal *in* your business?



Rex "V" Bucket Conveyor handling coal

Coal in everybody's business is a source of power.

In our business it is also a commodity to be handled.

Your business is to get the most power out of the coal with the least possible incidental expense. A large part of our business is specialized designing and building of the coal and ash handling equipment that will cut the cost of coal handling in your business.

Our business is to build it for you, whether your business is a small factory or a big central station.

Don't you think it is time that your business and ours got together on the matter of your power costs? If so, will you please write.

REX CONVEYORS

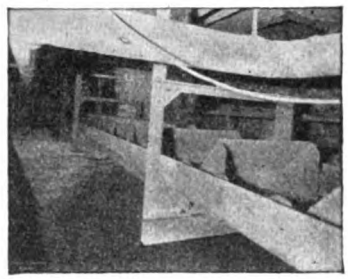
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Old King Coal and The Grey Ghost



Old King Coal is a pleasant fellow to work with. Rex Engineers know him well. They are skilled in working out the combinations of conveyors, weigh larries, spouts, bins, etc., that will get Old King Coal to the boilers in the way that best fits the plant layout, rating of the plant, frequency of use of the conveyors and storage available.



Rex "V" bucket conveyor

It is strange that such a jolly old fellow as Old King Coal should, on departing, leave such a devil behind him as the Grey Ghost, his ashes. They swirl out into the plant at any opportunity. They are usually hot and wet, three times as abrasive as coal and delight in wrecking the machinery that handles them.

In fact it is frequently more trouble to get the ashes out than it is to get the coal in. Rex Engineers handle the Grey Ghost roughly, they hustle him out of the plant at the lowest cost, and cut short his opportunities for malicious mischief.

Part of our business is to have engineers to work out complete systems for handling coal in and ashes out. Will you write our business on the needs of yours?

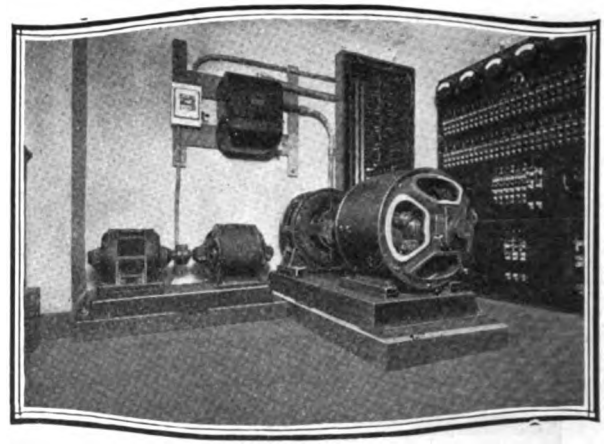
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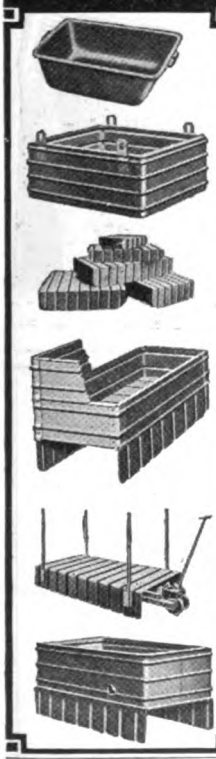
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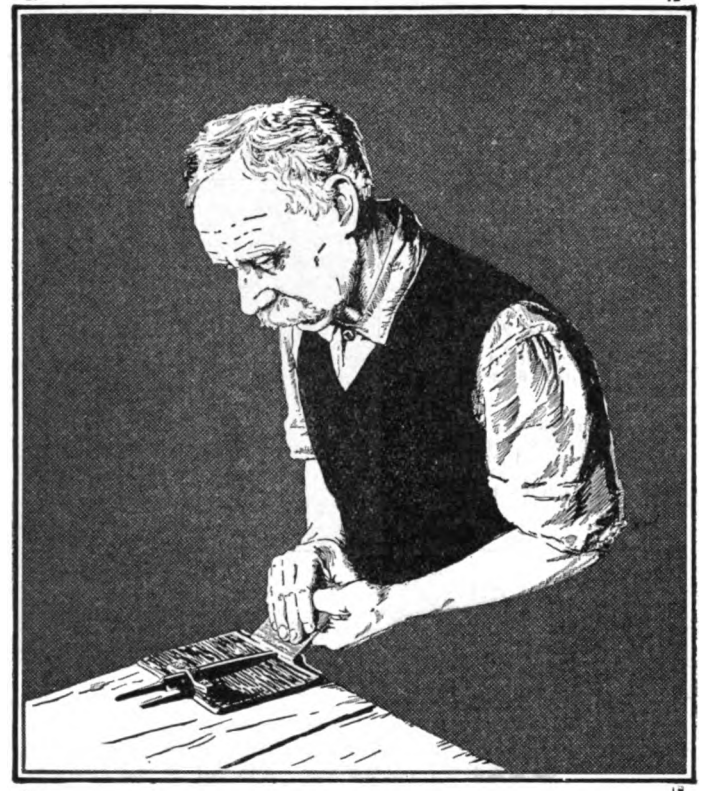
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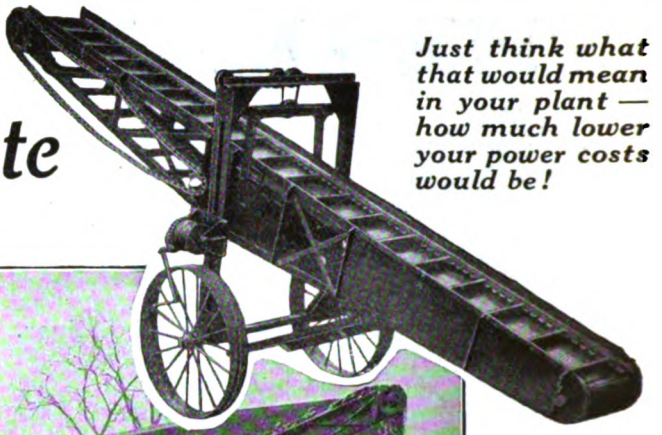
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"SCHIEREN BELTS DO LAST LONGER"

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Unloads 2 Tons of Coal a Minute

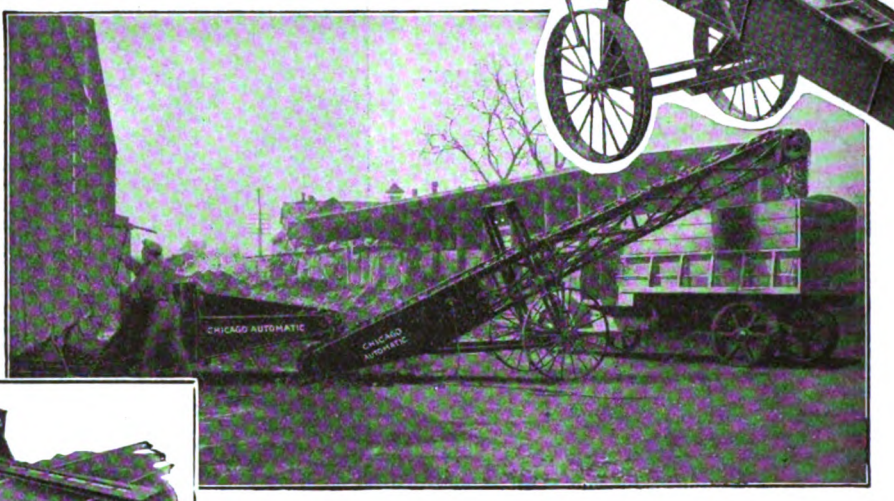
Just think what that would mean in your plant — how much lower your power costs would be!

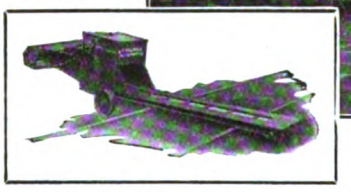


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Chicago Automatic Conveyors have for years reduced coal handling costs in hundreds of industrial plants in the United States and Canada.

There's a Chicago Automatic Conveyor right in your neighborhood handling coal more economically year after year. Let us tell you about it.





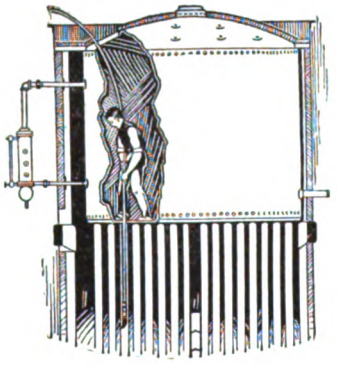
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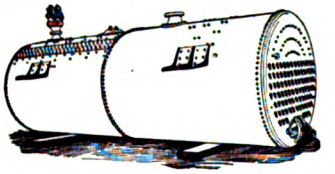
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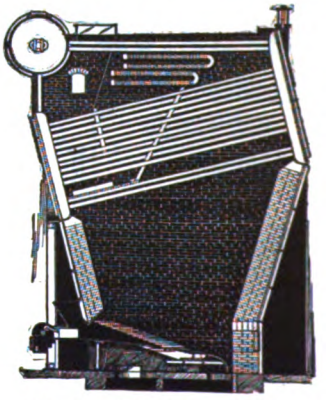
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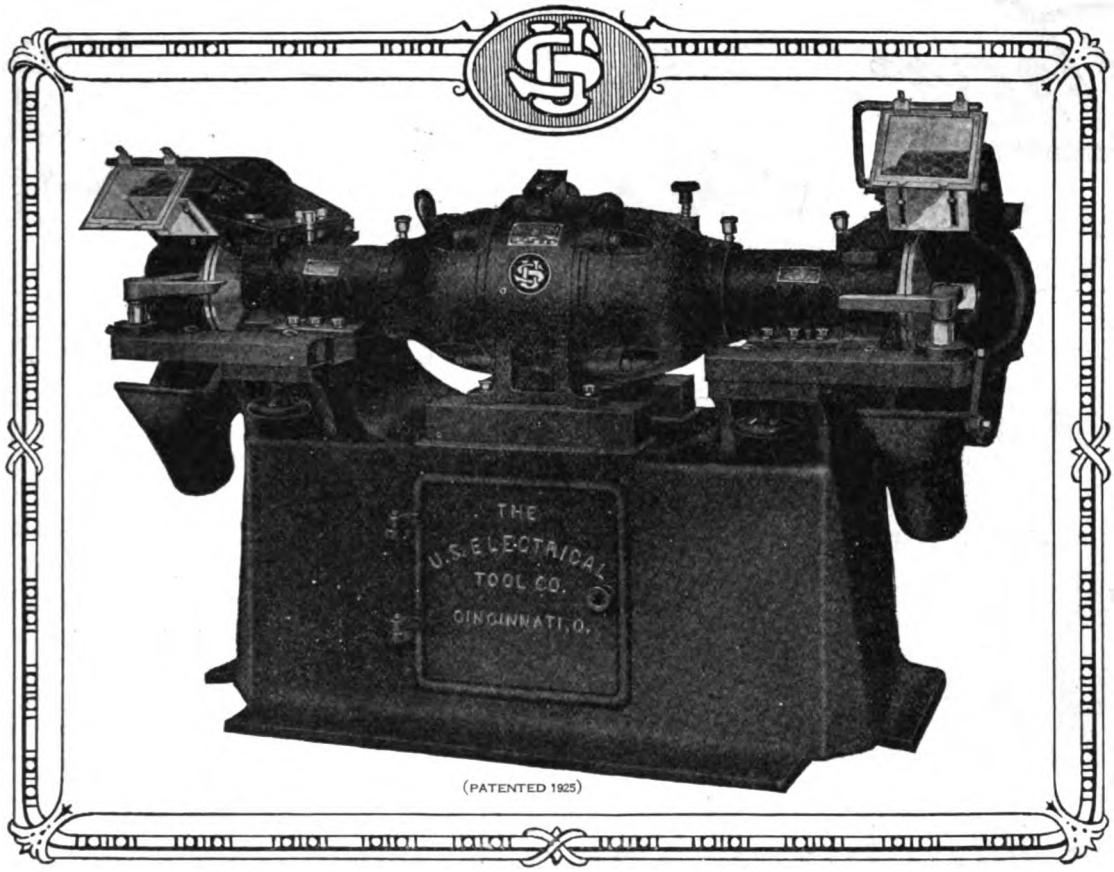
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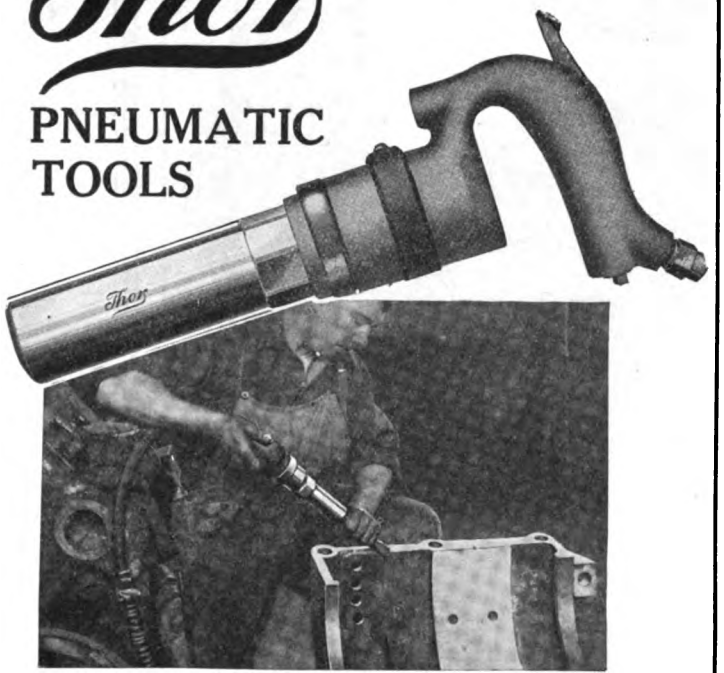
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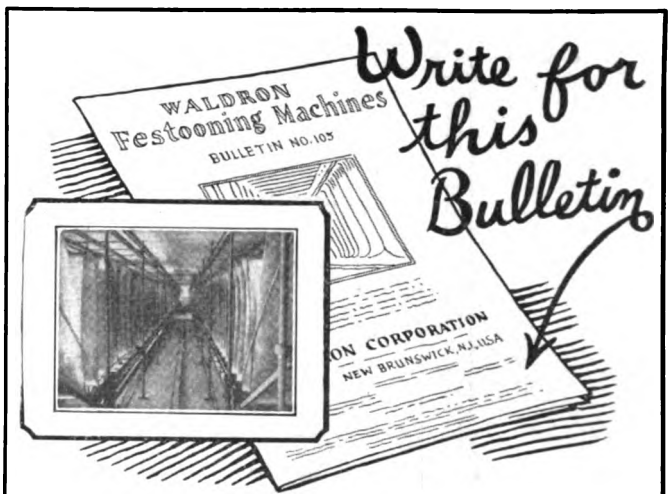
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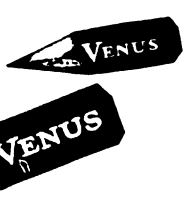
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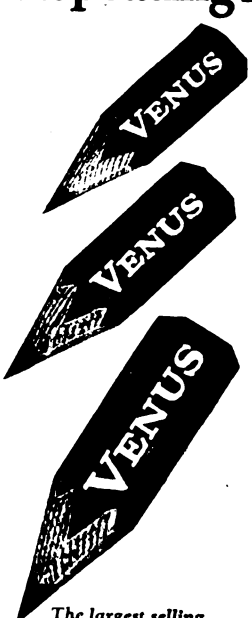
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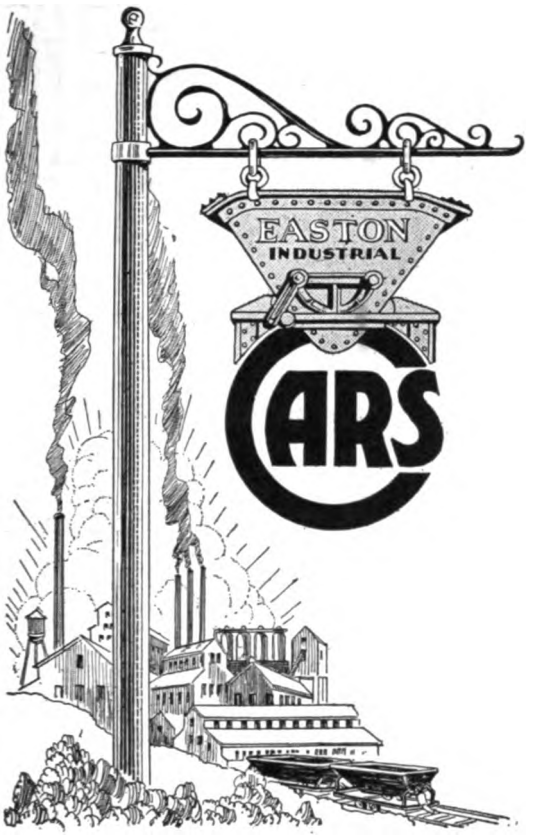
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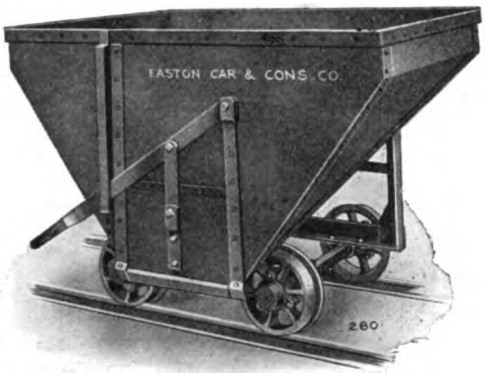
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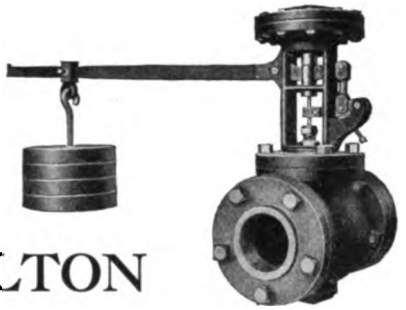


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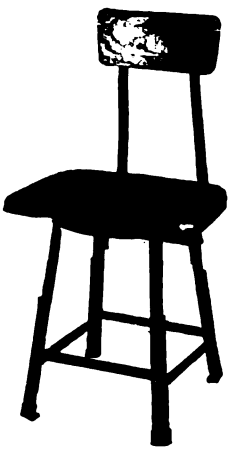
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Anti-Friction Bearings, that permit higher speed at the lowest friction loss. See page 35. The New Departure Mfg. Co.

An Average Power Saving of 15 per cent. is shown on page 6 by Hyatt Roller Bearing Co.

A Saving of 8% in Power with self-aligning ball bearing hangers. See page 4. SKF Industries, Incorporated.

An Oilless Bearing is described on page 58 by the Arguto Oilless Bearing Co.

ELECTRICAL EQUIPMENT. (Motors, Generators, Buffers, Polishers, Grinders, etc.)

A Motor Built for the Hardest Jobs in the Plant. Complete details, prices, etc., can be obtained from Howell Electric Motors Co. See pages 82-83.

Descriptive Bulletins on Motor Generator Sets for practically every purpose are offered by Diehl Manufacturing Company. See page 102.

Bulletins Describing a Ball Bearing Motor are offered by The Valley Electric Co. See page 93.

Tap Drill Chart Cards useful for designers and builders of machinery are being issued by Wisconsin Electric Co. See page 47.

Motors Built for Specific Production Requirements. See page 81. The Domestic Electric Company.

Complete Details can be obtained on a Motor that gives long service. See page 115. Master Electric Company.

"Industry's Electrical Progress" is a story of savings through modern motor control of machinery and equipment, and can be obtained from The Cutler-Hammer Mfg. Co. See page 121.

Information on Drop Cord System that saves its cost many times in lamp renewals. See page 99. Appleton Electric Co.

A Nation-Wide Service in electric motors. General Electric Co. See pages 64-65-113.

Catalog "E" very interestingly describes an adjustable speed grinder that saves its cost in one year. See page 105. The U. S. Electrical Tool Co.

Information on Lighting Fixtures, adjustable for any operation, is given in the catalog offered by the American Fixture Co. See page 115.

MAINTENANCE

An Interesting Booklet and Sample on a Waterproof, Acid, Alkali, and Brine resisting Paint. American Asphalt Paint Co. See page 63.

A New Chart and a Folder which aid in the selection of the exact liquid window cleaner for every purpose are offered by The Gerson-Stewart Corp. Mfrs. See page 77.

Metal Case Brooms for every industrial purpose. For illustrated booklet and price list see Joseph Lay Co. advertisement on page 69.

An Oily Waste Can that outwears 3 to 5 of the ordinary kind is described on page 60 by The Witt Cornice Company.

Descriptive Bulletins on Metal Coating that can be applied right over wet, rusty, oily and hot surfaces. For information see page 94. The Nitrose Company.

Coatings that Cut Down Upkeep on Roofs, Floors and Walls, Choice of samples offered by L. Sonneborn Sons, Inc. See page 85.

An Illustrated Booklet, "More Light" on the use of factory paint is offered by the U. S. Gutta Percha Paint Co. See page 9.

Information on Scientifically prepared Coatings for all industrial purposes can be obtained from The Goheen Corporation. See Inside Back Cover.

Catalog No. 23 contains information on valve reseating machines, useful in any power plant and factory. The Leavitt Machine Co., page 98.

Blowers for Heating, Ventilating and Mechanical Draft. For information see page 119. American Blower Company.

An Engineering Service is offered by Truscon Steel Co. on Mechanical operated steel windows. See page 3.

The Proper Handling and Storage of Lubricating Oils. See page 97. S. F. Browser & Co., Inc.

Bulletin No. 90 on Fan Furnaces is offered by New York Blower Co. See page 103.

A Painting Method that makes the painting of industrial plants an economical and low cost labor saving method. See page 37. The Vortex Manufacturing Co.

A Quick, Permanent Way of Repairing Floors, see page 101. The Master Builders Company.

MATERIALS HANDLING EQUIPMENT

An Industrial Truck Trailer, with Hyatt roller bearings that makes tremendous savings in materials handling is manufactured by Lansing Company. Page 59.

Any Type of Truck or Caster can be equipped with the new Floor Saving Wood Wheels made by the Metzger Company, Inc. See page 86. Booklet offered.

A catalog and booklet, "Euclid Utility," can be obtained from The Euclid Crane & Hoist Co. See page 94.

Factory Certified Wire Rope for use as crane cable. See page 14. Williamsport Wire Rope Co.

The Link Belt Bucket Elevator is described on page 122 by The Link Belt Co.

A free trial offer on a lift truck that handles materials with less cost than any other material handling system. See page 110. Barret-Cravens Company.

A Handy Tool for Moving the Heaviest of Railroad Cars. For information see page 71. The Advance Car Mover Company.

An Elevating Truck with a quick, detachable boom. For description, see page 38. The Yale & Towne Mfg. Co.

Fifty Years of Conveyor Service, the record of the Logan Company. Details on page 1.

Catalogue L-66 gives Useful Information on an inexpensive device that enables you to run your conveyors at any

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Make Cheaper and Stronger Benches!



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Steel Bench Legs and Steel Bench Drawers

Build your benches on "Hallowell" Steel Bench Legs and they'll last almost forever. The wide base pyramid effect of the feet often saves fastening to the floor. "Hallowell"-legged Benches are easy to move—they are rigid and can't come apart or get wobbly.

It actually costs less to build benches with "Hallowell" Steel Bench Legs and besides, they can be picked up from stock exactly as wanted and just when needed.

"Hallowell" Steel Bench Drawers are dust-proof and may be equipped with lock and if desired special sliding Tray. Every bench should have one.

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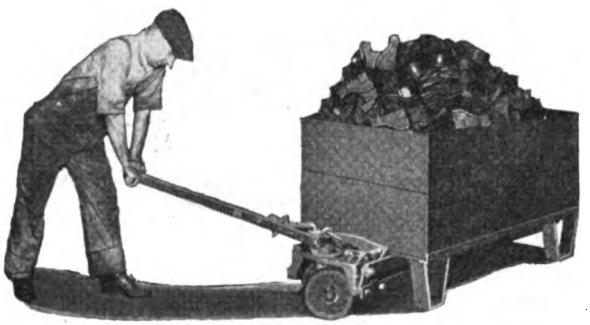
Standard Pressed Steel Co.

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Barrett Handling Equipment



Adapted to Your Particular Plant

The Barrett Lift-Truck is adapted to use in *your* plant, to handle *your* material with less cost, less time, less labor than any other material handling system.

Manufacturers in more than 310 different industries are using Barrett Lift-Trucks because Barretts mean

50% speedier handling
25% easier lifting
Complete elimination of waste in material handling
Lower operation costs

Write for FREE Trial Offer and booklet which describes savings you can make in material handling.

"Steeleg" Platforms for Lift-Trucks

Barrett "Steeleg" Platforms increase the speedy operation of trucking systems. Strongly built with rigid steel legs and maple top boards—every board end steel gripped—nothing to become wobbly. Built in all sizes to fit all Lift-Trucks.

BARRETT-CRAVENS COMPANY—1334 West Monroe Street, Chicago, Ill.—Grand Central Palace, New York—Sole Licensee for Canada, Riley Engineering & Supply Co., Ltd., 360 Dufferin St., Toronto—Paris, Factory, Barrett-Cravens Co., 9 Rue de Rocroy. Distributors in all principal cities of the world.

EASIEST LIFT—BY ACTUAL TEST

speed desired. See pages 49-50. Reeves Pulley Company.

A Booklet "Facts for Consideration in Selecting a Storage Battery" is offered by the Electric Storage Battery Co. See page 95.

An Illustrated Catalog on Hand Trucks that are steel-bound wherever wooden surfaces must be protected can be obtained from The Fairbanks Company. See page 71.

Information on a High Speed Hoist that has 21 points of superiority, can be obtained from the Wright Manufacturing Company. See page 102.

Industrial Tractors, Trucks and Cranes that save enough on handling costs to charge off the purchase price in six months. See page 116. The Baker-Raulang Co.

A Complete Engineering Service that solves elevating conveying, crushing and screening problems is offered by The Jeffrey Manufacturing Co. See page 11.

An Overhead Monorail System that can be applied to every industry is shown on page 13 by The Louden Machinery Company.

Four Different Types and Fifteen Different Models of Tractors are described in Bulletin 106. Other bulletins are offered: A100 showing all purpose Industrial Trailers. A125 and A120 also give complete descriptions of their line of trailers for every industrial requirement. See pages 42-43. Mercury Manufacturing Company.

Catalog Showing Trucks, Barrels, Boxes and Trays for transporting and storage of packages, parts, raw material, trimmings, etc. See page 76. Rogers Fiber Co.

A Conveyor Belt that made a tonnage record. See page 111. United States Rubber Company.

Bulletin 515 contains the complete story of a Pneumatic Conveying System recently installed. See page 30. Dust Recovering & Conveying Co.

Another Engineering Study of a crane installation is shown on page 51 by Whiting Corp.

A sixty-eight page "Book of Illustrated Economies," giving figures and actual photographic illustrations and a sixty page, "Floor Operated Hoist Catalog" are offered by the Shepard Electric Crane & Hoist Co. Back Cover.

Industrial Railway Equipment for every requirement. See page 107. Easton Car & Construction Co.

Information on Equipment that Lowers Handling Costs in the yard or plant is shown on page 33 by Barber-Green Co.

Handling Coal Cheaper. See page 101. Chain Belt Co.

Information on Canvas Cushion Wheels for every type of factory truck, that eliminates tire replacement. See page 10. Divine Brothers Company.

Equipment that Minimizes the Handling of Products. The Powell Pressed Steel Co. Page 103.

"Snapshots of Sensible Savings" is a book describing various uses of a Tier-Lift Truck. See page 117. Lakewood Engineering Co.

The "Merrick Catalog" shows how bulk materials can be weighed while conveyor handled. The Merrick-Scale Co. See page 118.

A Thirty Day Trial Offer on a Portable Crane that is known as the handiest tool in the shop. For information see page 117. Canton Foundry and Machine Co.

A New Track Unloader that fits right on to the coal car is described on page 104 by the Chicago Automatic Conveyor Company.

POWER PLANT EQUIPMENT AND AUXILIARIES

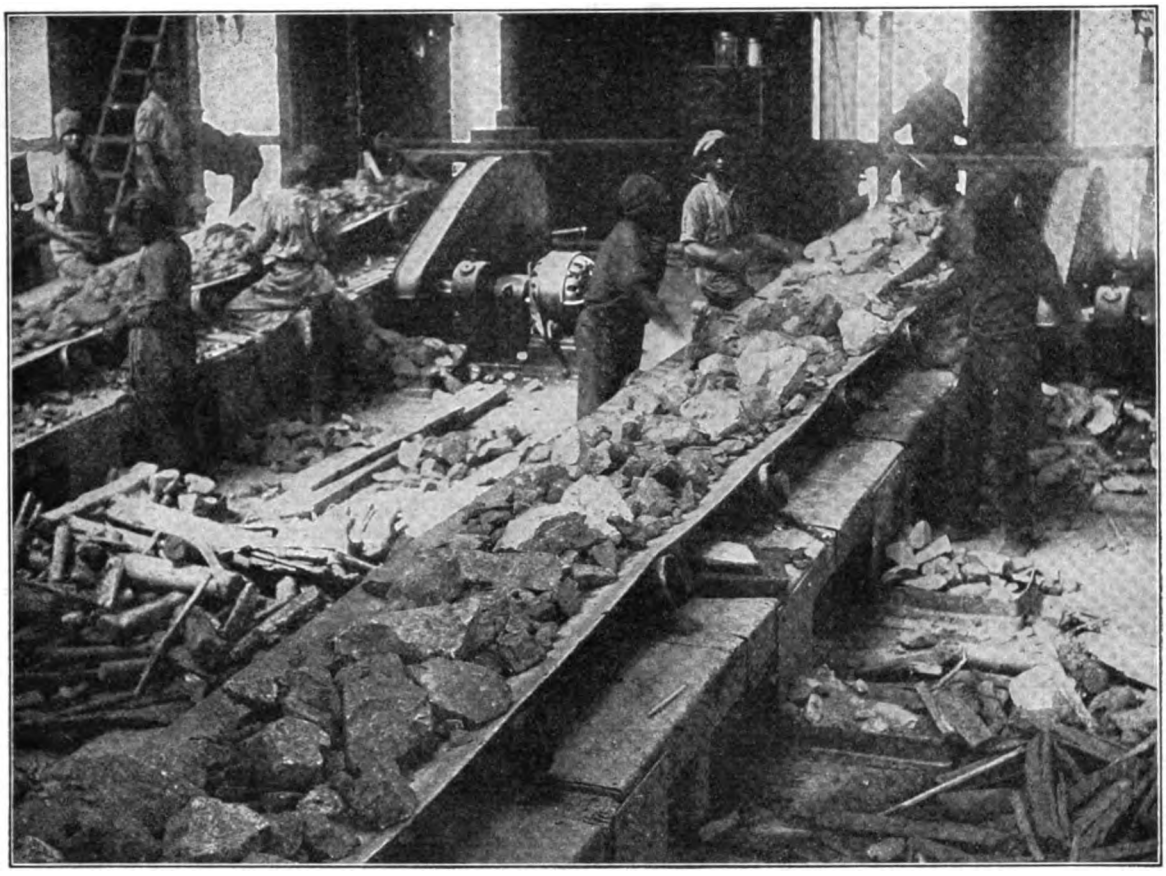
Catalog No. 475 describes the Baby Conoidal Fans for general ventilating and exhausting work. For a copy, write Buffalo Forge Company. See page 61.

Catalog and Price Lists on Steam Unions that prevent loss of steam, can be obtained from the E. M. Dart Mfg. Company. See page 94.

Bulletins on Jennings Heating Pumps, containing valuable information on heating system installations. Nash Engineering Co. on page 16.

Catalog No. 10 illustrates and describes an industrial ther-

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"U. S." Conveyor Belt Makes Tonnage Record in South African Gold Mine—

ALL over the world "U. S." Conveyor Belts are carrying materials of every description efficiently—and economically. From South Africa comes the story of a "U. S." Giant Conveyor Belt which recently set up a new tonnage record.

1,102,964 tons of gold ore were carried by this 36-inch "U. S." Belt in a record breaking run of 1,327 days at the mine of the Randfontein Estates Gold Mining Company. This remarkable performance was the best ever given by any belt under the unusually severe conditions existing in this mine. Never before had any belt given more than 950 days service.

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"U. S." Conveyor Belting is built to meet the individual needs of the installation. Our sales engineers, backed by 75 years experience in the manufacture and installation of mechanical rubber goods, are ready to serve you. The "U. S." trade-mark is your guarantee from the world's largest rubber organization of satisfactory quality and service.

United States Rubber Company

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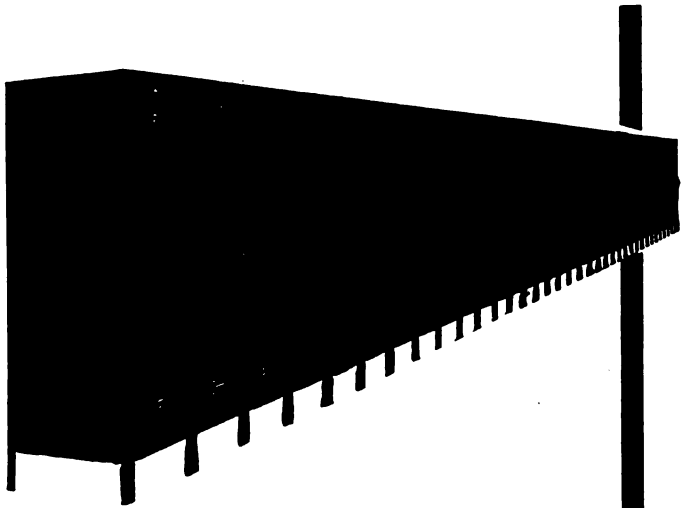
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The Unseen Quality That Determines Value

In nearly every article there are unseen parts that constitute its value. In a locker the unseen values are also present. The built-in engineering principles may not be apparent to the eye.

In Durand lockers you will find the highest grade materials and the best of engineering. A minute examination will reveal the reason for long life and service-giving qualities. The one-piece angle frame, the special Durand hinge, the 16 gauge steel door are but a few of the important features of Durand lockers. The rigid standards adopted for Durand lockers and religiously adhered to assure their long life and entire dependability.

These unseen values reveal themselves in satisfactory service over a long period of use. Write for the Durand catalog.

DURAND STEEL LOCKER CO. INC.
1539 First National Bank Building
Chicago, Illinois

mometer that can be read from a distance of twenty feet. The Moto Meter Company, Inc., on page 57.

A Steam Trap with Only One Moving Part is described in Catalog A-12 by Davis Engineering Corp. See page 92.

Free Trial Offer of a Steam Trap that spells fuel economy can be obtained from the Sarco Co., Inc. Also write for booklet R. 268. See page 100.

Catalog Describing a Gas-Fuel Boiler Governor can be obtained from the Chaplin-Fulton Mfg. Co. See page 107.

Very Interesting Bulletins on Boiler Room Economies are offered by the Wickes Boiler Co. See page 104.

A Steam Trap on a 90 Day Trial also catalog. Offered by the Armstrong Machine Wks. See page 118.

TOOLS. Shop Tools, Saws, Files, Chucks, etc.

A Description of a Vise built to stand plenty of rough stuff. See page 78. Prentiss Vise Co.

High Speed Drills with forty-five years experience behind them. See page 71. The Standard Tool Company.

Features of the New Keyless, Ball Bearing Drill Chuck are described on page 87 by Eastern Tube & Tool Co.

Catalog 57B describes a vise with seven distinct and exclusive features of construction. See page 90. The Charles Parker Company.

An Ornamental nut with the strength of steel and the non-corrosive qualities of Brass, Copper, Nickel Silver, or other non-ferrous metals. See page 90. The Ferry Cap & Set Screw Co.

Tools That are Built for Maximum Service are shown by Morse Twist Drill & Machine Co. See page 66.

Sample Blades are Offered by Victor Saw Works. See page 87.

Information on Portable and Bench Type Woodworking Machines is offered by Gallmeyer & Livingston Co., page 69.

Chrome Vanadium Wrench Kits for Millwrights, Loom-fixers and other Shop Mechanics. See Inside Front Cover. Bonney Forge and Tool Works.

High Speed Drills for high speed production. See page 73. The Cleveland Twist Drill Co.

A New Organization offering a unique service to users of grinding machines has been formed by Cincinnati Grinders, Incorporated. See page 15.

The Spindle Book, now ready, shows a complete list and information about different classes of machines and their spindle specifications. For a copy see page 67. Jacobs Mfg. Co.

Files for Speed, Ease and Depth of Cutting. See page 34. Simonds Saw & Steel Co.

Special Analysis Steel can be obtained from Ludlum Steel Co. Page 90.

Catalog No. 30 on Small Tools and Catalog No. 138 on the complete line of machine tools can be obtained from Brown & Sharpe Mfg. Co. See page 84.

A One piece forged screw driver made of high quality special analysis steel. See page 61. American Saw & Mfg. Co.

TRANSMISSION EQUIPMENT. Including Belting

Samples of a New Belt Fastener with self aligning plates and rivets are offered by The Bourne-Fuller Company on page 2.

A Coast to Coast Service in paper pulleys. See page 79. Rockwood Manufacturing Co.

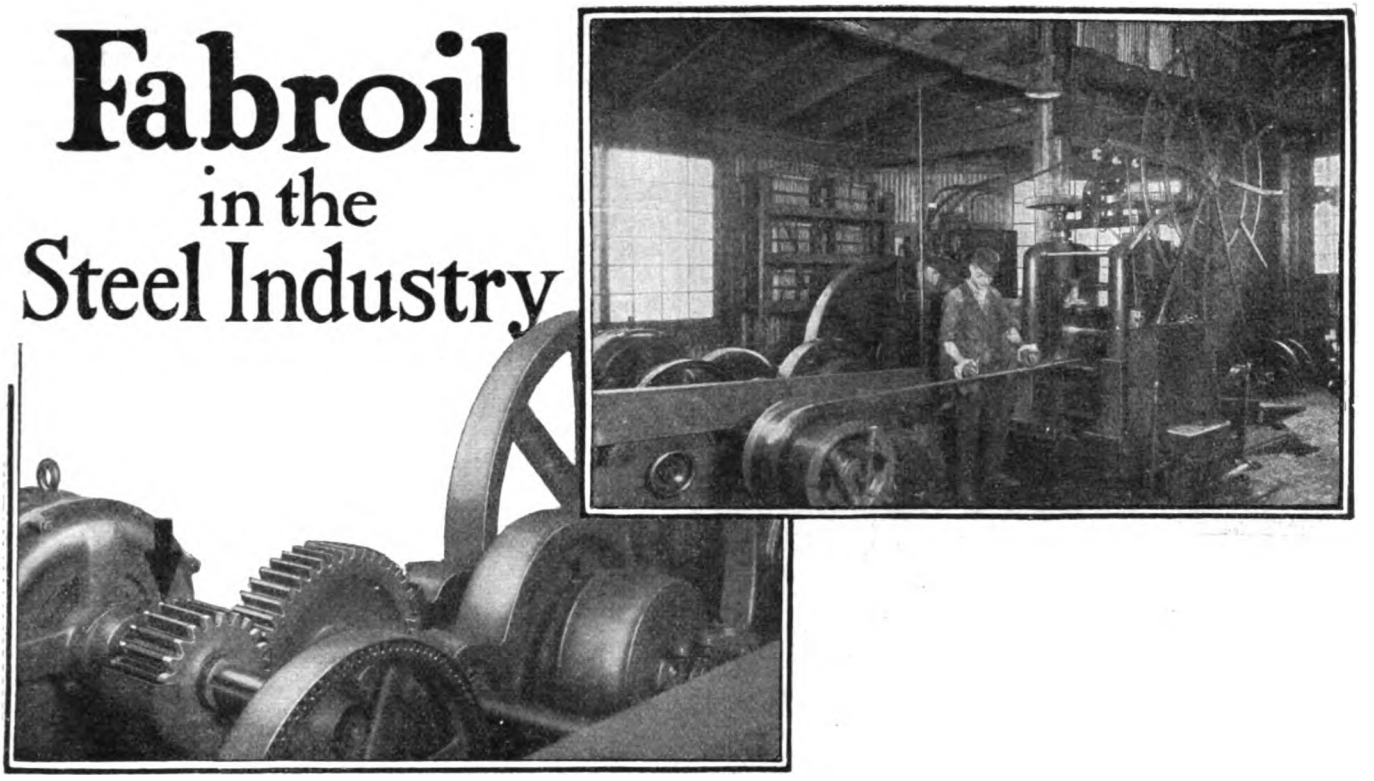
A Booklet, "There's Money in This for You," that answers questions on belt care and operation can be obtained from Chas. A. Schieren Co. Pages 62-103.

Gears That Make Quieter Service Possible are described on pages 64-65-113 by General Electric Co.

Medart Catalog No. 43 and Discount Sheet cover dimensions, details and list prices of the entire range of power trans-

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Fabroil in the Steel Industry



Gone are the waves

Gone are the waves from the steel strip produced by the Pittsburgh Rolled Steel Company, since Fabroil was installed.

The resiliency of Fabroil has reduced the rejections of steel strip because, by absorbing all shocks, it permits the material to be rolled with uniform thickness and without undesirable waves.

Wherever the driving mechanism introduces uneven impulses, Fabroil will dampen them out. It prevents tool chatter in machine tools and improves products in its many other applications to rolling and machining.

With its enduring strength, it stands up under the toughest jobs, and with quiet service, improves working conditions.

Distributors for G-E Non-Metallic Gears

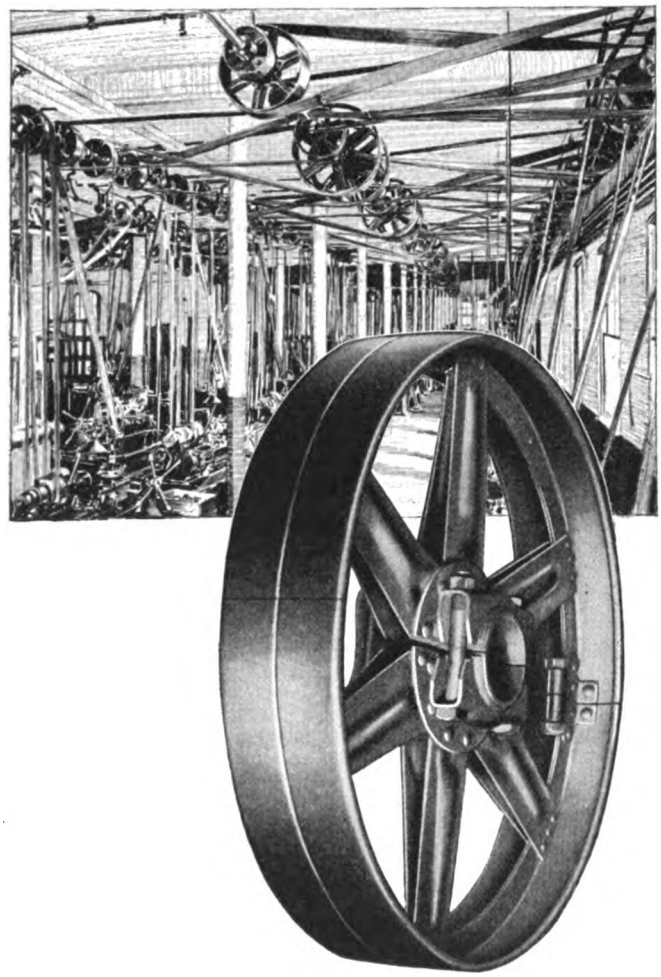
Boston Gear Works, Norfolk Downs, Mass., with branches in Boston, New York, Cleveland, Chicago, and Philadelphia
Chicago Rawhide Manufacturing Co., Chicago, Ill.
Cincinnati Gear Co., Cincinnati, Ohio
Crago Gear & Machine Works, Kansas City, Mo.
Wm. Ganschow Co., Chicago, Ill.
Horsburgh & Scott Co., Cleveland, Ohio
Johnson Gear Co., Berkeley, Cal., with branches in Los Angeles & San Francisco
The Medart Co., St. Louis, Mo.
Michigan Gear and Engineering Co., Detroit, Mich.
Philadelphia Gear Works, Phila., Pa., with branch in New York City
Pittsburg Gear and Machine Co., Pittsburg, Pa.

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He knows that in such a shop everyone works with greater zest and accomplishes more and better results.

One of the *practical* means of building up this sort of shop pride, is to buy and install equipment that combines the maximum of utility with distinct elements of beauty.



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Such a combination awaits you in "American" Steel Split Pulleys and "American" Pressed Steel Shaft Hangers. They "team up" to transmit power efficiently and to build "shop pride" in mechanical equipment.

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Manufacturers of Steel Split Transmission Pulleys, Pressed Steel Shaft Hangers, Pressed Steel Hand Trucks and Pressed Steel Shapes

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For nearest dealer, see MacRae's Blue Book

AMERICAN PRESSED STEEL HANGERS | STEEL SPLIT PULLEYS

PATENTED PATENTED

mission equipment made by The Medart Co. See page 70.

Literature that Explains the Advantages of Pulleys and Pressed Steel Hangers is offered by the American Pulley Co. See page 114.

A 60-Day Trial on a Belt Preservative. See page 116. Cling-Surface Company.

Bulletin No. CE719 Describes a Steel Belt Lacing that is quickly joined. See page 61. The Bristol Co.

A Short Center Drive is described on page 93 by The F. L. Smidth & Co., Inc.

Hangers, Pillow Blocks, Friction Clutches, etc., that offer definite savings in power transmission. See page 88. T. B. Wood Sons Co.

Booklet on Pulleys, Gears and Sheaves is being offered by the Pyott Foundry Company, makers of Pyott Red Face Pulleys. Look on page 87.

A Catalog on Flexible Shafting for tool room, machine shop, pattern shop and foundry. See page 118. N. A. Strand & Co.

Belt Lacers that result in greater transmission efficiency. See pages 74-75. Clipper Belt Lacer Co.

MISCELLANEOUS

Literature Describing a Power Baler that saves waste storage space and is fire-proof is offered by Davenport Mfg. Co. See page 92.

A Trial Offer on Factory Chairs, that eliminate fatigue. See page 107. Royal Metal Mfg. Co.

A Bulletin describing a complete line of Pneumatic Tools can be obtained from the Independent Pneumatic Tool Company. See page 106.

Wire Wheel Brushes for cleaning, scratching and polishing, are described on page 7 by The Osborn Manufacturing Co.

Information on Stopping the Losses Resulting from Human and Mechanical Errors in the measurement of material is offered by The Toledo Scale Co. See page 12.

A New Catalog M-28 gives complete information and data on Blue Printing. C. F. Pease Co. See page 8.

Catalog Describing 275 Styles and sizes of oilers for all types of machinery. Gits Bros. Mfg. Co. Page 116.

An Economical Means of Cleaning Parts and Products is shown on page 72. Oakite Products, Inc.

Booklets Describing Temperature Control are offered by Taylor Instrument Companies. See page 91.

"Checking Your Filing Costs" is the name of a booklet offered by the Globe-Wernicke Co. See page 89.

Lead Pencils that offer a choice of seventeen degrees of black and three copying types. See page 106. American Lead Pencil Co.

Catalog on Automatic Fire Door Equipment is offered by Richards-Wilcox Mfg. Co. See pages 24-25.

A Booklet Describing Counters for rate setting and production work. See page 68. The Veeder Mfg. Co.

The Advantages of Mechanical Festooning of Goods over the old hand method, are explained in a new bulletin issued by the John Waldron Corporation. See page 106.

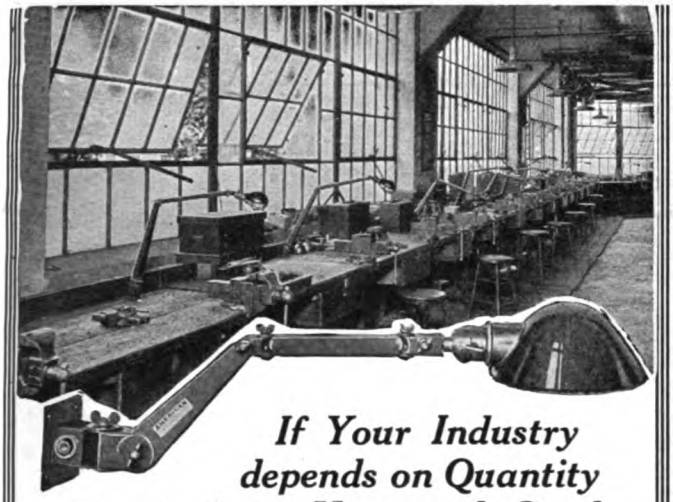
A Catalog No. 21, Showing some Valuable Suggestions for Steel Lockers, Bins, Racks and Shelving. See page 112. Durand Steel Locker Co.

Fabricated Sheet Metal Parts. An engineering service offered by The Breese Bros. Co. See page 117.

Complete Specifications and Portfolio containing information on agitator drives, and all types of stirrers. See page 92 New England Tank & Tower Co.

Illustrated Folders on the Hallowell Pressed Steel Bench Legs and Workbenches should interest every industrial executive. See page 109. Standard Pressed Steel Company.

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If Your Industry depends on Quantity Production—You need Good Lighting.

In every industry where quantity production has been brought to a high degree of efficiency the lighting system is considered of great importance because of its influence on the employees.

In the automotive and other industries, many plants use American Fixtures for that very reason. American Fixtures guard against eyestrain. The light can be placed directly on the work at all times. Write for illustrated catalog.

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The *Master Builders Method* of laying *patches that last.* Stop making temporary repairs. Relay that heavy-duty area for the last time with *Quickfix* concrete.

Will mend a hole like this Saturday, ready for use Monday

Use Quickfix Concrete for emergency jobs like Machine Foundations, Platforms, Driveways, Stairs, etc. Gives the ideal wearproof, dustproof, waterproof surface, ready for use in 48 hours.

QUICKFIX makes a permanent concrete patch of flint-like hardness in only 48 hours. Ordinary concrete patches block traffic and delay production for ten to twenty days while they harden. With Quickfix you can Patch the Floor Saturday and Open it Up to Traffic Monday. No costly delays or interference with plant's operation.

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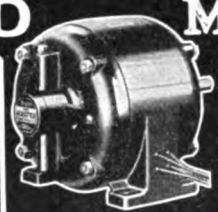
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We have _____ sq. ft. to repair. it is understood there will be no charge if Quickfix does not perform as represented.

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MASTER GUARANTEED MOTORS

⅛ TO 7½ H.P. Dayton THE MASTER ELECTRIC CO. Ohio Less than 40°

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THIS fleet of Baker industrial machines speeds up production, cuts material handling charges and reduces the working force at the new Indiana Harbor, Ind., plant of the Youngstown Sheet and Tube Co. Bakers can move heavy loads easily and economically for you, too. Write

THE BAKER-RAULANG CO.
CLEVELAND, OHIO

ELECTRIC TRACTORS AND TRUCKS
TRADE-MARK REG. U.S. PAT. OFF
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stop!

are you letting costly power slip away?

MANUFACTURERS have at last grasped the stupendous losses due to slipping belts. Tightening them gives only temporary relief, kills the belt and makes the bearings run hot.

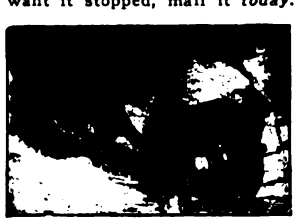
Cling-Surface Preservative is a belting treatment that has been used for thirty years by the most wide-awake transmissions experts. It absolutely prevents slipping. With Cling-Surface you can run belts slack, get a better and greatly increased grip on the pulleys and bring belt deterioration and the wear and tear on your transmission equipment to a minimum.

With Cling-Surface your belts become and remain healthy and pliable.

If you are willing to tolerate loss of money through belt slip, don't send this coupon. If you want it stopped, mail it *today*.

Cling-Surface — preserver of belts—has been made for thirty years by the only company whose sole product is belt treatment. It is used in every country of industrial importance in the world. It saves belts and machinery.

It increases transmission efficiency and prevents all loss due to slipping.



CLING-SURFACE COMPANY
PRESERVES BELTS—ELIMINATES BELT SLIP

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Conditions in our plant are about as checked:

☐ cold ☐ hot
☐ damp ☐ dry
☐ dusty ☐ clean
☐ 3 gal. Tin at $3.40 gal.
☐ 6 gal. Tin at $3.25 gal. F.O.B. nearest Warehouse.

Cling-Surface Co., 1656 Niagara St., Buffalo, N. Y.

Gentlemen: I am always willing to give a belt-saving, money-saving proposition a trial on its own merits. Send tin to fit conditions noted and of the size checked. If need be, I shall use the entire contents. If satisfactory I shall pay in 60 days. Otherwise no pay.

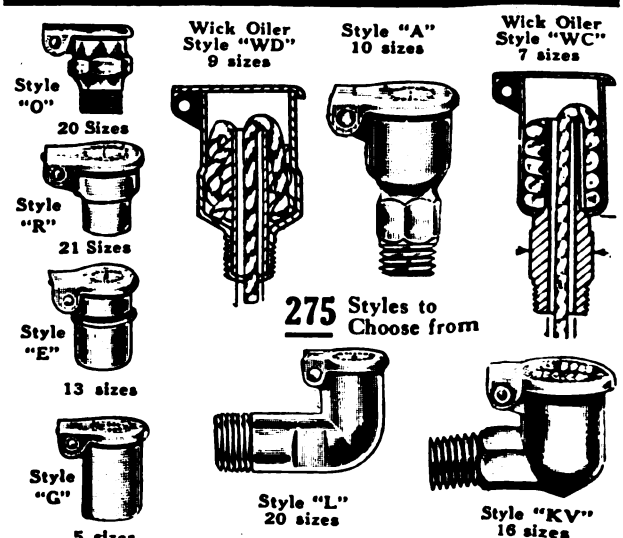
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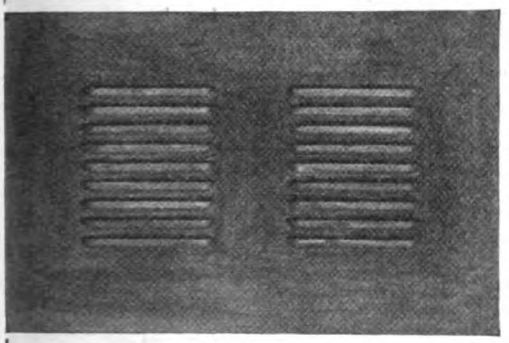
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We make Louvres for all purposes.



Our Engineering department is available without obligation to you—just send us pencil sketch or blue print of what you want made.

STEEL—IRON—BRASS—COPPER—MONEL METAL
Requiring Stamping—Forming—Drawing—Blanking—Punching

See Data A.S.M.E. Condensed Catalogue of Mechanical Equipment. Also Hendricks' Sweets Engineering, and Thomas Catalogues.

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The "CANTON" PORTABLE CRANE

Does the work of six men, and in less time, too



The "Canton" Portable Crane, known as the "Handiest Tool in the Shop," is indispensable for the quick and economical handling of those heavy and awkward loads. It's an easily handled Hoist that goes quickly to parts of your shop where nothing else can reach.

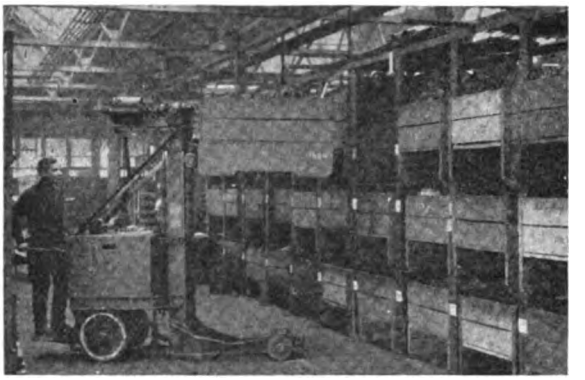
Those who are using it tell us this "Handy Tool" does away with the six and eight man job—it saves them no end of time and labor—and that they wouldn't be without it for many times the cost.

These Cranes are made in various sizes and capacities and when desired, can now be furnished with the NEW SAFETY FRICTION LOAD BRAKE shown on illustration.

Shipped on thirty days' trial.
All good jobbers handle them.
Write for price and descriptive catalog IN.

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CANTON, OHIO
New York Office, 203 E. 15th Street

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The standard Tier-Lifts are made in four different sizes, lifting heights ranging from 42″ to 96″ and lifting capacities up to 3 tons.

There is a Lakewood Tier-Lift for every purpose. With the many different types of attachments, such as roller platforms, cranes, tilting platforms, etc., there are over 100 uses for this equipment.

Send the coupon today.

The
LAKEWOOD
Engineering Company
CLEVELAND

THE LAKEWOOD ENGINEERING CO., Cleveland, O.
Please send "Snapshots of Sensible Savings"

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68% of all Armstrongs sold are repeat orders

AN analysis of Armstrong sales records shows that 68% of the Armstrong Steam Traps manufactured are purchased by users of Armstrongs. It shows that many firms have standardized on Armstrongs, generally after having accepted Armstrong's test offer.

In one issue of "Power" thirty-eight prominent manufacturers among the advertisers were Armstrong users. Rather a strong indorsement, isn't it?

Why?

Why so many repeat customers? It's because the Armstrong won't air-bind, because it does not clog, because scored valves are rare, because the Armstrong is low in cost—all due to the patented, exclusive, inverted submerged bucket principle.

Armstrong Steam Trap

The Armstrong is different from any other steam trap. Find out for yourself if it is superior.

Please ship, prepaid, an Armstrong for 90-day test. **(It is understood that when test is completed the trap is to be returned collect)**

Size of trap.....Size of pipe connections.....

Maximum pressure.....(Do not neglect to state maximum)

Firm .....

Address .....

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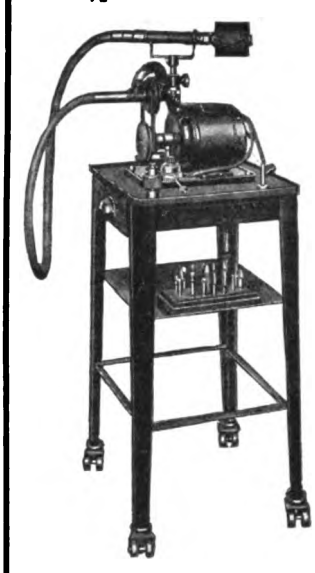
Signed ..... position .....

☐ Send the catalog only; send no trap

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326 Maple Street, Three Rivers, Michigan

II 10-Gray

Type MP 5
¼ H. P. Motor



Strand

Flexible Shafts and Equipments

for the

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and
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1/10 to 2 H. P.

Several Types and Sizes

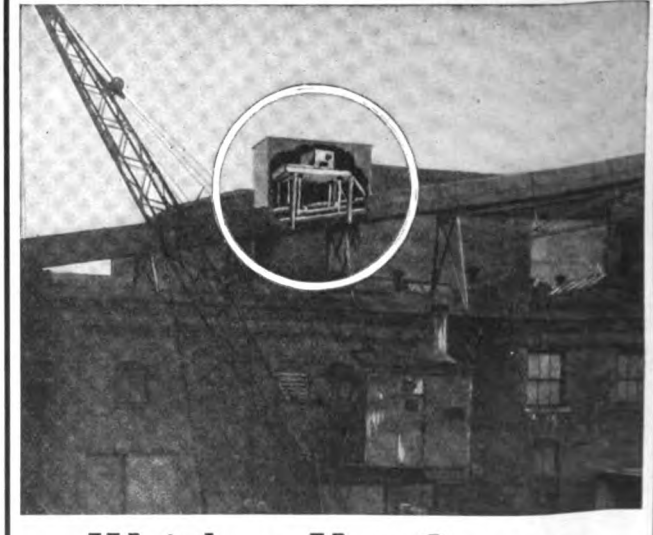
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Manufactured by

N. A. Strand & Co.

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Weigh as You Convey and Eliminate Losses

What check have you on materials handled on conveyors? Your bills of lading are not always correct. The chance for error is always present.

Conveyors equipped with Merrick Weightometers are assured of an accurate check on all conveyor handled materials—99% accuracy guaranteed—ore, sand, stone, gravel, coal, coke, finished cement, etc. The weighing is done while the materials move along and the weights recorded. It is ideal for checking receipts, shipments and interplant movements.

Write for the "Merrick Catalog." It explains how it works.

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Lower Maintenance Costs
and greater heating efficiency
with the new

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TRADE MARK

METHOD OF HEATING



The Venturafin Method of Heating is a compact, highly efficient heating method that actually forces heat all over your building. It is made up of units like the one pictured here which can be placed anywhere yet throw heat everywhere. So efficient and yet so compact is the Venturafin Method of Heating that one of the small size units is equal to 500 square feet of direct radiation—occupies one-fourth the space and has only one-tenth the weight.

The Venturafin Method of Heating is so easily, quickly and inexpensively applied to practically any heating problem that it is being widely used for heating industrial buildings of every type and description, garages, schools, public buildings and numerous other places.

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BRANCH OFFICES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONTARIO

✓ *Heat With Unit Heaters*

(553)

American Blower

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MANUFACTURERS OF ALL TYPES OF AIR HANDLING EQUIPMENT SINCE 1881

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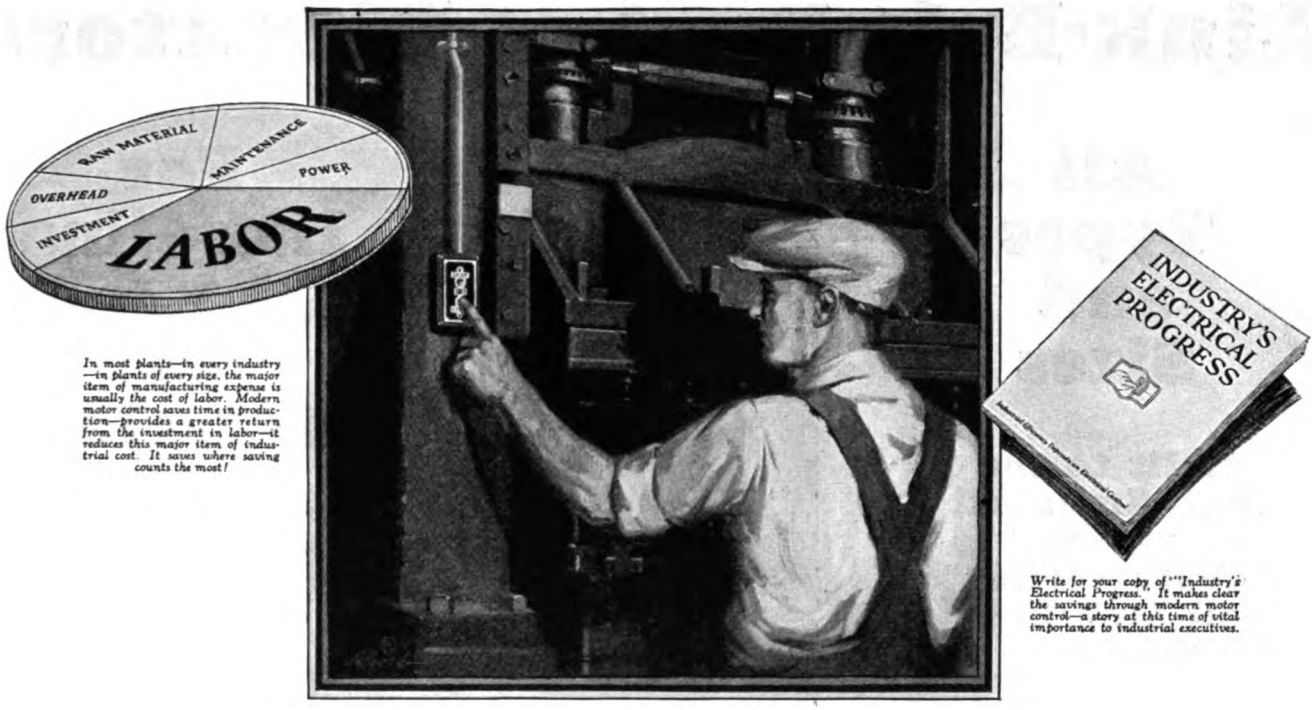
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Save-where saving counts the most!

WHERE does your plant stand in this battle industry is waging to eliminate waste? Have you checked up to see where worthwhile savings can be effected in *your* production?

Competitive conditions today demand it.

In most plants—in every industry—in plants of every size, the major item of manufacturing expense is usually the cost of labor. And wages cannot be decreased! Economists point out that the present prosperity is largely due to the increased buying power of the nation resulting from higher wages.

It is a vital time, then, to analyze manufacturing costs. To materially increase profits it is necessary to save where saving counts the most—in the wasted time of labor.

The greatest tool of labor today is electric power. The use of motors is practically universal in industry.

But even if your plant is *completely* motorized you cannot be sure it is wholly efficient. For motors by themselves are only brute force. The savings in labor that you expect—the savings that add substantially to industrial profits—come through the proper application of motors. They come through the effectiveness of correct motor control.

Someone in your plant *must* investigate. To add to profits now through savings in production gives any plant an advantage in competition. To wait only postpones progress.

The development of motor control equipment has been so rapid that it has been easy for plants to fall behind. In the short span of ten years the electric power consumed by industry has multiplied by six. Such rapid expansion has brought wondrous perfection in the control equipment required. It is high time to make a check on the motors you use to determine where modern control will reduce production costs.

Thirty years of engineering experience to show you the savings possible

Without charge, the Cutler-Hammer field engineers, expert in the application of electric power for greatest efficiency, will co-operate with your plant men or consulting engineers. Either to assist in the choice of new equipment, or in the revamping of existing drives their counsel is yours without obligation. And the control equipment they may recommend pays for itself through savings in production.

In the purchase of new equipment in which motor and control is incorporated as an integral part by the machine builder, demand C-H Control. The familiar C-H trademark on all your motor control is the best assurance you can have that your plant is keeping pace with electrical progress—that your motors are giving you the true economy of production you have a right to expect.

The CUTLER-HAMMER Mfg. Co.
Pioneer Manufacturers of Electric Control Apparatus
1265 St. Paul Avenue Milwaukee, Wis.

CUTLER-HAMMER

Industrial Efficiency Depends on Electrical Control

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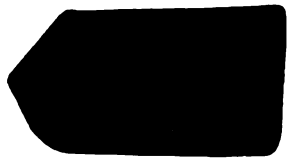
Link-Belt Bucket Elevators

All Types and Sizes

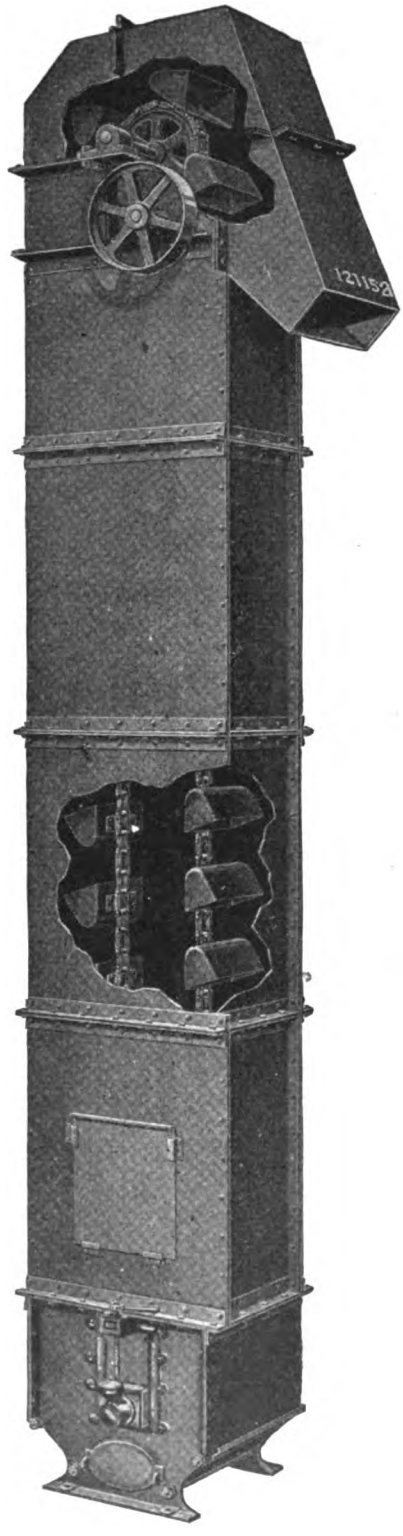
Built to the high Standard which characterizes all Link-Belt Products



Sprocket and Traction Wheels. Made to fit the chain. Furnished in the >FLINT-RIM< or gray iron. Stocks of popular sizes.



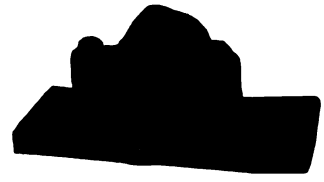
Buckets — Malleable Iron, Pressed Steel or Steel Continuous. For all services. Large Stocks.



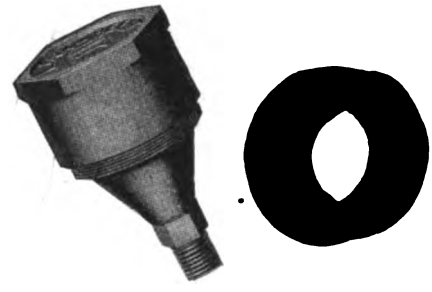
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Tell us the kind of Material you wish to handle and full particulars

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Bearings—Light and heavy with approved types of lubrication, oil well, grease cup, ring oiling, or collar oiling.



>HEX-TOP< Grease Cup of Malleable iron. Rugged—grease tight and easily turned by hand or wrench. Malleable iron safety collars—durable and light in weight.

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Since 1888 these paints have been designed to fit the peculiar conditions of the specific industries for which they are intended. Thirty-eight years of paint engineering service to mines, mills, railroads, general industries, public buildings and industrial housing projects have enabled our staff of experts to develop a series of protective coatings, each the *best* for the specific purpose for which it is intended.

Goheen paints give unusual service. Materials are chemically united instead of being mechanically mixed. When you specify or requisition Goheen Paints you are assured of quality plus engineering service controlled by *experts* from the raw material to the finished product.

Goheen Paints are the chief reliance of those charged with plant and equipment maintenance. Alert executives everywhere specify "Goheen"—the scientific paint.

Galvanum
Applied direct to Galvanized iron without any preliminary treatment

Concrete Paint Concrewaltum Trade Mark For Floors & Walls
For dampproofing and beautifying concrete floors and walls

Goheen's Mill White Trade Mark
An interior white that stays white

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For protecting iron and steel

Thermokote A Goheen Product A Paint for All Hot Surfaces and Stacks
For Stacks and other hot surfaces

Chemically Combined Highway Red Trade Mark Red Lead Paint
A chemically combined red lead paint. To be used in place of hand-mixed red lead

GOHEEN CORPORATION of N. J.

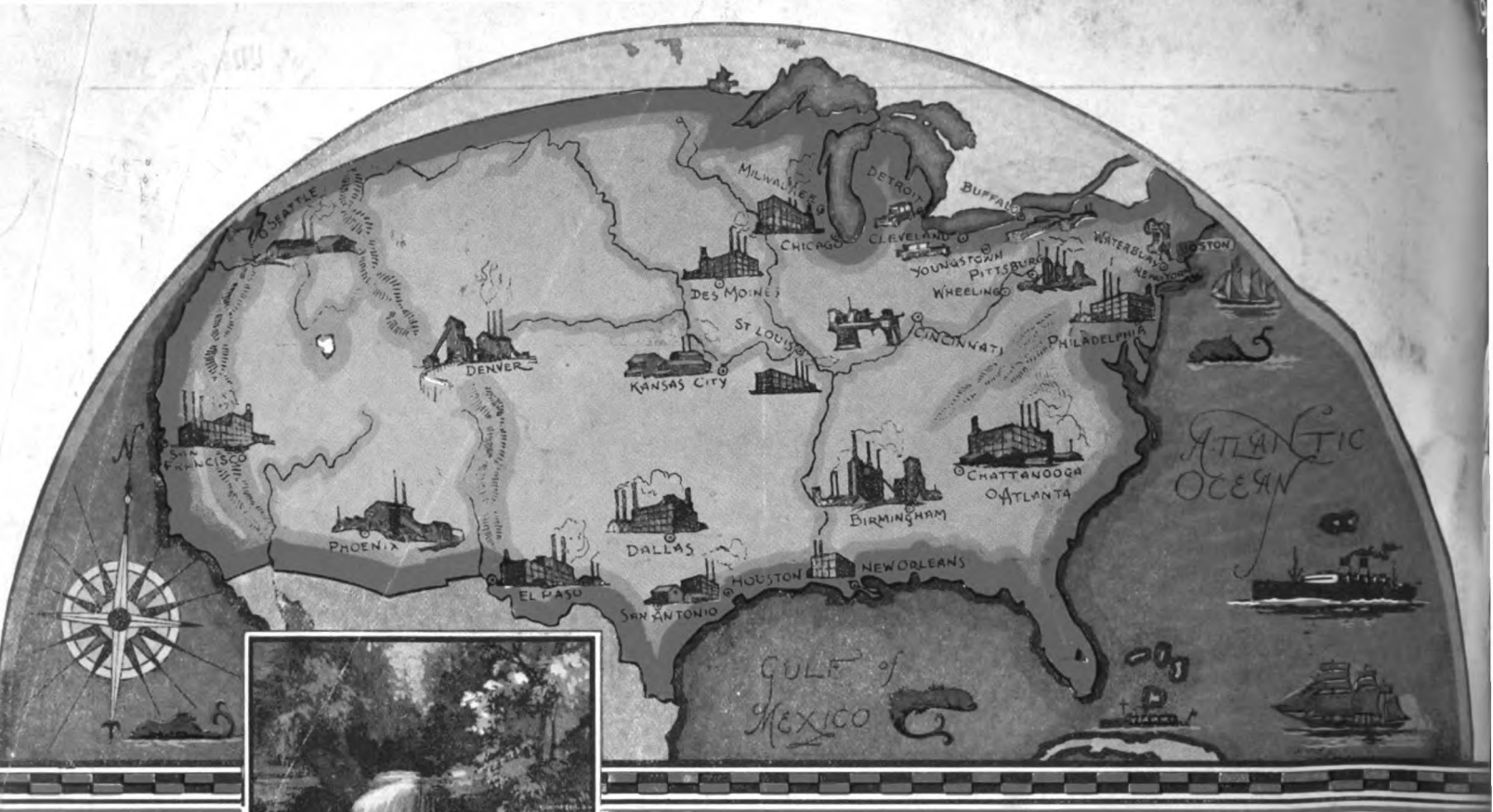
Paint Engineers Since 1888

Goheen Corporation Paint Engineers Since 1888

Newark, N. J.

EILERT PRINTING COMPANY, INC.
516-526 W. 29TH ST., NEW YORK

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from MONTOUR FALLS
to Industry of America

For many years Montour Falls, New York has been a community of engineers and machinists, builders of electric cranes and hoists. It is here that the Shepard Electric Crane and Hoist Co. was founded over a quarter century ago. It is here that Shepard Cranes and Hoists are still built.

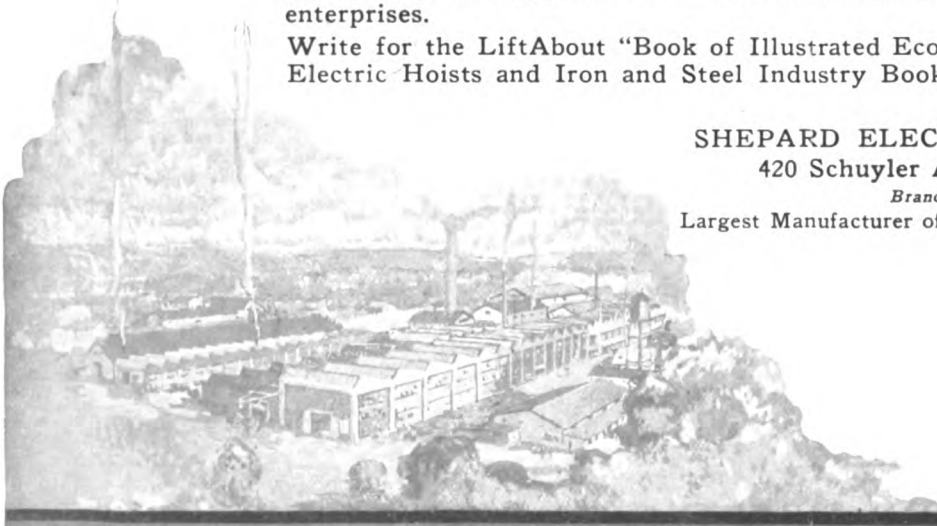
During this quarter century the Shepard Company has grown to be the largest manufacturer of electric hoists in America, with Shepard the predominating electric hoist in American industries.

Steel plants, fabricating shops, foundries, copper and brass rolling mills, smelters and refineries, machine tool plants, automobile factories, ice plants, food product manufacturers—practically every type of manufacturer in America uses Shepard Electric Hoists.

Shepard gives industry a proven design; the widest range of hoist capacities and types to meet every plant condition; big economies in time and labor; these plus the endorsement of thousands of satisfied users, including America's biggest industrial enterprises.

Write for the LiftAbout "Book of Illustrated Economies"; Book of Floor Operated Electric Hoists and Iron and Steel Industry Book.

SHEPARD ELECTRIC CRANE & HOIST CO.
420 Schuyler Ave., Montour Falls, N. Y.
Branches in Principal Cities
Largest Manufacturer of Electric Cranes and Hoists in America

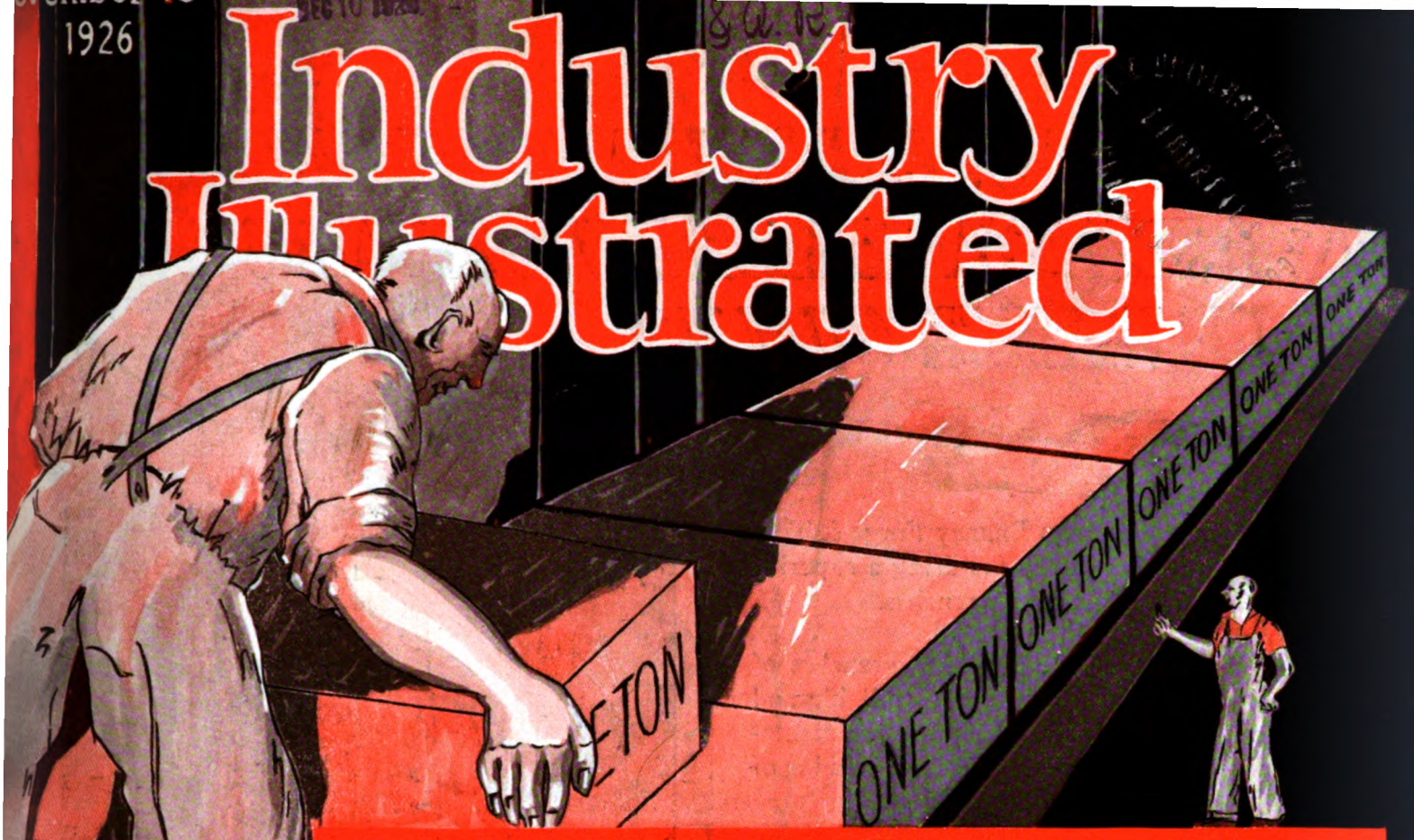


SHEPARD *America's most widely used electric hoist*

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1926

Industry Illustrated



Planning Ahead for 1927

¶ Power Generation—Power Transmission—Production Equipment—Plant Equipment—Mechanical Handling—these are "tools" of the factory manager.

¶ The Classified Analytical Survey of these tools and their uses, in the pages of this issue, provides a means for checking up your own plant, for finding new sources of economies and profits, and for determining your policies for the coming year.

¶ This issue constitutes the "opening gun" in our program for 1927. It is an ambitious program, and one that will appeal to ambitious and practical men.

he Power Giant

wage earner has 3¾ horse-
r at his command; in other
, a giant with the strength
men. This giant works
through Machinery.

OWER AND PRODUCTION REFERENCE NUMBER

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BONNEY *CV CHROME VANADIUM WRENCHES HAVE ESTABLISHED NEW STANDARDS OF WRENCH QUALITY

A few years ago Bonney Forge & Tool Works were manufacturing a superior line of carbon steel wrenches.

They sensed the need for wrenches of better quality than were available and after much research and experimentation developed a wrench made of Chrome Vanadium steel.

These new Bonney Chrome Vanadium wrenches established new standards of wrench quality.

When the public began to demand Bonney Chrome Vanadium wrenches and refused to be satisfied with anything else, alloy steel wrenches of various kinds began to appear on the market, but the BONNEY CHROME VANADIUM WRENCHES STILL REMAIN THE STANDARD OF WRENCH QUALITY.

You cannot fool a good mechanic when it comes to tools, and the fact that good mechanics almost invariably specify Bonney Chrome Vanadium Wrenches means more than anything we can say.



(PATENTS PENDING)

You can secure from your Mill Supply Jobber.

Bonney Forge & Tool Works
Allentown, Pa.

Makers of Special Service Wrenches of Chrome Vanadium, Carbon Steel Drop Forged Wrenches, Stillson Wrenches, Vises and Drop Forgings and the Bonney Rim Tool.

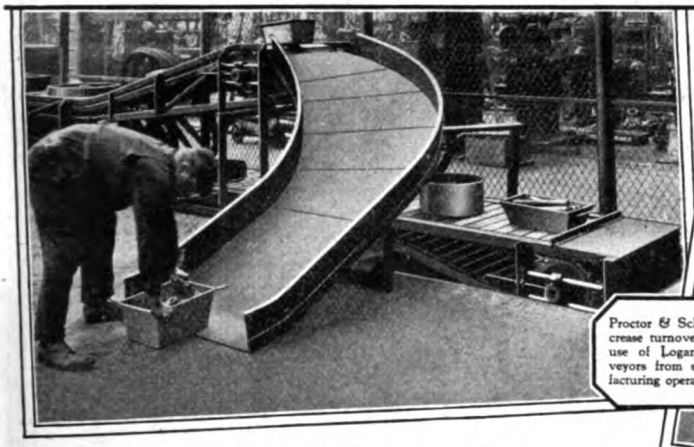
BONNEY Chrome-"CV"-Vanadium WRENCHES
REG. U.S. PAT. OFF.

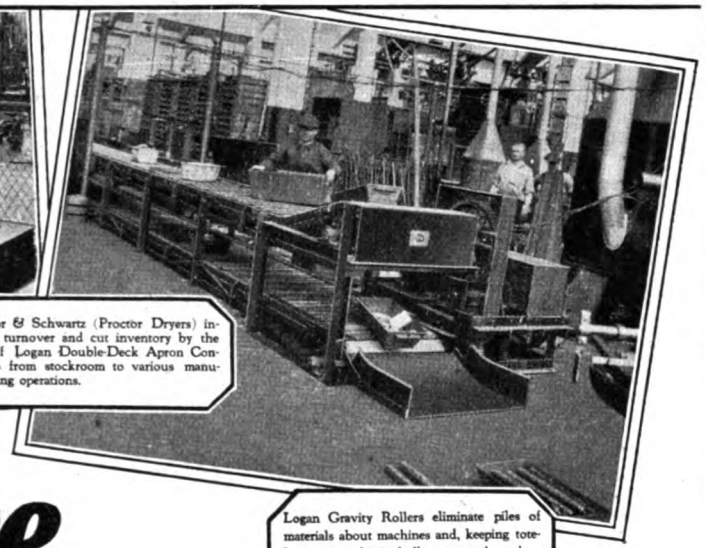
**C. V. is a Bonney trademark registered in the U. S. Patent Office*

Chrome Vanadium registered August 11th, 1925

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50 YEARS OF SERVICE ~ OUR GOLDEN ANNIVERSARY





Proctor & Schwartz (Proctor Dryers) increase turnover and cut inventory by the use of Logan Double-Deck Apron Conveyors from stockroom to various manufacturing operations.

5 Reduce Your Stock on hand ~

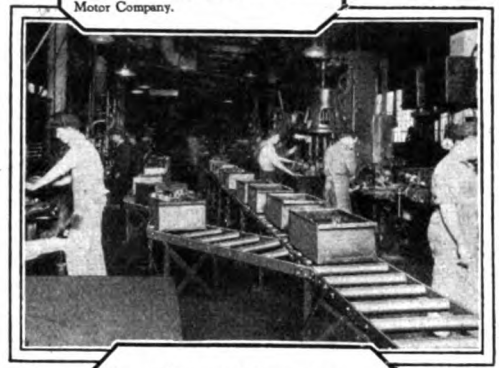
THE business "horn of plenty," only a few years back, was symbolized by factory and warehouse bulging with surplus stock. But times have changed.

Today Logan Conveyors enable many a manufacturer to get his finished products invoiced before the cash discount period of the raw material has expired.

Whatever you make or sell, Logan Conveyors can reduce your inventory costs from receiving room straight through to shipping platforms and save you labor, time, floor space and breakage all along the line. Get the facts and start *your* savings as soon as you can. The coupon is for convenience.

THIS is the FIFTH *of a series of announcements featuring seven savings of Logan Conveyors.*
No. 1—Savings in Labor.
No. 2—Savings in Time.
No. 3—Savings in Space.
No. 4—Savings in Breakage.

Logan Gravity Rollers eliminate piles of materials about machines and, keeping tote-boxes at machinists' elbows, speed production—two inventory savings for Chandler Motor Company.



These machines in the Ford tractor plant are fed by Logan Gravity Rollers, which so synchronize supply and production that no money is kept tied up in materials between operations.



LOGAN CO.
Louisville, Ky.

Date .....

We are interested in conveyors. Send catalog ☐ Without obligating us, have your representative call ☐

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Address .....

Logan Co. INCORPORATED 1881
(Formerly THE DOW CO.)
LOUISVILLE, KY. *Offices in Principal Cities*

Logan Conveyors
LOUISVILLE

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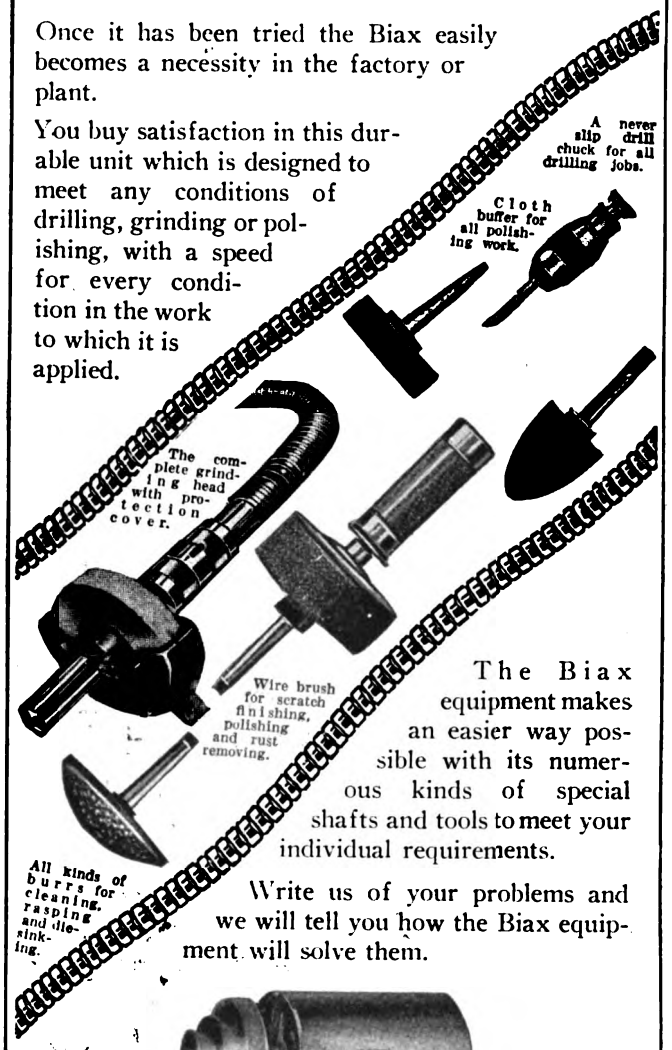
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BIAX
FLEXIBLE SHAFTS

BUYING SATISFACTION

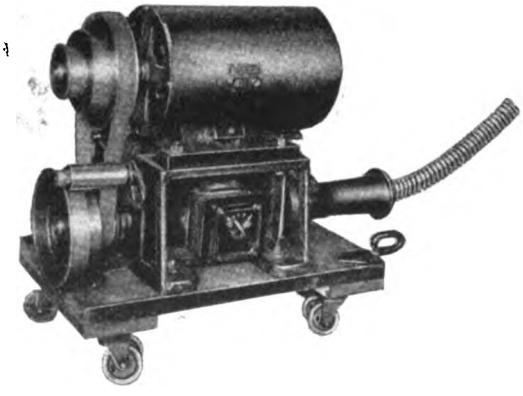
Once it has been tried the Biax easily becomes a necessity in the factory or plant.

You buy satisfaction in this durable unit which is designed to meet any conditions of drilling, grinding or polishing, with a speed for every condition in the work to which it is applied.



The Biax equipment makes an easier way possible with its numerous kinds of special shafts and tools to meet your individual requirements.

Write us of your problems and we will tell you how the Biax equipment will solve them.



"TAKE THE TOOLS TO THE WORK AND LEAVE THE WEIGHT OF THE DRIVE BEHIND."

See our exhibit at the National Power Exhibition. Booth 757

BIAX FLEXIBLE SHAFT COMPANY
136 LIBERTY STREET, NEW YORK

The Publisher's Column

ARE you keeping step?

During the past ten years, there has been an increase of 34 per cent. in the efficiency of American Industry. This is measured by the average increased output of the wage earners employed.

During the next ten years there will undoubtedly be a still further increase in the efficiency of our industry, of at least 34 per cent. Americans have a reputation for beating past records.

Executives who keep step with this fast rate of progress will keep up with the procession. Those who do not, will fall back, and out. Industrial progress has no use for stragglers.

Both the editorial and the advertising pages of INDUSTRY ILLUSTRATED are planned to convey a message and prove a source of inspiration for those who keep step.

Industry Illustrated

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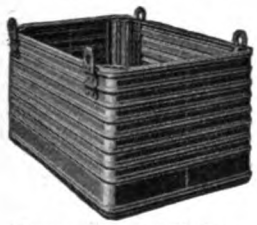
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Elwell-Parker Electric Lift Truck handling Truscon Core Racks at Ferro Machine and Foundry Company, Cleveland, Ohio



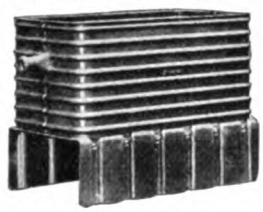
Truscon Platform—note the deep rib reinforcement



Truscon Boxes and Platforms permit heavy handling



Truscon Boxes and Platforms in sizes to meet all needs



Standard Box and Platform combination

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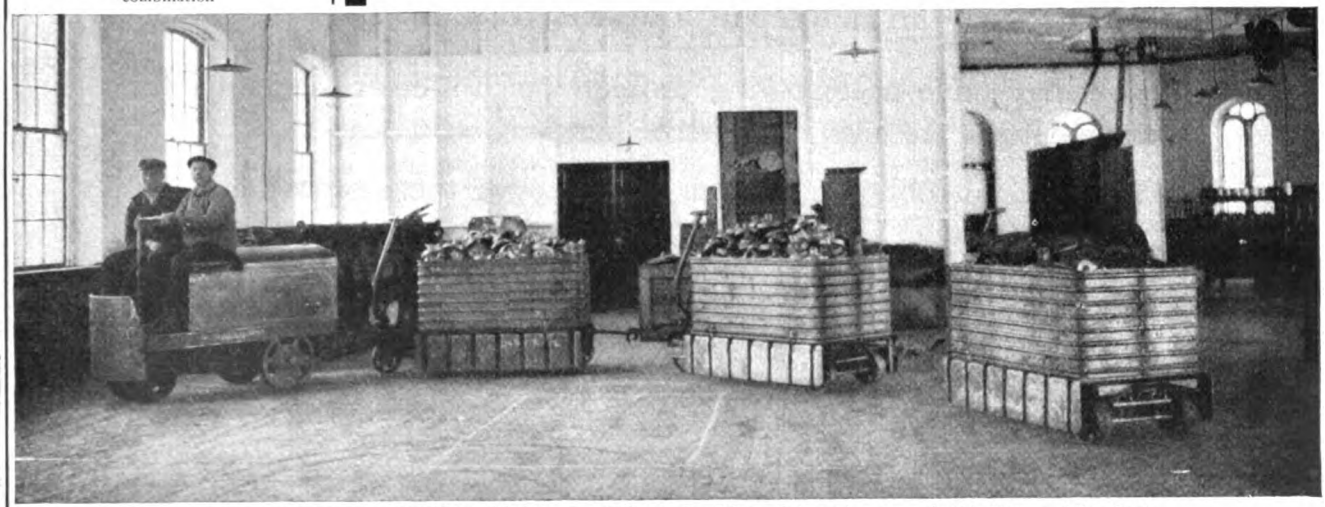
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Write for free catalog

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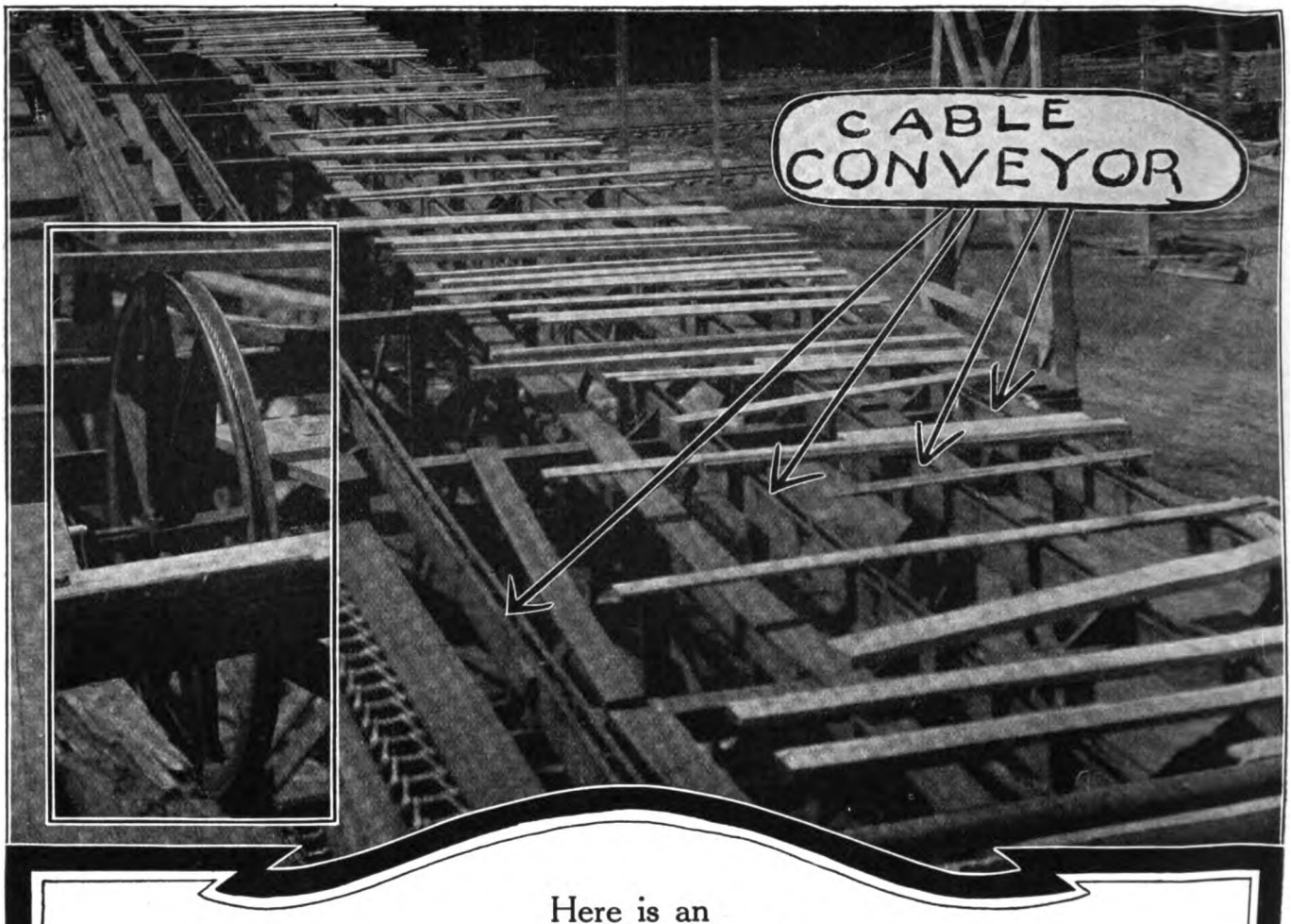
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TRUSCON ALLOY STEEL BOXES AND PLATFORMS



Boxes and Platforms used by Whitin Machine Co., Whitinsville, Mass. Lift trucks are used with Truscon Alloy Steel Platforms and Boxes Tow-Motor hauling train

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unusual application for

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by the Goodyear Lumber Co., Picayune, Miss.

It is a simple 4 cable Conveyor used in delivering Lumber to the cars

You may have a conveying problem our Engineers can solve for you that will reduce the cost of handling.

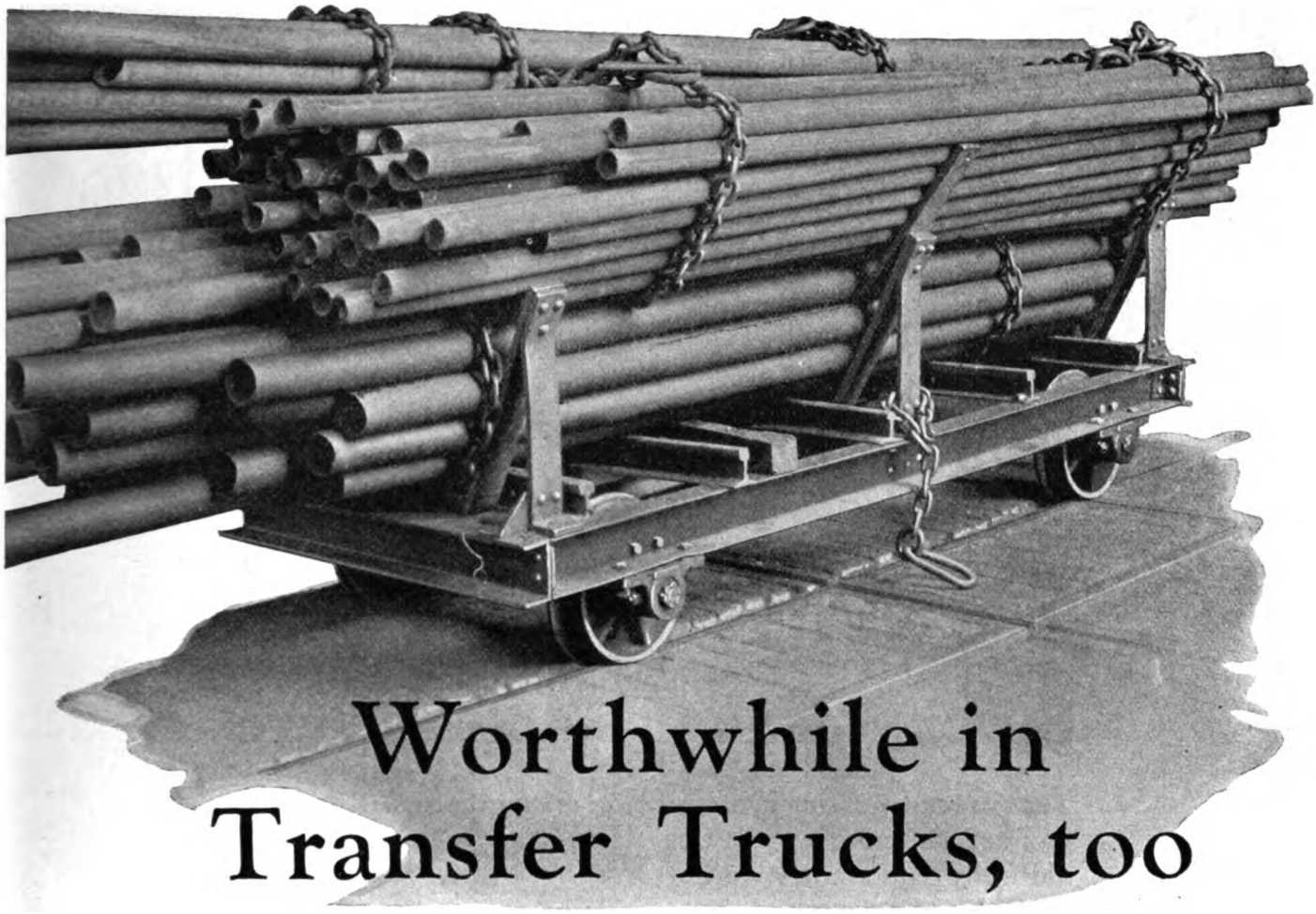
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Worthwhile in Transfer Trucks, too

Timken Bearings make the difference between dragging factory trucks of any kind, and rolling them. The friction in the wheel mountings becomes so much less with Timkens that lubrication only once a year is enough! That surely means heavier loads handled with far less muscle, fuel, or electric current.

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Whether you use rail or floor trucks, of the trailer or self-propelled types, you can obtain Timken economies in leading makes.

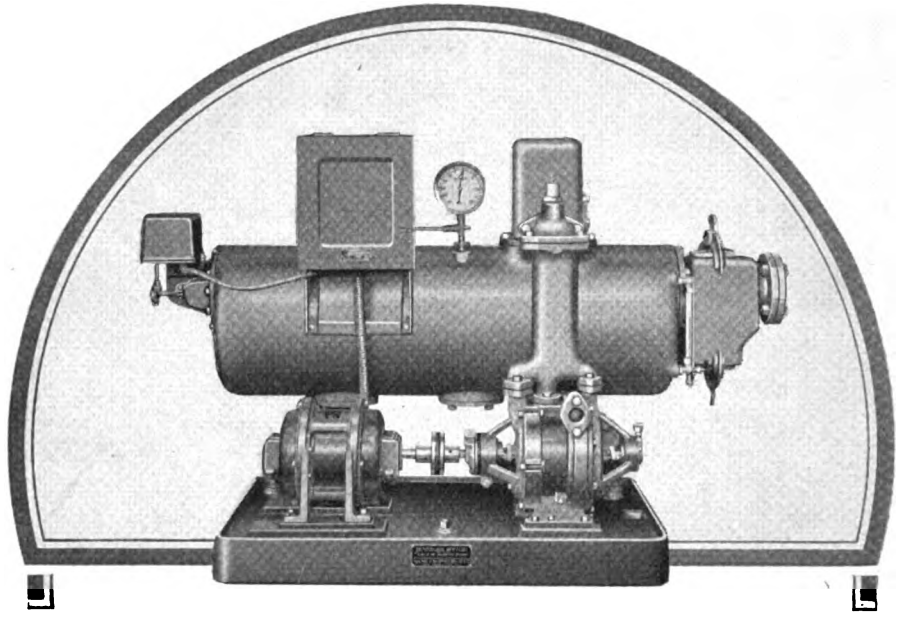
THE TIMKEN ROLLER BEARING CO., CANTON, OHIO

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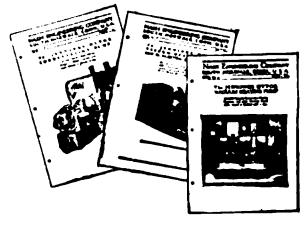


Specify Jennings and be sure

That vacuum heating system you are planning to put in, naturally you want it to be as good as you can get. Yet —remember that the success of the system, the service you get out of it, its flexibility in meeting quickly varying demands for heat, its contribution to comfort and good health, all these depend in large part upon the heating pump you choose.

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Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures

JOHN H. VAN DEVENTER, *EDITOR*

W. THOMSON LEES
Associate Editor

ADOLF SCHILDKRAUT
Art Director

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VITAL INDUSTRIAL STATISTICS on POWER and PRODUCTION

INDUSTRIAL efficiency has increased in the past decade. Output per worker is more than one third greater than in 1914. The average factory has increased 75 per cent in size.

Yet in spite of this, management is finding it increasingly difficult to show a profit on making and selling the product. Average cash dividends, in industrial corporations amount to but 3.6 per cent on total annual volume of business.*

Why is it that increased prosperity has apparently made the earning of a profit more difficult?

The following eight pages have been devoted to a graphical presentation of data of great importance to American industrial executives, in answering these questions. For the first time, we believe, the relationships between power, production, improved machinery, wages and profits have been made clearly evident by the aid of simple graphic analyses.

A study of these statistics, which are given in easily followed charts and diagrams, will place the industrial executive in a position to plan intelligently for increased profits through a clear conception of the basic economic movements now at work in industry, and through better control of the two big factors which stimulate profits and prosperity — added power and improved machinery.

*National Industrial Conference Board, Sept. 20, 1926.

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VITAL
INDUSTRIAL
STATISTICS

on

POWER

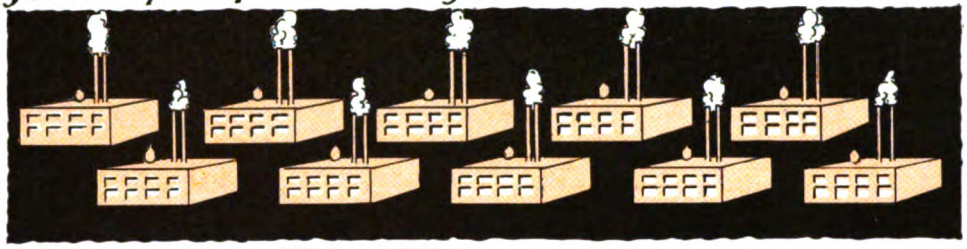
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PRODUCTION

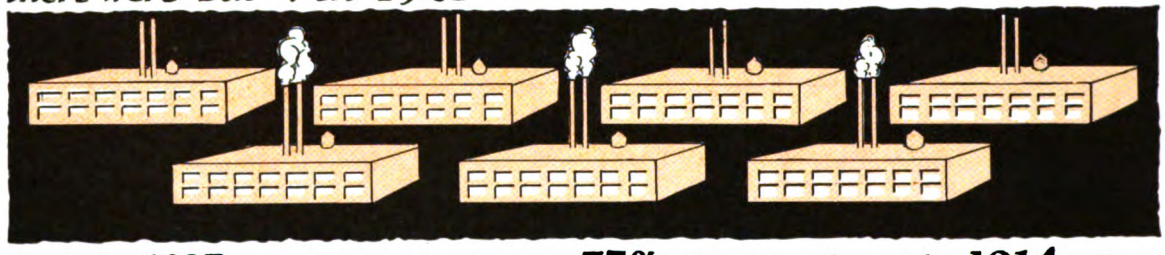
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Industrial plants are getting fewer and bigger

for every 10 *plants and factories in* 1914~~



there were but 7 *in* 1923

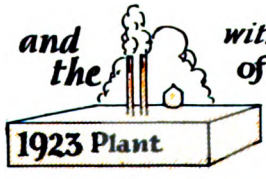


but the 1923 average plant was 75% larger than the 1914 plant

Output is increasing much faster than the size of plant



with an average of 26 workers, produced goods during the year, valued at $139,000*

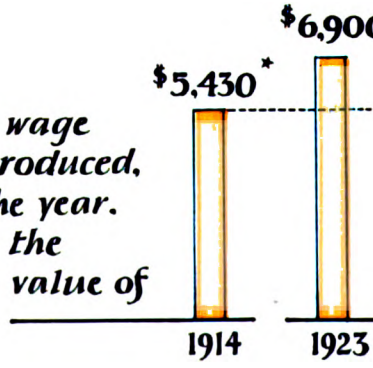


with an average of 45 workers, produced goods during the year, valued at $301,000

Output, per worker, was as follows:



The 1914 wage earner produced, during the year, goods to the value of $5,430*



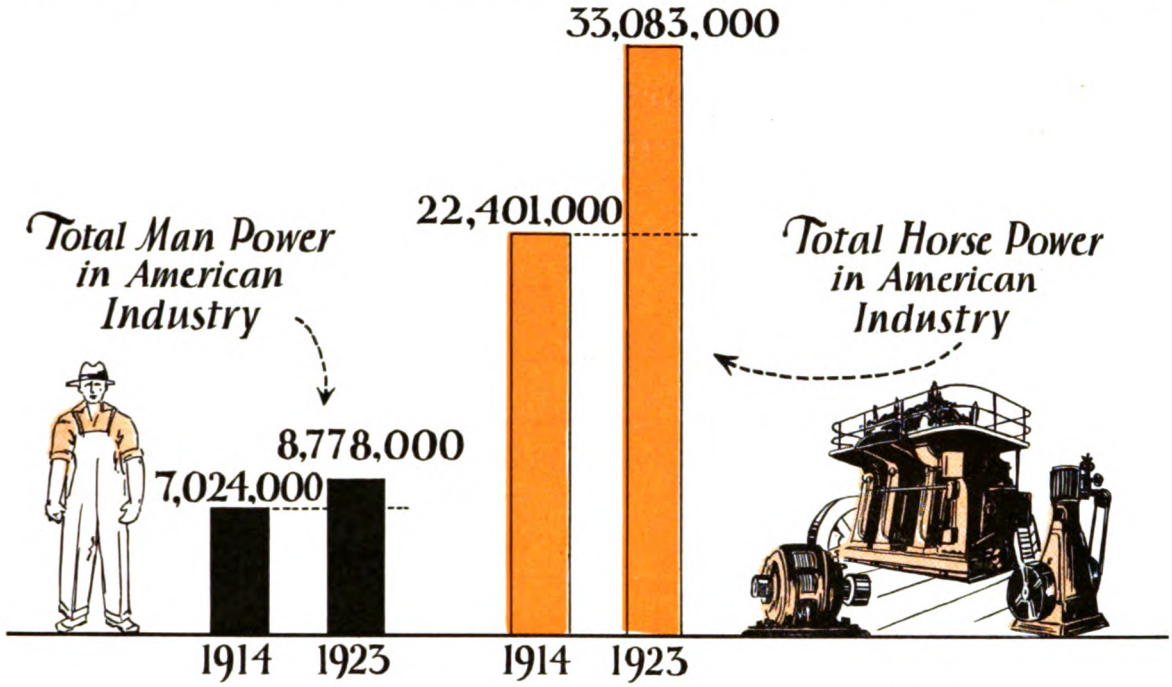
The 1923 wage earner produced, during the year, goods to the value of $6,900



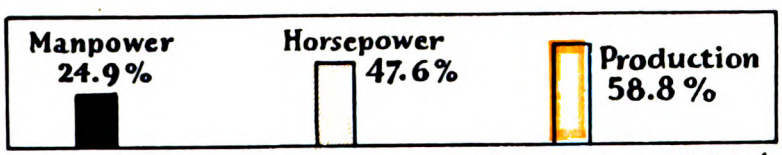
*Expressed in the equivalent of dollars of 1923 value.

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Horsepower is increasing much faster than Manpower.

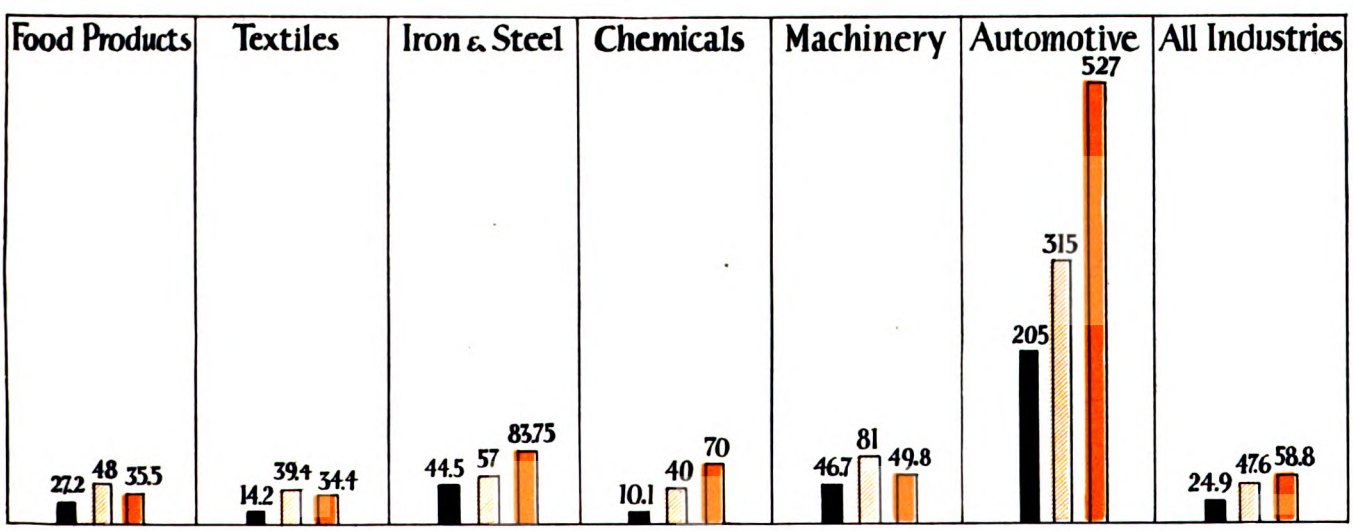


But production gains outstrip both.



Percentage Increases in 1923 over 1914

Production made this remarkable gain, in spite of a six per cent. reduction in working hours, simply because more horsepower was put to work through improved machinery.



This is the way the increases took place in our big industries

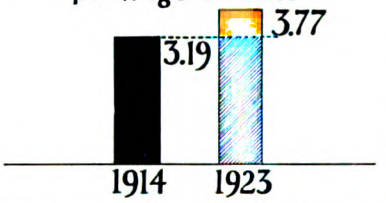
Manpower Horsepower Production

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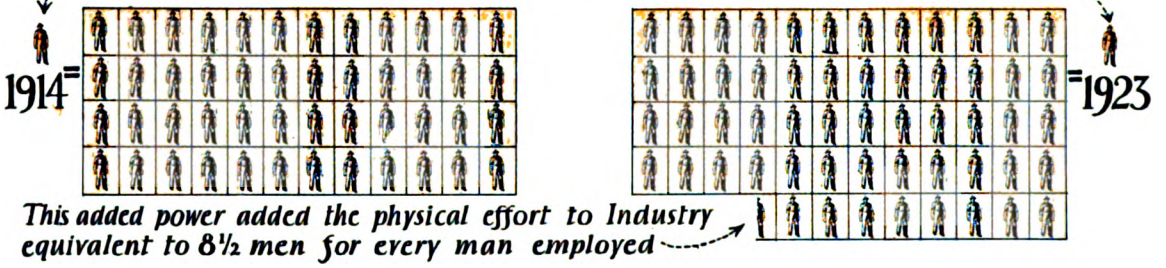
For every wage earner at work in American Industry, 3¾ horsepower are also at work, driving production machinery and factory apparatus

*Through this power, each American wage earner, in 1914 was able to multiply his physical effort 48 times**

Increase of Horse Power per Wage Earner



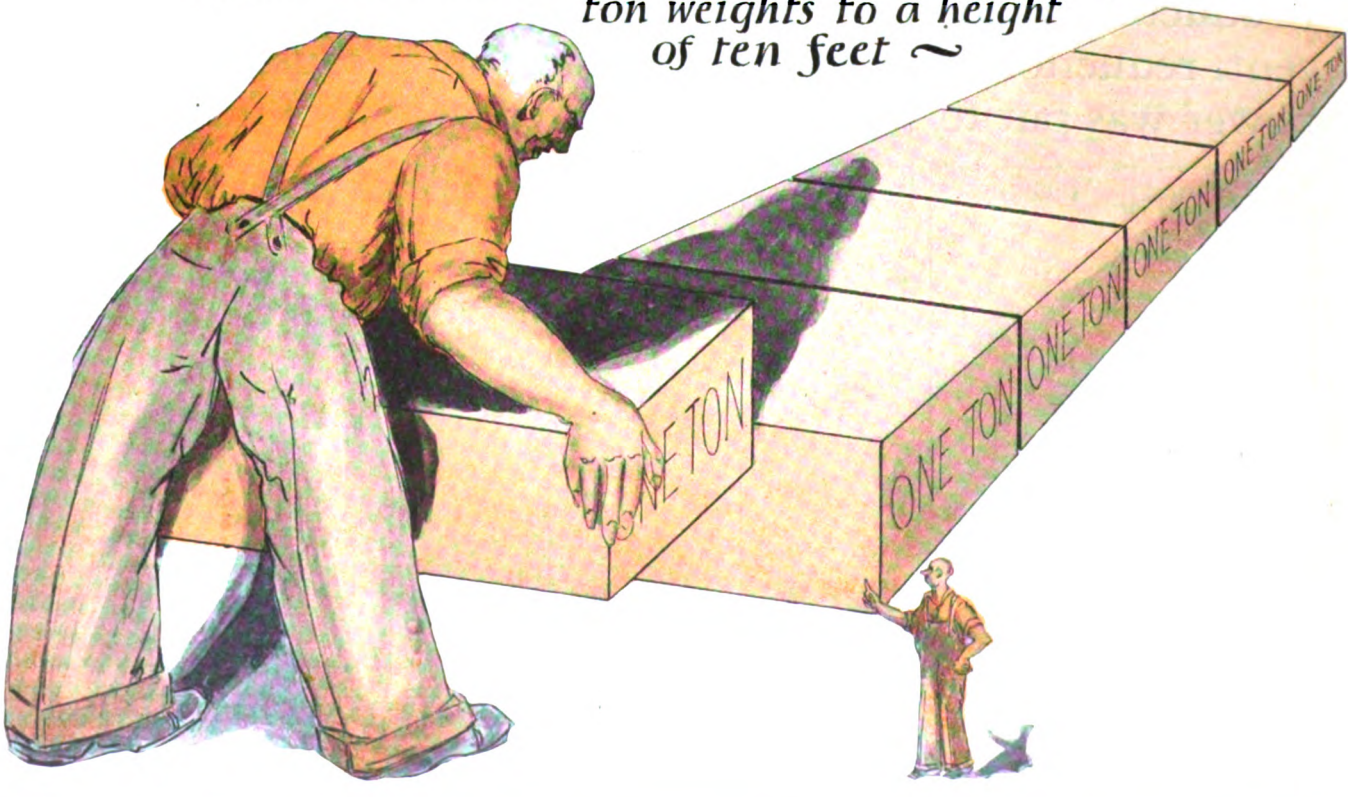
*Through this power each American wage earner in 1923 was able to multiply his physical effort 56 ½ times**



This added power added the physical effort to Industry equivalent to 8½ men for every man employed

What does 3¾ horsepower per worker mean to industry?

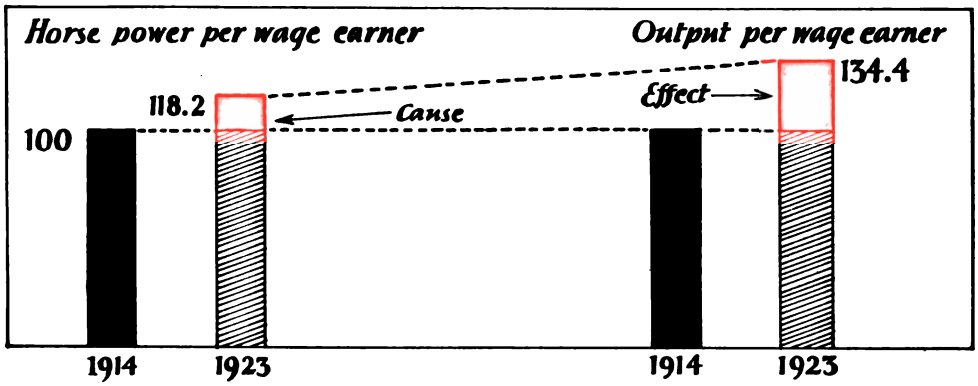
It provides each wage earner with a tireless slave capable, each minute of the day, of lifting 6 of these ton weights to a height of ten feet ~



*On the basis of a man being able to sustain effort at the rate of 1/15 horsepower.

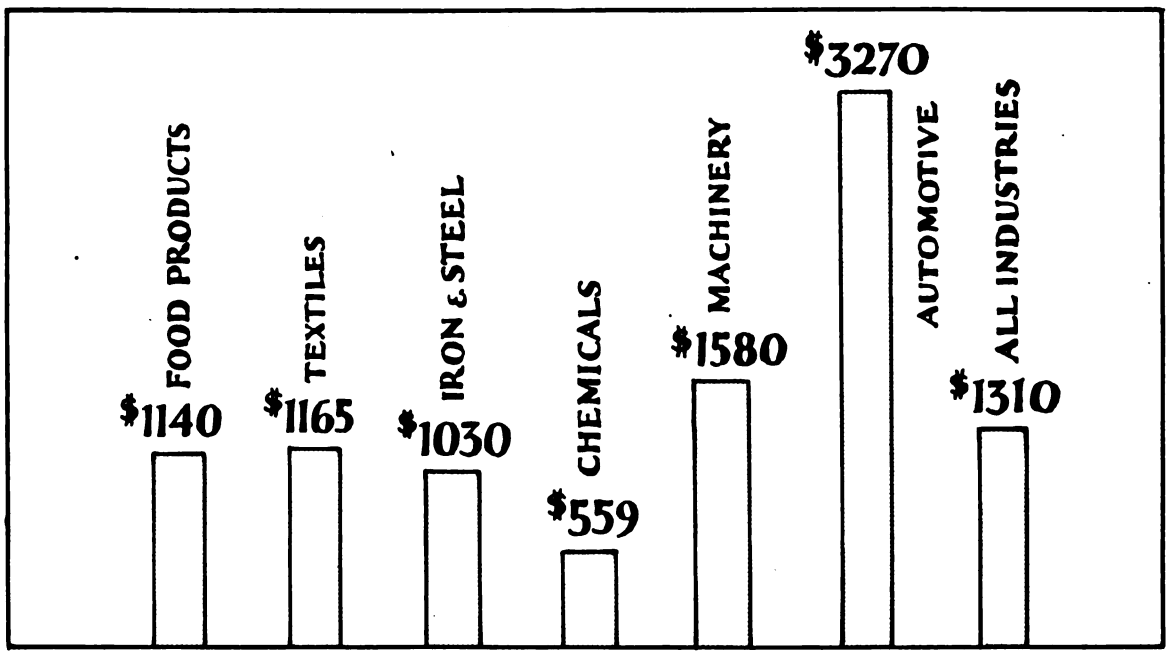
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The 18 per cent. increase in horsepower per wage earner applied through improved machinery, resulted in a 34 per cent. increase in output per wage earner.



Relation between added power and increased output

By actual performance, each added horsepower per wage earner, during this period has added $1310† to each wage earner's annual output, in industry as a whole.



Value of each added horse power per wage earner in various leading industries ~

Measured by increased annual output per wage earner

The secret of American prosperity consists in adding power per worker, and in applying this added power through improved machinery

† Corrected for price inflation. Excludes cost of raw materials.

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Vital Industrial Statistics

In 1914—*

Each wage earner was provided with raw materials valued at

$3,220



Through power and machinery provided him, he turned this raw material into product that sold for

$5,430



Thus he added a value of

$2,210

to the value of the raw materials.

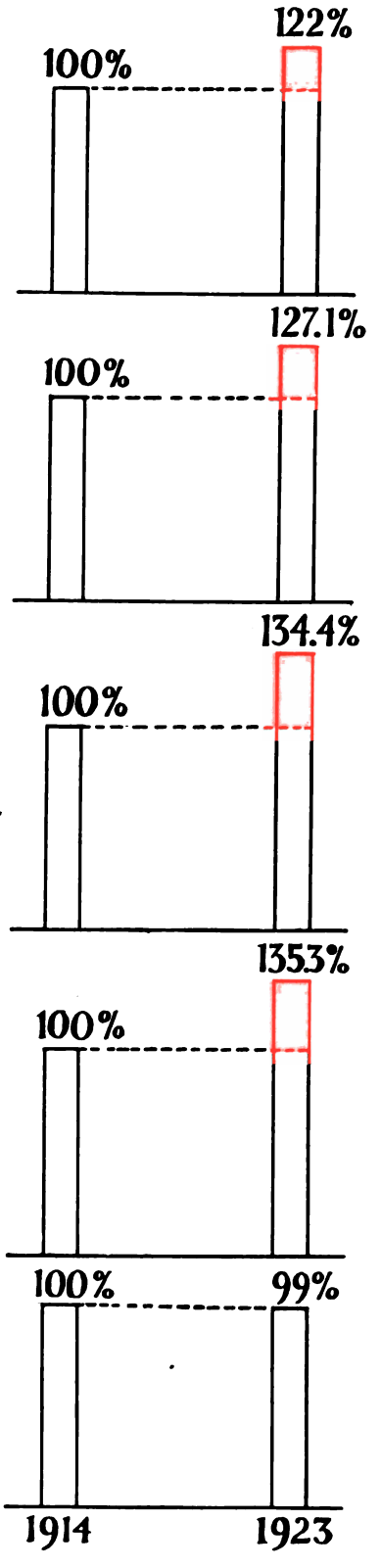
For this, he received wages amounting to

$933



For each dollar of wages received, he added a sale value, through the use of machinery and power, of

$2.37



In 1923 —

Each wage earner was provided with raw materials valued at

$3,930



Through power and the machinery provided him, he turned this raw material into product that sold for

$5,900



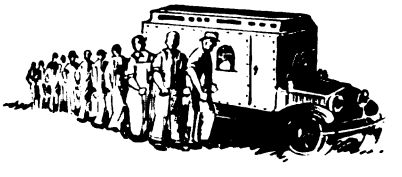
Thus he added a value of

$2,970

to the value of the raw materials.

For this, he received wages amounting to

$1,243



For each dollar of wages received, he added a sales value, through the use of machinery and power, of

$2.35

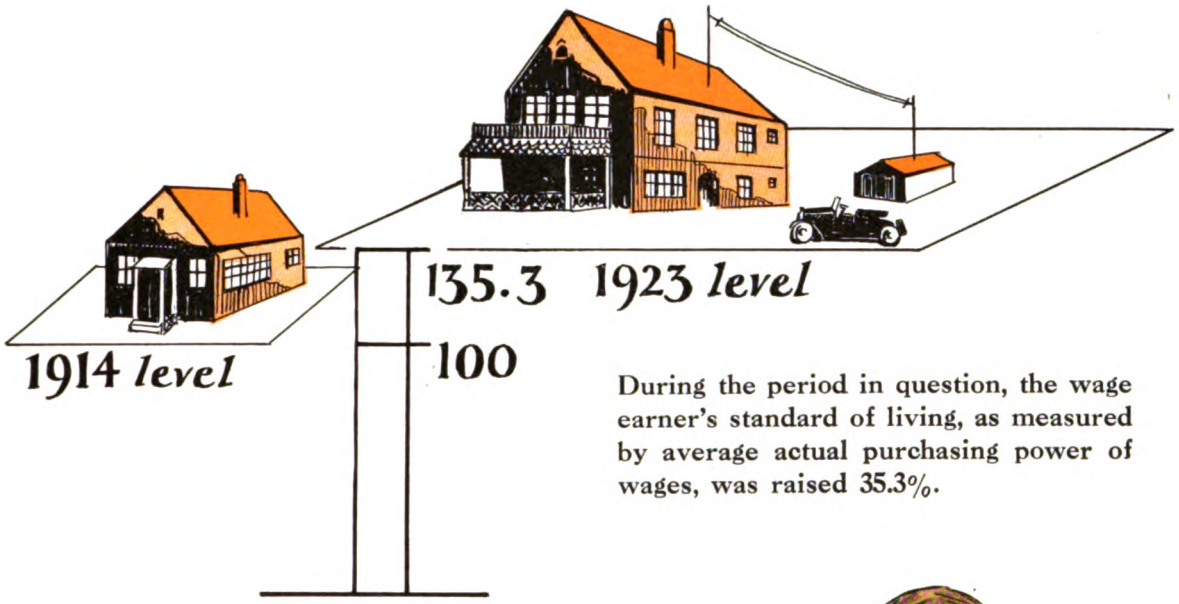
This is the margin out of which must come interest, depreciation, reserves for expansion, selling costs, factory overhead, executive salaries, profits and all other items except materials and wages.

*Figured on the basis of dollars of 1923 purchasing power.

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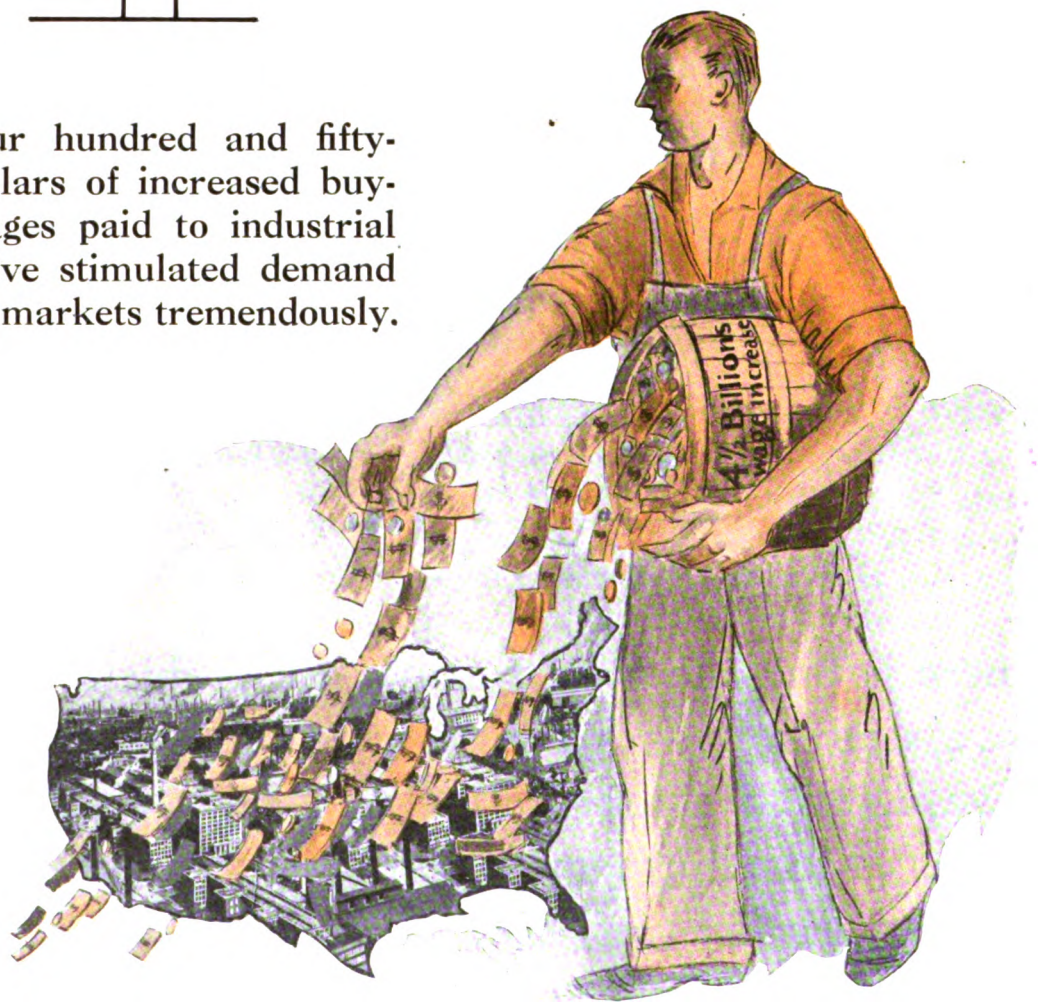
Power and Production

Although production, in 1923 was 34.4% greater, per worker, than in 1914, it was less per dollar of wages paid, because wages increased faster than output value.



During the period in question, the wage earner's standard of living, as measured by average actual purchasing power of wages, was raised 35.3%.

Four billion, four hundred and fifty-seven million dollars of increased buying power of wages paid to industrial wage earners, have stimulated demand and enlarged our markets tremendously.



In 1923, wage earners in American industry received over 11 billion dollars. This was a **gain of nearly 4½ billion** over 1914. **Practically all of this money was put into circulation through purchases and investments.**

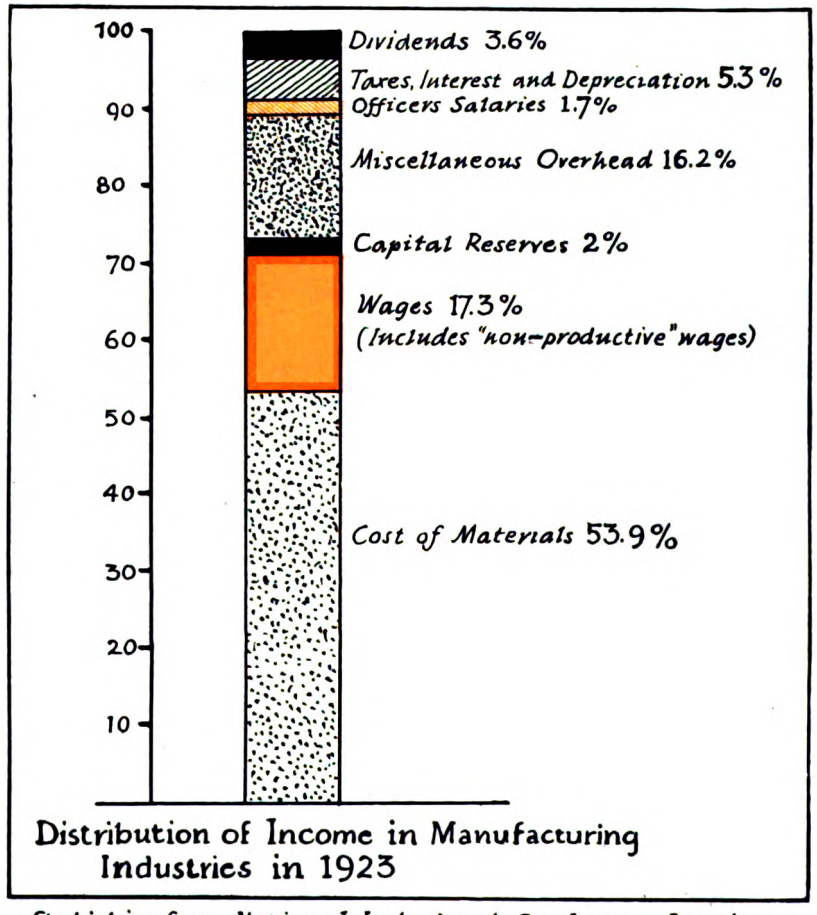
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Production Volumes, in Industry, are 35% bigger than in 1914

But this does not solve the industrial executive's problem, which is to show a profit and pay a dividend.

Cash dividends in manufacturing industries, in 1923 amounted to only 3.6% of total receipts.

Profits are harder to make today than they were 10 years ago, because the margin between prime costs and selling prices, has decreased.

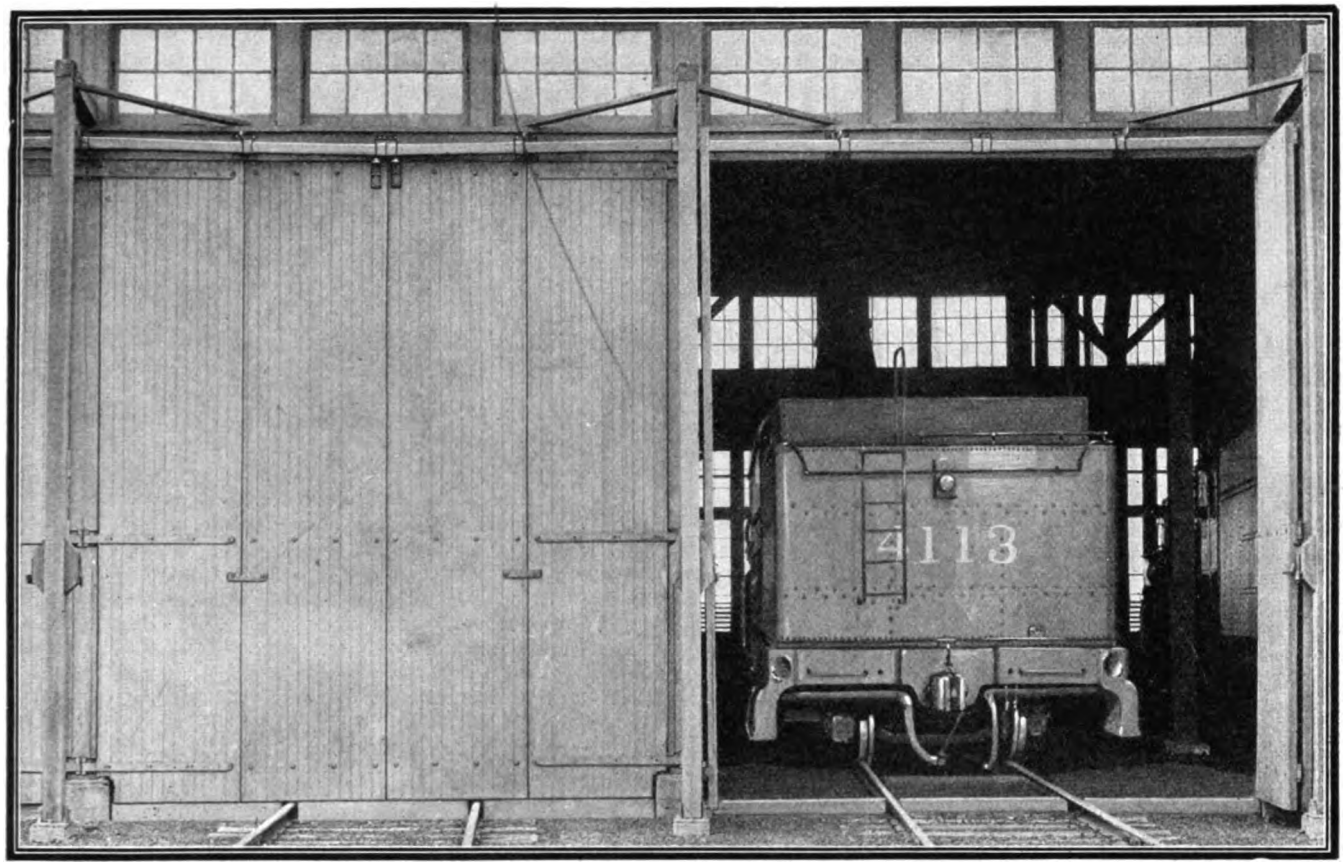


Distribution of Income in Manufacturing Industries in 1923

Statistics from National Industrial Conference Board and U.S. Bureau of Census.

There is but one way to solve the problem of profits. You have seen how added horsepower and improved machinery have declared a four and a half billion dollar dividend to labor. More horsepower and better machinery must now be put to work to boost the 3.6% investment dividend.

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On the windy plains of *Oklahoma*

Slidetite solves Frisco doorway problems

THE FRISCO line had an acute doorway problem at their Oklahoma shops. Doors of locomotive size, open country, high winds, storms—these combined to make frequent and serious trouble.

Then they installed doors equipped with *Slidetite* industrial door hardware. Their troubles disappeared.

Slidetite industrial equipment is the most logical equipment for large doorways. Doors so equipped operate easily and surely, stay where they are put, close smoothly, surely, weathertight. When open the doorway is clear from jamb to jamb—no obstructions. It is the most practical hardware for any doorway up to 30 feet wide.



Slidetite industrial door hardware is sensible economy.

Richards-Wilcox Mfg. Co.

A Hanger for any Door that Slides

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Cutting the Cost of Power Generation

Questions Designed to Aid in Checking Up on Present Performance and Planning for the Future

What was the average cost per kw. hr. for the past year?

Was the cost system complete and accurate?

Were the cost items properly divided between the boiler house and the power house?

Were the cost items properly divided into maintenance and repairs, operation, fixed charges and overhead?

Was the difference in cost as compared with the previous year due to change in efficiency of operation, load factor or price of commodities?

Was the cost of power more than that in other plants of the same industry operating under less favorable conditions or was it lower than those operating under more favorable conditions?

Were these differences in cost due to cost of fuel, efficiency of plant or overhead charges?

How many potential heat units in the fuel were required to develop a kw. hr.?

Was the quantity and quality of fuel received the same as that guaranteed by the seller?

What was the total purchase price and the cost of freight and of handling of the ash content of the fuel both before and after firing?

Was the market searched for fuels of greater or less potential heat content that would provide more heat units per dollar?

Is there an available fuel, probably more expensive, with a higher fusion temperature of ash that would clinker less and thus afford higher boiler efficiency and reduce the cost of furnace and grate maintenance?

Could a cheaper fuel with a lower fusion temperature of ash be used without serious clinkering?

Is the volatile content of the fuel suitable for the combustion chamber in which it is burned?

Has an effort been made to find a market for the sale of ashes?

Has sufficient effort been made to reduce the amount of carbon in the ash?

Would more modern machinery for handling fuel into and out of storage and for the disposal of ashes reduce costs?

Would the installation of stokers or more modern stokers or pulverized coal system or better designed furnace decrease labor, increase boiler efficiency or permit the use of a cheaper fuel?

Are too many boilers carried in service, resulting in low efficiency due to low ratings, expensive banking of fires and frequent blowing of safety valves; or are too few boilers carried in service so that the steam pressure drops under peak load demands, resulting in a tremendous waste of heat in trying to raise the pressure to normal?

What is done to prevent peak loads?

Is too much time spent in burning down, cleaning and dumping fires?

Is power wasted by operating the draft fans against an unnecessarily high pressure in the air ducts?

Does air pressure instead of draft exist in the combustion chamber resulting in the burning out of grates and furnaces?

How often are the boiler baffles examined in order to prevent the short circuiting of hot gases?

How are the back dampers regulated to keep down the temperature of the waste gases and are the gas temperatures close to that required for high boiler efficiency?

Is the CO_2 of the waste gases known and how is it controlled?

What is done to prevent leakage of cold air through the boiler setting and furnace?

Do the back dampers fit tightly and are they closed when the boiler is not steaming?

What is the temperature of the flue gas leaving the economizer and is it as low as possible?

What is the temperature of the water entering the economizer and is the temperature maintained as high as possible by returning all hot water available to the boiler house?

What is the increase in the temperature of the water passing through the economizers and how often must the tubes be cleaned inside and out to maintain that increase?

Is the pressure of the feed water unnecessarily high to force the water into the boiler?

Are the boiler tubes kept clean inside and out?

Has the proper feed water treatment been intelligently determined and how is the water or steam sampled to keep scale forming impurities at a predetermined minimum?

Are hot water and steam leaks promptly stopped and how is the proper amount of blow-down determined?

Are all hot surfaces economically insulated?

What instruments are provided to enable the fireman to know the air pressure under the grate, the draft in the combustion chamber and in the back pass, the temperature of the flue gases leaving the boiler and the rate at which the boiler is steaming?

What instruments are provided to enable the engineer in charge to measure the amount of production of steam, the efficiency of the plant, the magnitude of peak loads and to inform him of what kind of operation was maintained during the night?

What is the total input in heat units in the fuel, the total production of heat units by the boilers and economizers, the equivalent heat units used by the boilers and the number of heat units supplied to the factory for heating and processing purposes?

What code of rules for safe operation and maintenance is applied in the boiler house and is a periodical inspection made by insurance or state boiler inspectors?

What is the drop in steam pressure from the boiler house to the power house and is it excessive?

How many pounds of steam are used to develop a kw. hr. and is it kept at a minimum by maintaining as high an initial steam pressure and as low an exhaust pressure or as high a vacuum as possible for the prime mover?

Are periodical inspections made of the wear of the steam cylinders and valves and of the proper setting of the valves in addition to other parts of the engine?

Has the most efficient and economical lubrication been determined?

Are the generator coils cleaned and painted as required?

Are there instruments and is a log kept to determine the peak loads, the power factor, the voltage maintained and the number of kw. hrs. produced?

Are live wires, switches, buss bars and connections properly guarded?

Is the treatment of employees such as to make them anxious to hold their jobs?

Is the interest and pride of the management in the boiler house and power house sufficient to inspire a similar attitude in the employees?

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Compendium of Modern Equipment and Its Relation to Profitable Production

Section I—Power Generation

Air Compressors

Air compressors are required in most plants for the operation of pneumatic tools of all types.

Compressors serve to compress air to the required pressure, delivering it to a tank, which supplies distribution pipes running to strategic points in the plant. Intercoolers and aftercoolers are required to absorb the heat produced in the air by the compression process. Air filters prevent the entrance of dust into the system and assure its safe operation.

Air Filters

Apparatus to filter air for the ventilation and cooling of turbo generators and other electric equipment. Increases efficiency of operation by eliminating dust deposits, thus preventing shutdowns and loss through short circuits.

Air Preheaters

Air preheaters perform a function for the furnace air supply, similar to that performed by feed water heaters for the boiler water supply. They make use of waste heat in the outgoing gases, to raise the temperature of the air before it is admitted to the fuel bed. Their purpose is to promote better combustion by furnishing the necessary air at a temperature of 300° F. or more, instead of at the normal of from 70° F. downward.

Arches

Ignition arches, and various types of flat arches and suspended arches make rapid and efficient combustion possible, depending upon the grade of fuel burned.

Low grade fuels can be burned if proper arches are provided, thus materially reducing fuel costs. Modern arch construction and intelligent handling of fires keep maintenance costs at a minimum.

Ash Bunkers

Ash bunkers are usually concrete. They are high enough to allow a truck or car to pass under. Suitable ash gates operate to discharge ashes at the bottom. The bunker may be filled by conveyors or hoists.

Ash Cars

Small industrial cars, or even large railroad cars, can sometimes be "spotted" directly under the ash pits, practically eliminating any extra operating costs and entailing minimum labor costs.

Ash Hoists

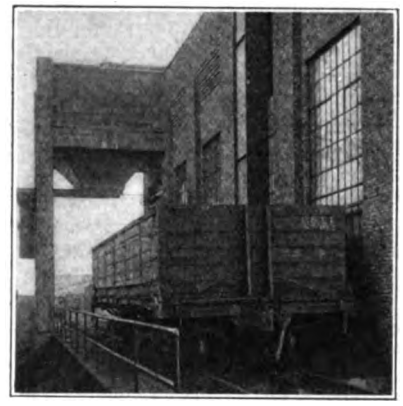
Elevators of the plunger type or skip hoists are frequently used to raise ash cars from the ash cellar.

Rapid handling, and moderate labor and operating costs are possible with this system.

Ash Pits and Quenching

Ash pits are designed deep enough to prevent injury to stoker or grate parts by hot ashes. Provision can be made for quenching the ashes in the pit immediately after dumping.

Proper design of ash pits and proper handling of the ashes will materially reduce maintenance costs of coal burning equipment.



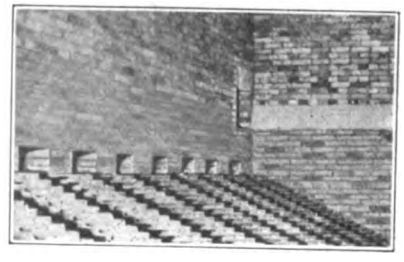
OVERHEAD ASH BUNKER

Baffles

The purpose of baffles is to properly direct the flow of gases through the banks of boiler tubes. They consist of a wall of heat-resisting brick, built around and between the tubes.

Baffles prevent the shortcircuiting of the gases in their path through the tubes. Thus, they conserve heat and utilize in full the heat developed in the furnace.

Solid and monolithic baffles offer no cracks for gas leakage and are, therefore, more efficient than the built-up brick baffle. They are easily repaired and reduce fuel and labor costs.



TYPICAL BAFFLES

Boiler Accessories

Water columns, steam pressure gages, safety valves, check valves, non-return stop valves, etc., are necessary safety appliances on every boiler. The water column gives visible indication of a safe water level. It may be provided with a high or low water alarm whistle, as a further precautionary measure. The steam gage gives the men on the firing floor a visible indication of the operating pressure in the boiler. The safety valve operates to let steam blow out when the pressure is excessive. Check valves in the feed water line prevent water in the boiler flowing back into the feed water system. Non-return stop valves are placed on the boiler steam line to prevent steam flowing from the main line back into the boiler when steam pressure is low in that particular unit.

Boiler Coverings

Steam boilers are covered with insulating material to prevent radiation of heat. Boiler coverings therefore, conserve fuel and reduce fuel costs.

Boiler settings are often painted with a plastic coating to prevent leakage of air into the fire box. Air infiltration reduces furnace temperatures and combustion efficiency is impaired. Prevention of air leaks, therefore, assists in maintaining low fuel costs.

Boiler Tube Cleaners

Scale deposits are removed from boiler tubes by various types of mechanical cleaners. Where feed water treatment does not prevent the formation of scale, tube cleaning at regular intervals is necessary to maintain a high rate of heat transfer and low fuel consumption.

Boilers, Fire Tube

Fire tube boilers in stationary plants are of the return tubular type. That is, furnace gases pass under the boiler shell to the rear of the boiler and enter the boiler itself through large tubes or flues which run from rear to front. Water in the boiler surrounds these tubes. Gases leave the boiler at the front.

Return tubular boilers are often suited to small plants where the load is uniform and no rapid steaming is required. They involve a moderate financial outlay and are economical at moderate ratings under the conditions specified.

During 1927, the issues of Industry Illustrated will contain articles especially planned and prepared by experts dealing with the executive selection, control and operation of this modern money-saving equipment.

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Boilers, Water Tube

Water tube boilers consist of one or more drums, superimposed above one or more banks of tubes. Water circulates through the drums and tubes, while the furnace gases pass between the tubes.

Water tube boilers are rapid steamers and are adaptable to fluctuating loads. They maintain a high efficiency under heavy overloads and may be built in very large sizes.

Coal Bunkers

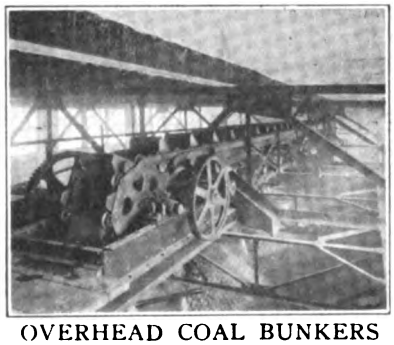
Bunkers offer a temporary storage for coal in the boiler house. They are installed at an elevation that is high enough to permit fuel to feed by gravity to the furnace. Individual chutes lead from the bunker to each boiler and a coal gate is placed at the head of each chute so that the supply can be shut off when the boiler is out of commission. Bunkers are particularly desirable where the furnaces are mechanically fired.

With mechanical firing, overhead bunkers greatly reduce labor costs of handling coal in the boiler house. They also assure a reserve supply of coal that could tide over a failure of the delivery system for short periods of time.

Coal Crushers

Many plants, because of their location, may find it very economical to buy run-of-mine coal, which has large lumps mixed with it. Coal crushers quickly reduce the size of this coal so that it can be fed to the furnaces.

Where local conditions warrant, coal crushers make it possible, therefore, to reduce the coal bill materially.



OVERHEAD COAL BUNKERS

Coal Handling

Coal handling systems have for their purpose the unloading of coal from cars or barges, the delivering of the fuel to a storage pile or to the boiler house, the weighing and recording of the amount of coal received, the crushing of the larger sizes to a size that is suitable for feeding to the furnaces, and the delivery of the sized coal to bunkers supplying the boilers.

A complete system is suited only to a large plant, where a large coal tonnage is burned. Modifications of the complete system, with some of its features omitted, are suited to smaller plants, where less coal is burned.

Coal handling systems reduce labor costs because the fuel is handled mechanically. Where a storage is provided, a reliable coal supply is assured and interrupted production due to coal shortage is insured against.

Coal Scales

Coal scales at the point of delivery indicate the correctness of the weight of coal received. They do not save labor. If anything, it costs perhaps a little more to weigh coal than not to weigh it. But they insure against short-weight.

Recording scales are often installed on the conveyor systems which deliver coal to the boiler house. These scales act as a check on the railroad scales; they indicate losses between the storage pile and the coal bunker; and they assist operating men in maintaining the efficiency of the boiler house.

Condenser Equipment

Condenser equipment comprises means for condensing steam exhaust from an engine or turbine, by means of cooling water. A pump is provided for circulation of the water. Other pumps are used for removing the condensate and the air that get into the system.

A condenser system lowers the back pressure on the steam prime mover and enables it to do more work with the same amount of steam. Condensing equipment, therefore, saves fuel costs.

Conveyors, Ash

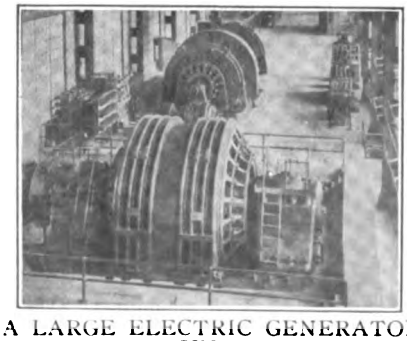
In large plants ashes are usually handled by mechanical conveyors. In small plants a steam jet conveyor is often suitable.

In either case labor costs are materially reduced.

Conveyors, Coal

Bucket conveyors, bucket elevators, belt conveyors and, sometimes, scraper conveyors receive coal from railroad cars or delivery trucks and carry it to coal crushers, to overhead bins, to a storage pile, etc.

A large amount of fuel is handled mechanically and continuously and labor costs are materially reduced, particularly where any considerable amount of fuel is burned. Portable unloaders are sometimes backed up to a car or truck and the labor and time required to unload is reduced, even where the amount of coal received is small.



A LARGE ELECTRIC GENERATOR UNIT

Cranes, Unloading

Locomotive cranes consist of a hoist mounted on railroad trucks. They are easily shifted about by a switching engine and can be used where yard facilities permit and where coal is delivered by rail. They unload coal quickly.

Overhead cranes of various types are used for unloading coal from either barges or railroad cars.

Unloading cranes and hoists increase the speed of handling coal when it is delivered and reduce the labor required in the handling.

Dampers

Dampers are provided in air ducts, flues and stacks as a means for controlling the draft and air supply for combustion purposes.

The manipulation of these dampers has a great deal to do with efficient combustion and coal consumption of the plant. Intelligent handling of the dampers reduces operating costs.

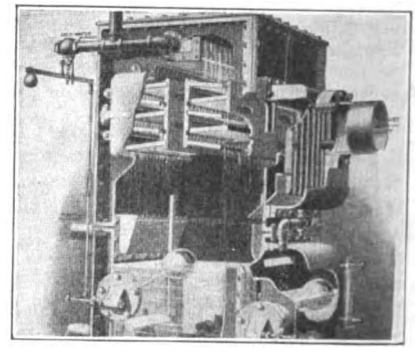
Damper Regulators

Regulators are often provided to automatically operate the dampers, as the steam pressure or condition of the fuel bed requires it.

Damper regulators eliminate the uncertainty of the human element and when properly adjusted add to the economy of operation in terms of efficient combustion and low fuel costs.

Diesel Engines, Oil Engines

Where coal costs are high, Diesel and oil engines are often economical units, both as prime movers and also in the smaller sizes. They may be used in the same services that would be required of steam engines.



BOILER AND FEED WATER HEATER

Draft, Forced

Turbo-blowers and forced draft fans supply air under pressure to the ash-pits of boiler furnaces and literally force air through the fuel bed.

Stokers are designed to give high combustion rates and are, therefore, usually operated in conjunction with forced draft fans, which supply more air than would be available with natural draft. Forced draft is also used with flat grate installations, making it possible to burn low grade fuels rapidly and economically.

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Draft Gages

Gages are often used for indicating and recording the draft and air pressure in the ash pit, in the furnace or in the uptake of a boiler setting.

Draft, Induced

An induced draft system comprises an exhaust fan situated between the boiler and the smoke stack. The suction of the fan draws the gases of combustion from the boiler setting and delivers them to the stack. Instead of having a positive air pressure in the furnace chamber as in the case of forced draft there is a partial vacuum. The purpose is the same as with the forced draft system, namely to increase the rate of combustion and secure higher boiler rating than would be possible with stack draft only.

Economizers

Additional heating of the feed water can be obtained under favorable plant and load conditions by the use of economizers. This type of heater is placed in the smokestack breeching, so as to utilize the waste heat of the gases of combustion. Feed water circulates through the economizer just before the water enters the boilers. It is always under boiler pressure. The water forced through it by the feed pumps is raised to a very high temperature by the waste chimney gases of the stack. Economizers save fuel costs. They involve an addition to operating and overhead costs, however, and their economy always depends upon the particular conditions found in each individual plant.



ASH REMOVAL CONVEYOR

Electric Generators

Electric generators are driven by some form of prime mover and develop either direct or alternating current, depending upon the design, for use throughout the mill. They are very efficient machines and operate with minimum trouble and annoyance. In larger sizes a cooling system, consisting of fan and air duct, must be provided for supplying air to cool the windings.

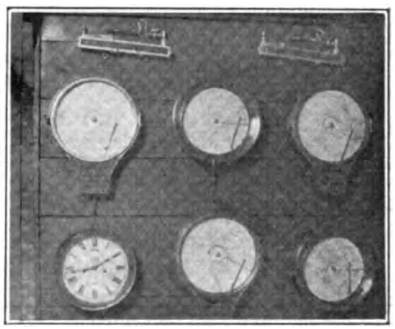
Exhaust Piping

Small exhaust lines may be made up of standard pipe. For large lines, however, spiral riveted pipe is more practical and economical.

Expansion Joints

Expansion joints are provided in long steam lines to absorb the expansion and contraction in the line due to heat or cold.

If proper expansion joints are not provided the line may buckle, open up at the joints and always be in need of repair.



BOILER GAGES AND METERS

Feed Pumps

Pumps are required to force water into the boilers against the operating pressure. They may be reciprocating plunger pumps, geared rotary, or centrifugal pumps.

The correct installation of boiler feed pumps and their proper capacity are of great importance. Improperly installed pumps may result in faulty operation. causing considerable annoyance and increasing maintenance costs. The same may be said if the pumps are too small for the job.

Pump governors are used in conjunction with boiler feed pumps to control its operation and the consequent delivery of water. Automatic governors make constant attention on the part of the operator unnecessary.

Injectors are also installed as an emergency means for feeding water to the boilers, in case of failure of the main feed pumps.

Feed Water

The care of boiler feed water systems and the efficiency of the equipment comprising the system has much to do with operating efficiency and maintenance costs in a power plant.

Feed Water Heaters

Cold feed water is heated by exhaust steam in feed water heaters before it is introduced into the hot boilers. There are two kinds of heaters, viz.. open and closed. In the open type the water is under no pressure. Where this type is used the feed pump is placed in the line between the heater and the boilers. The closed type of heater is always under the same pressure that exists in the boilers. It is placed in the water line between the boilers and the feed pump.

The use of feed water heaters saves coal, because a large amount of waste heat in the exhaust steam is utilized to do work that would otherwise have to be done by the boilers. Since feed water heaters reduce the amount of work required by the boilers, smaller boilers are required to evaporate a given amount of steam.

Feed Water Piping

Water is delivered to the steam boilers through a system of piping. Due to the corrosive action of hot water on metal, only high grade brass piping, capable of standing boiler pressures, can be used.

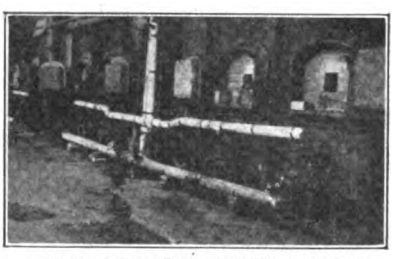
Feed water piping, in itself, does nothing to increase or decrease operating costs. But the selection of suitable piping for the service and its proper installation and anchoring has much to do with the maintenance costs over a period of time.

All feed lines should be insulated with proper material, because the water carried is hot and a loss of this heat by radiation to the air requires a definite coal tonnage to replace. Feed water insulation accomplishes a one per cent. coal saving for every ten degrees of temperature retained in the feed water.

Feed Water Regulators

In modern plants automatic regulators control the supply of water to the boilers, so that a safe and satisfactory water level is at all times maintained in the drums.

Hand regulation of feed water is intermittent, i. e., large volumes of relatively cool water are introduced at infrequent intervals. Constant and uniform steaming of the boiler, therefore, is not possible. A more even steaming and operating pressure is maintained by automatic regulators. The boilers can thus absorb heavy overloads almost instantly and greater reliability of plant production is assured.



STEAM PIPE INSULATION

Feed Water Softeners

The water that must be used for boiler feed is, in some localities, contaminated, or it may carry scale-forming salts in solution. If scale is deposited in the boilers it prevents efficient operation. Various methods and equipment are used, therefore, to remove these salts or to render them harmless.

Specially prepared chemicals, known as boiler compounds, can sometimes be

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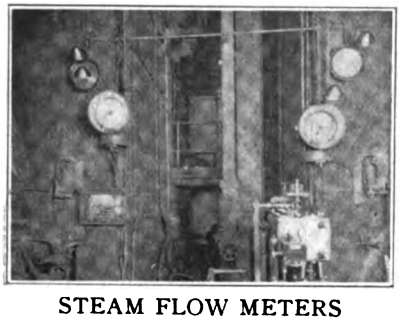
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advantageously introduced into the feed water and harmful deposits thus prevented.

In other cases a softening system, known as the "lime-soda" process, may be used. Such a system involves tanks where the water is chemically treated, where the salts are precipitated, and where they are allowed to settle out. Filters may also be used to remove suspended salts.

Continuous feed water treatment is accomplished by the "zeolite process," which also renders boiler feed water harmless. The water flows continuously through tanks of zeolite, which absorbs the harmful elements in the boiler feed as it passes to the boilers.

Scale deposits insulate the boiler tubes and prevent efficient heat transfer from the furnace to the water in the boiler. They increase, therefore, the coal consumption of the plant. Where scale is formed it must be removed regularly, thus increasing labor costs. Feed water softeners, consequently, reduce labor and operating costs in proportion to the amount of scale they prevent.



STEAM FLOW METERS

Fire Brick

High efficiency of combustion involves high furnace temperatures. The limit of furnace temperature depends upon the character and quality of the fire brick used. Within recent years the development of fire bricks to resist unusually high temperatures has made marked strides. The same applies to fire brick cement.

Good fire brick and cement, together with proper laying, therefore, assure long life of the furnaces and reduced labor and maintenance costs. The maintenance of high combustion efficiency and low fuel and repair costs is, therefore, possible under these conditions.

Furnaces

The design of boiler furnaces is of the utmost importance from the standpoint of efficient combustion and plant maintenance. Furnace design should be considered with due regard to the type of fuel to be used, and with an eye to the future as well. A change of fuel, without consideration of the furnace design, often results in poor efficiency.

Gages, Pressure

Gages of the indicating and recording type give visible indication of steam pressures in boilers, in receivers, in condensers, etc.

Gas Engines

Some plants produce waste gases as a by-product. When these gases are combustible, such as blast furnace gas, they can be used to operate gas engines and thereby generate electrical power. Waste products of the plant are thus reclaimed.

Grates

Grates form a mechanical support for coal while it is being burned under the boilers. Various types are designed for the different kinds and grades of coal available.

Properly selected grates increase combustion efficiency, decrease coal consumption and labor costs in connection with the handling and cleaning of the fires.

Insulation

Insulation for exhaust and live steam lines is provided in the form of a covering for the pipe lines.

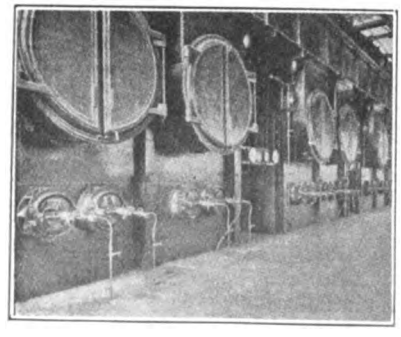
Insulating material prevents condensation of the steam, enabling it to retain its heat and to accomplish more work for a given amount of coal burned.

Live Steam

Live steam piping is made in three weights. The weight used depends upon the steam pressure to be carried. Fittings are made to correspond to the weight of pipe used. In the matter of maintenance costs of steam piping, much depends upon the installation, as regards anchoring, proper size of bends, etc. A poorly done job can give all kinds of trouble.

Lubricating Appliances

Various types of lubricating appliances are provided for assuring a continuous supply of oil to machine parts. This eliminates the intermittent feature and possible neglect which is unavoidable with hand oiling. Proper oiling appliances prevent excessive wear and influence the attainment of low maintenance costs of mechanical equipment.



OIL BURNERS

Meters, Steam

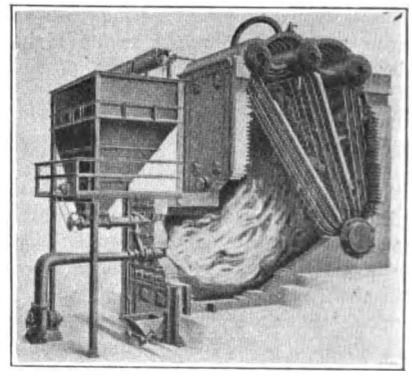
Meters are also provided for measuring the steam flowing in a given pipe line. They are of the orifice and venturi types.

Meters, Water

Means for measuring the weight of water fed to and evaporated in the boilers are frequently provided. They may be of the V-notch, orifice, venturi, or weigher types.

Meters, Etc.

Meters and boiler room instruments are invaluable to operating men in checking power plant losses and in maintaining a high standard of operating economy. To executives they provide a visible indication and record of plant performance, which can be compared from day to day or from week to week.



PULVERIZED FUEL FURNACE

Oil Burners

In localities where the cost of coal is high, fuel oil is suitable for burning under boilers. Specially designed burners direct the oil into the furnaces where it is burned with a high efficiency, not possible to attain with coal. Oil burning systems must provide for oil storage, for heating of the oil, for pumping it through the system and for atomizing it and blowing it by air or steam into the furnace.

Oil burning plants reduce fuel costs in localities where coal prices are unfavorable. The big saving in burning fuel oil, however, is in the reduction of labor. Very little attendance is required on the firing floor and there is no ash handling, coal passing or cleaning of fires to be done.

Oil Separators

Oil separators are placed in exhaust steam lines from reciprocating engines and steam pumps in order to remove cylinder oil that may be carried in the exhaust steam.

The presence of oil in the exhaust steam fouls the heating coils of boiling and cooking apparatus and reduces its efficiency and capacity. In some processes the presence of oil in exhaust steam would contaminate the product that is being manufactured. In either case production suffers.

Pulverized Fuel Equipment

Pulverized fuel burning equipment consists of means for crushing coal, for reducing it to a powder, for mixing it with air and for blowing it into the

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boiler furnaces, where it is instantly burned in a rapid hot combustion.

Very low grade fuels can be burned with unusually high efficiency. Material reductions in fuel costs are, therefore, possible and high boiler ratings can be maintained. The burning of pulverized fuel produces no ash and ash handling equipment is not required. Provision must be made, however, for removing the fused refuse from the furnace and settings.

Pyrometers

Electrical instruments, called pyrometers, indicate and record the temperature of flue gases in a way similar to the thermometers previously mentioned.

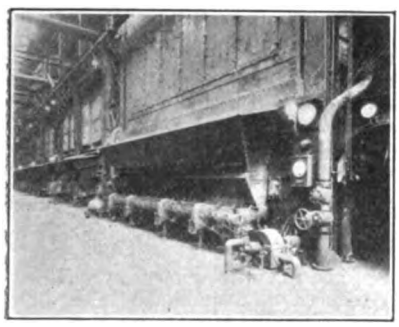
Recorders, CO_2, Hand Orsat

The hand Orsat indicates the per cent. of Carbon Dioxide in the flue gases, while the CO_2 Recorder gives a continuous record of this factor over a period of time. The readings taken are an indication of the efficiency of combustion in the furnace.

Refrigeration Machinery

Refrigeration machines in stationary plants use ammonia as the refrigerant. The properties of ammonia enable a very low temperature to be attained after compression, when adequate provisions are also made for cooling and re-expansion. Low temperatures such as these are required in many processes, the most obvious of which is ice making.

In some plants conditions are ideal for the use of an absorption system of refrigeration. This process does away with the compressor, utilizing various arrangements of pumps and pipe coils to attain the same result. This system operates on exhaust steam and is very economical.



MECHANICAL STOKERS

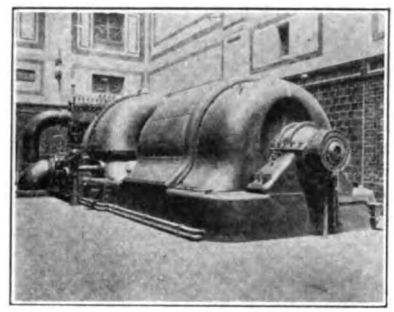
Sluice System

The lay of the land and the presence of a brook or stream or other waste water sometimes make conditions ideal for a sluice system for handling ashes. Such a system has the advantages of having no maintenance costs and very little labor cost.

Soot Blowers

Soot is deposited between the tubes of water tube boilers and in the tubes of fire tube boilers by the gases of combustion on their way from the furnace to the flue. This soot insulates the tubes in the same way the water scale does. Soot blowers, using steam for scouring purposes, remove this soot at regular intervals.

Soot blowers, if consistently used, maintain a high rate of heat absorption in the boiler and assure reduction in the fuel consumption of the plant.



STEAM TURBINE

Steam Engines

The main prime movers of a power plant are highly efficient. Engines of the Ball, Corliss and Uniflow types are designed to operate with remarkably small steam consumption, particularly when running in conjunction with condensing apparatus.

Main units usually drive electric generators. They may also drive the line shafting of the mill through a large transmission belt.

Auxiliary steam engines are not so economical as the main units. Their excessive steam consumption, however, is utilized in the heating of feed water or in the manufacturing processes of the plant. Auxiliary engines drive auxiliary plant equipment.

Steam Separators

Before steam is allowed to enter the cylinders of steam engines it is first passed through a steam separator, which removes all water and larger drops of moisture in the steam.

Steam separators prevent accidents, due to the presence of water in a steam engine cylinder and the consequent blowing out of the cylinder head on the exhaust and compression stroke of the piston.

Steam Turbines

Steam turbines drive electric generators. They may also drive fans, blowers, pumps, etc.

The large main units are exceptionally economical when operating with a condenser. The small auxiliaries like small engines are more wasteful of steam, but their exhaust is used for various heating purposes, thereby conserving what would otherwise be a loss.

Stokers

Stokers are, briefly, mechanical grates. They may be operated by hand, by electric motor or by an auxiliary steam engine. They are designed to feed coal automatically to the furnace. Means are usually provided for controlling the distribution of air to the fuel bed.

Automatic stokers materially increase the combustion efficiency; they make possible high combustion rates and maximum boiler capacity; they make it possible to burn low grades of fuel; they eliminate hand shoveling of coal. Reduced labor, fuel and overhead costs are, therefore, possible in plants large enough to utilize them to advantage.

Superheaters

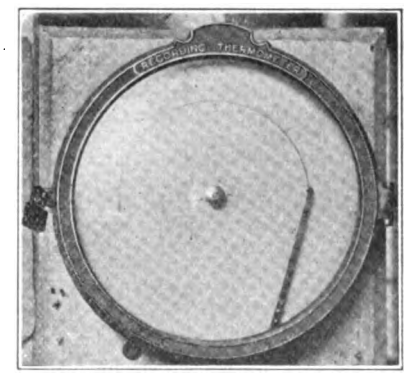
Superheaters consist of a bank of tubes (exposed to the heat of the furnace gases), through which steam generated in the boilers is passed before it is delivered to the main steam line. This superheating of the steam evaporates all the moisture and heats the steam to a very high temperature. Superheaters prevent condensation of steam in the pipe lines, engine cylinders and steam turbines, thereby assuring a maximum amount of work done by the steam. Superheaters, therefore, save heat losses due to condensation that are unavoidable when ordinary steam is used. They result in a material coal saving under favorable conditions.

Thermometers

Indicating and recording thermometers read the temperature of feed water, flue gas and superheated steam lines.

Valves, Pressure Regulating

Where a constant pressure is needed in the exhaust line, a pressure regulating valve is provided, which acts to admit live steam or turbine steam. When the back pressure builds up to normal the valve shuts off the makeup supply.



RECORDING THERMOMETERS

Valves, Relief

Atmospheric relief valves are provided in exhaust steam lines to permit steam to escape to the atmosphere, if the pressure builds up too high. This is a safety measure to prevent rupture of the line.

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Eliminating Losses in Power Transmission

Questions Designed to Aid in Checking Up on Present Performance and Planning for the Future

How much power did each produced article represent during the past year?
How does this amount compare with that of the preceding year?
Was the difference in power consumed per article produced due to changes made in the power transmission system, or to changes in manufacturing processes and equipment?
During the past year how many idle machine hours were chargeable to failures in power transmission?
What percentage of these failures was due to lack of proper inspection and maintenance of equipment?
How does the unit of power per produced article compare with that of other plants manufacturing similar articles?
Considering the individual motor driven machines collectively, and the sum of their idle hours chargeable to power transmission trouble, what is the average time lost per machine?
Considering the group driven machines on the same basis and comparing the figures with those of individual drive, which system of driving shows the smaller number of machine hours lost due to power transmission trouble?
During the past year, what was the maintenance cost of power transmission equipment per 1000 kw.-hr. consumed?
How does this compare with that of the preceding year?
Considering the individual motor driven machines collectively; their total number of operating hours for the past year, and the total maintenance cost of power transmission equipment for driving them—what was the average maintenance cost per 100 operating machine hours?
How does this cost compare with that of the preceding year and what was the reason for the difference?
Considering the group driven machines on the same basis, and comparing the figures with those of the individually driven machines, which system of driving shows the lower maintenance cost?
What is the annual cost of power wasted through frictional losses in the jack shaft, line shaft and counter shaft bearings?
How many oilers are employed in oiling power transmission equipment?
Would the sum of money to be saved in reduced frictional losses, less lubricant, fewer oilers, lower maintenance cost, and fewer shut-downs, justify discarding the bearings now used and replacing them with modern anti-friction bearings?
Where alternating current is used for power, what is the average power factor of the plant load?
Has a penalty ever been paid to the public utility for failure to maintain a satisfactory power factor?
In selecting motors, are the drives carefully analyzed and the characteristics of the various types of motors carefully considered?
As a measure toward efficient operation and power factor improvement, are all induction motors selected of sizes that in operation they will be well loaded?
Are the less expensive and more efficient high speed motors used where applicable?
As an additional means of maintaining high power factor, is use made of the synchronous motor in sizes of 50 horse power and over?
Are there any high starting torque loads employing squirrel cage motors, where smaller motors of the form wound rotor type or those having high resistance rotors would be better applicable?
Are there any group drive motors which operate lightly loaded after the shutting down of a machine consuming considerable power and operating only part time?
Would the savings to be effected by driving the machine individually and replacing the group drive motor with a smaller one justify the expenditure?
Are large group motors operated partly loaded on overtime or Sundays to drive one or two machines engaged in maintenance work where these few machines could be more efficiently driven individually or in a small separate group?
What portion of the maintenance to motors and controllers is made necessary by improper starting?
Are all motors having the old style controllers started by reliable and properly instructed employees?
Are the fool-proof push button controllers used on all new installations as means of protecting both electrical and mechanical apparatus?
Are motors standard as to size, type, speed and make used wherever possible, thereby permitting their interchangeability and requiring fewer spares?
Are like motors for belted drives equipped with standard pulleys so far as possible, thus permitting quick interchangeability?
Are spare motors carried for important drives where a shutdown from motor trouble would involve considerable expense or inconvenience?
Are oilers careful to see that the motor windings do not become oil soaked?
Are records kept on all motors showing their present locations, their speed, horse power, frame number, etc., and to what drives they are applicable?
On individual drives, are the motors protected from excessive shocks and vibrations by the use of flexible couplings or belts as shock absorbers?
Are motors periodically inspected, gauges or feelers being used between the rotors and stators?
Are the bearings of motors, line shafting and other transmission equipment periodically cleaned with kerosene and filled with clean lubricant?
In the selection of shafting for power transmission duty, is special care taken to see that perfectly straight pieces are obtained and that they are not bent in handling?
Has standardization as to sizes and speeds of line shafting been followed so far as practicable, permitting greater interchangeability of parts and a smaller stock of spare parts?
In planning a group drive system, is the direction of rotation of the main shaft such as to allow the use of the fewest possible cross drives, thereby prolonging belt life and reducing friction?
Are group drive motors placed so as to allow the bottom side of the belts to be in tension, thereby making the top strand useful through added area of pulley contact?
Is power applied to a shaft at the load center or at the center of the shaft?
Are group drive systems arranged with clutches or couplings at intervals in the shafting, betwen groups and at other shaft joints, permitting loads to be shifted from one motor to the other as production fluctuates, thereby enabling a motor to be shut down and its load shifted to the remaining motors during a slack season?
Is shafting periodically inspected for misalignment in an effort to keep bearing friction reduced to a minimum?
Where a machine is idle for a considerable time, is its belt removed entirely from the line shaft, thus saving the belt and reducing friction?
Are records kept of the service rendered by each belt, enabling intelligent comparisons to be made of the various types and brands for the particular drives in question?
Are belts as to material, width, ply, etc., specified by a capable engineer or by a millwright?
Is quality rather than price the determining factor in the selection of leather belting?
Have the merits of balata, rubber, cotton, hair and other composition belts been investigated as a replacement of leather on certain drives?
Before a belt is specified for driving a machine, is there an acurate test of that particular drive made to determine exactly the amount of horse power to be transmitted?
Is advantage taken of every opportunity to run belts at their most efficient speed, enabling the use of lighter and less expensive belts?

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Compendium of Modern Equipment and Its Relation to Profitable Production

Section II—Power Transmission

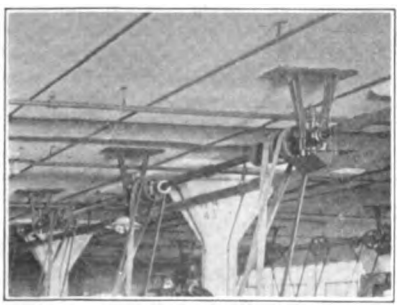
Bearings

Where mechanical power is transmitted there must be bearings to support all rotating members such as machine parts, shafting, etc. There are many types of bearings and proper places in industry for each, but of vital significance from the economical viewpoint is the wise selection of the type best suited for each given application.

In operation there are always slight frictional losses in bearings. Due to the large number of them in every industrial plant, their collective losses are large. These losses, however, can be reduced to a minimum by the proper selection, installation and maintenance of bearings.

Where two or more bearings are required to support a single continuous rotating member as in the case of a line shaft, extreme care should be taken to see that they are properly aligned. Very slight misalignment may only increase the power consumption, wear-and-tear and maintenance costs, but the greater misalignment in addition to these evils may cause the fatigue and breakage of the shafting which rotates within them or the hangers or structure by which they are supported, thus endangering nearby equipment and the lives of persons. Most bearing failures are due to lack of knowledge on the part of the user, the employment of improper oil and grease being a common fault.

In the care of bearings, lubricants should be chosen and applied intelligently. A lubricant that may prove best for a plain bearing may be unsatisfactory for a different type. Again, a lubricant which may prove best for a bearing under certain operating conditions may be unsatisfactory for the same bearing under different operating conditions. Atmospheric temperature, shaft speeds and loads are some of the points to consider when specifying lubricants. Bearings last longer when inspected, cleaned (usually with kerosene) and refilled with clean lubricant periodically.



SHAFT HANGER WITH OIL DRIP PAN



CROSSED BELT DRIVE

Bearings, Anti-Friction

During the past twenty years, remarkable progress has been made in developing ball and roller bearings. The automobile industry has been largely responsible for this. Today these types of bearings are available for almost every industrial purpose in standardized mountings. This standardization among manufacturers of anti-friction bearings has progressed to the point where many sizes of ball bearings are interchangeable with roller bearings; thus is the repair-parts problem simplified. The general principles of both ball and roller bearings are much the same in that friction has been greatly reduced by placing the balls or rollers, as the case may be, between the rotating and stationary surfaces. Practically all of the friction in these bearings is rolling friction, the amount of sliding friction being exceedingly small. The total friction is much less than with the plain or self-oiling bearings.

Anti-friction bearings are more noisy than other types where the rotating shaft rides on a film of oil. Again, vibrations are more readily transmitted through shafting supported by anti-friction bearings. The anti-friction types, however, have won favor over all others for power transmission service in almost every kind of industry. Their construction enables them to run for long periods without maintenance attention and the amount of lubricant required is negligible as compared with other types. The additional first-cost of these bearings for general power transmission service is justified in the amount of power which they save, to say nothing of the freedom from interruptions in service assured, and the less attention required.

Bearings, Grease Pocket

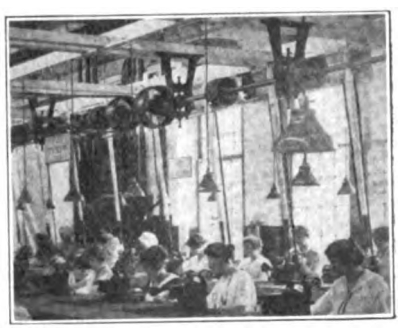
This self-oiling bearing is very similar to the plain type except that it has a large pocket formed in the top box for holding grease. A slot of liberal size is located in the bottom of this pocket connecting it with the bearing. Heat generated by excessive friction causes the grease to melt and feed through the slot to the bearing surfaces. This bearing is used on some steam engines, air compressors, elevators, hoisting machinery and sometimes on power transmission shafting. Its use is not recommended for short intermittent service or where atmospheric temperatures are excessively low.

Bearings, Oilless

A bearing having bushings made of hard wood or composition material impregnated with a lubricant. These bearings are particularly adapted to "hard to reach" locations, or where human neglect is a factor. They are also used where the presence of lubricating oils or grease would be objectionable, as in the case of screw conveyors for handling food products and other machinery in that industry. They are employed extensively in loose pulleys and clutches where the service requirements are within the operating limits of the bearing. For this application oilless bearings have been known to render continuous service for years without attention.

Bearings, Plain

Plain sleeve bearings are the simplest and probably the oldest in common use today. They are used in both solid and split construction and are usually made of low friction materials such as babbitt, bronze, etc. Frequent administration of the oil can or grease cup is depended upon for lubrication, as in these bearings there is no special provision made for continuous oiling. This type of bearing should be avoided in locations where frequent maintenance would be difficult or where the element of human negligence is a factor. Sleeve bearings are still used by many machinery manufacturers, but they are giving way to more reliable types, particularly where high speeds are encountered.



BELT SHIFTING MECHANISMS

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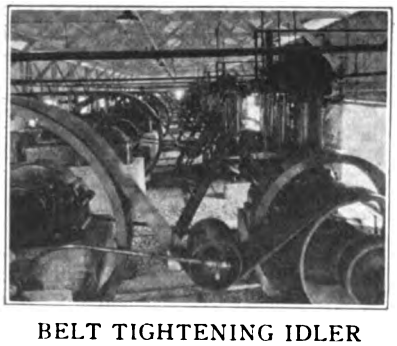
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Bearings, Ring Oiling

This bearing is self oiling, a modification in design of the plain type, but provided with an oil reservoir. As a means of conveying the oil to the bearings, one or more slender rings are hung over the shaft and rest upon it where slots have been cut in the upper section of the bearings for that purpose. These rings are sufficiently large so that their lowermost points are aways submerged in the oil. As the shaft turns the rings also turn, bringing up oil which upon contact with the shaft is distributed over the entire bearing area. To assist in the distribution of oil, small grooves are usually provided in the bearings. Chains are sometimes used instead of rings in this type of bearing for conveying the oil. Care should be taken to see that the oil used is always clean, as the rings or chains tend to agitate the oil. Any grit or other sediment which might be on the bottom of the reservoir is also stirred up with the oil and conveyed to the bearing, thus increasing the wear on it and the journal.

Bearings, Wick Oiling

This bearing, another modification in design of the plain bearing, is provided with an oil reservoir from which oil is conveyed to the bearing through a wick by means of capillary attraction. For many applications where the shafting speed is moderate, this wick oiling bearing is to be preferred over the ring oiling or plain types. Any abrasive dust or grit which might reach the reservoir goes to the bottom, where it remains. There being no agitation of the oil (as in the case of the ring oiling type), only clean oil is conveyed to the bearing. For this reason it is ordinarily longer lived than the sleeve or ring oiling types. It uses less oil and requires less attention.



BELT TIGHTENING IDLER

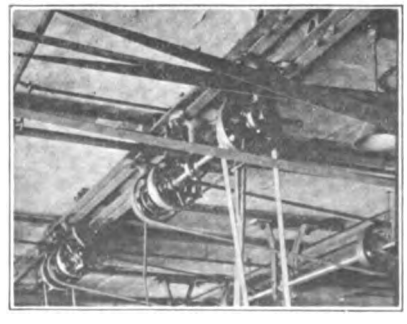
Belts

Of the various means in common use for transmitting mechanical power from one rotating shaft to another, belts are probably the oldest, simplest and most trouble-free. Belts of leather, rubber, canvas, composition and other materials collectively transmit more than one-half of the total horse-power used in industry. From the standpoint of investment and maintenance they form the most important types of power transmission. The losses due to improper selection, application and maintenance of belts are often overlooked and form a fertile field for the reduction of waste and the conservation of power. There are now available good belts for most every industrial application. Of great importance from the point of economy is the selection of the proper type as to material, width, ply and construction for each given application. Every good belt will render better service on some particular drive than any other belt.

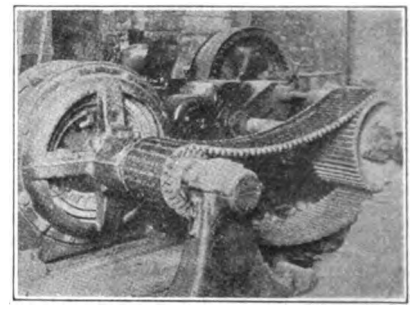
Of the many cheap belts to be had, their use is the poorest kind of economy. Belts operate most efficiently at speeds of from 3,000 to 4,000 feet per minute, and the lighter and less expensive belts will deliver the same amount of power that would require larger and more expensive belts at slower speeds. Belts should be operated on pulleys as large as practicable, as this practice provides a greater area of pulley contact and also lessens the belt's internal stresses when curving around the pulley. Where this point is considered, belt life can be prolonged. Exceedingly short pulley centers for ordinary open or closed belt drives should be avoided, especially on high ratios, as this practice necessitates high tension which consumes more power and shortens the life of the belt. This applies also to vertical drives, but they cannot always be avoided. The angle of a belt drive with the floor should not exceed 45 degrees. The taut strand of all belt drives should be on the bottom, insuring greater arc of contact with the pulleys. The tension of all belts in operation should be such as to result in a gentle sag in the slack strand. Crossed and quarter-twist drives should be avoided where possible as they are hard on belts and consume more power. Belt dressings containing injurious ingredients should never be used, and the good dressings but sparingly.

While some of these rules cannot always be strictly followed, they are good to remember, as opportunities for effecting economies by their use are often presented.

A belt is to a drive as a fuse or a circuit breaker is to an electric circuit or as a safety valve is to a boiler. At least one belt should be interposed in most drives. When a machine so driven becomes stuck or jammed the belt will slip off the pulleys, thus avoiding damage to the machine as well as the motor. It also serves as a shock absorber. Motors last longer on belted drives than on chain or gear drives because vibrations are less readily transmitted from the driven machine through the belts to the motors.



JACK SHAFT AND CLUTCH



CHAIN DRIVE

Belt Fasteners

Where belts are used, fasteners must be employed to join the ends, unless belts are made endless by cementing—the preferred way but not always the most convenient. Cemented joints are best adapted where provisions are made for tightening the belt without shortening its length. Motors with sliding bases or drives with idler or tightener pulleys are two notable examples where belts with cemented joints should be used.

For the general run of belts, however, some form of fastener is found most ecenomical. While there are many types of fasteners, the selection of the proper one is important from the standpoint of smooth and continuous operation and power transmitting capacity. Fasteners that may prove best for a belt employed on large pulleys may be the worst for the same belt where pulleys of small diameters are used. Again, a fastener that might render best service on a leather belt may prove unsatisfactory for a composition or other belt. Frequently, the belt ends are fastened by a lace of rawhide or metallic wire. The most commonly used fasteners, however, are made from high grade steel wire or sheet steel stampings with claws that are pressed or hammered into the ends of the belts.

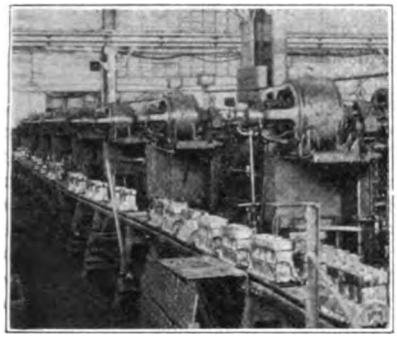
These latter types offer many advantages where frequent shortening is required and where quick service is an important factor. The complete lace is formed by firmly pressing or hammering the claws of duplicate pieces into the ends of the belt. These two pieces, placed together, interlock and are held by a pin of bakelite, hard twisted rawhide or steel, thus forming a hinge-like joint. As a means of preventing waste and loss of time, a new belt should have two such joints about 18 inches apart. When the belt needs shortening, the 18-inch section can be replaced by a shorter one. This saves the time of cutting the belt and applying a new fastener, and avoids wasting the piece of belt removed and the hooks therein. The piece removed is retained for use elsewhere; maximum service is received from every inch of belt and every fastener—nothing is wasted.

There are many other types; some of malleable iron with long claws which are hammered into the belt ends and peened over on the pulley side of the belt; another type consists of a steel plate which is held in place by a forked rivet passing through the plate and the belt, the prongs being peened over on

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the under side of the belt. All of these types, and others not mentioned, have their proper places in industry.



DIRECT MOTOR DRIVEN MACHINES

Circuit Breakers

Circuit breakers protect the investment in electrical transmission and apparatus. Under abnormal conditions, such as overloads or excessively high or low voltage, reverse current, etc., which would endanger equipment, they interrupt the circuits in series with which they are installed. They must obviously be located on the source side of the equipment which they protect. Circuit breakers differ from switches in that they are equipped for automatic opening. However, they may also serve as switches if arranged for manual or remote control opening. Unlike a fuse, they can be reclosed without renewing any element, thus avoiding prolonged interruptions to service. Where delays that may be required to renew fuses are objectionable or where currents are excessively high or voltages above 600, circuit breakers are to be preferred over fuses.

Clutches

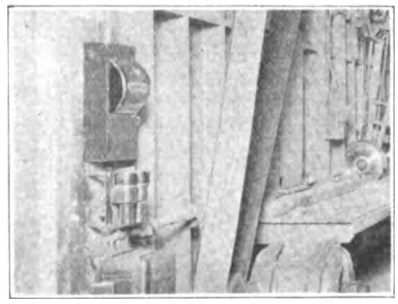
Clutches play an important part in the mechanical transmission of power. They are used for transmitting power from one rotating part to another one in line with it, and can be connected or disconnected at will. Clutches can be divided into two classes: friction and positive. There are many types of each. When applied to line shaft work, they add flexibility to the system as they permit the operation of only a portion of the equipment. Say, for example, where line shafting for driving several groups of machinery is arranged in a straight line. During busy seasons the motors for driving these groups may be well loaded; during slack seasons, when only a portion of the machinery is in operation, the motors would be only partially loaded and operating inefficiently. Clutches installed at intervals on line shafting permits loads to be shifted from one motor to another. During slack seasons it may be possible to take one or more motors out of service for a time and remove their belts from the pulleys. By the use of clutches in this arrangement, the loads previously carried by the motors taken out of service can be shifted to those remaining in operation and thus the operating efficiency of the motors can be increased by keeping them loaded to nearly their rated capacity at all times. Clutches for this use may be either of the friction or positive types except where torque or other operating conditions make it necessary to bring the motors to speed before putting the entire line shaft into motion. In this case, only friction clutches can be used.

Clutches, Friction

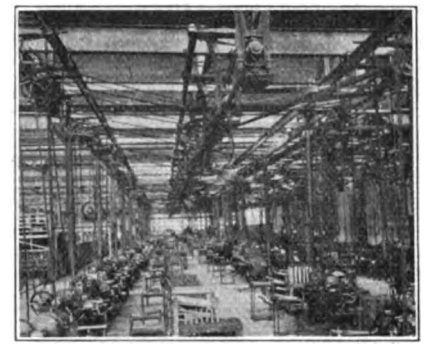
Friction clutches are so called because they have friction surfaces which are held in contact with one another and by means of which power is transmitted from the driving shaft to the driven shaft. They permit the gradual engagement and bringing to speed of revolving parts without shock. They may be set to slip under excessive or predetermined loads, thus protecting the machinery beyond them. The use of friction clutches frequently permits the use of smaller motors or those having little starting torque. In such cases the motors would be brought to speed, after which the load would be picked up gradually by the manipulation of the clutch. There are four types of friction clutches in general use. They are the external contracting band, the internal expanding band, plate or disc and cone types.

Clutches, Magnetic

Magnetic clutches have similar characteristics to those of friction clutches, and are usually made in two circular disc-like pieces. With these pieces keyed fast to the end of each shaft, the clearance between their friction faces is only a few thousandths part of an inch. Usually, one, or both, friction plates contain an electromagnet coil which upon becoming energized causes the plates to attract each other. There being a certain amount of flexibility to the steel disc, the two friction plates come into contact with one another. By controlling the flow of current through the coils the load may be picked up gradually. This type is very desirable for high speed duty because it is not affected by centrifugal force. The ease with which it can pick up loads makes it especially desirable for use with constant speed motors or those having little starting torque. They are used in large and small sizes and in most any place where an ordinary friction clutch is adaptable. Where frequent reverse in direction of rotation is encountered, they are of especial value. They can be readily controlled, automatically or otherwise.



ELECTRIC MOTOR STARTER



LINE SHAFT DRIVEN MACHINE

Clutches, Positive

This clutch has two parts, with teeth or jaws which engage one another when transmitting power. One part is keyed fast to the shaft while the other one slides freely on a spline or key of the other shaft. This movable part is usually operated by means of a fork which fits into a groove in its hub. Positive clutches are designed for various applications. Some have straight jaws; others have tapered jaws to prevent backlash; the jaws of others are straight on one side and tapered on the other, so that upon reverse direction of rotation they will automatically disengaged themselves. Positive clutches should be engaged only when shafts are stationary, or when the relative motion of the two is very nearly the same.

Controllers, Electric

Where electric power is used there must be some form of controller for starting, stopping, reversing, and controlling the speed of electric motors. Every day, damage costing many thousands of dollars is done to electric motors and apparatus through lack of knowledge on the part of persons manipulating controllers. For this reason the old types of rheostat and other manually operated controllers are giving way to the simple push-button types which are foolproof and which eliminate the hazard of improper manipulation. For some installations such as cranes, trolley cars, etc., requiring speed regulation, the manually operated controllers must be used, but the push-button types are available for almost every other industrial application and are especially recommended for use where workmen, untrained or with little or no electrical knowledge are depended upon to start and stop motors.

Chain Drives

In general, chain drives are of two types: high speed and low speed. The high speed chain is usually made up of small flat steel links with sloping teeth that fit into accurately machined slots of wide faced sprockets. These links are held together by hardened segmental bushings and round hardened steel pins. This chain is used in installations similar in requirements to those in which belts are used, but usually with much closer centers. Other features of this type are total absence of slip and the ability to transmit efficiently where the ratio is high and the centers short with either top or bottom strand in tension.

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The bottom strand, however, should always be the tension side where conditions will permit. This type is an excellent and quiet transmitter of power and is made in various sizes for applications where from ¼ to 1,000 horsepower is transmitted. For transmitting more than 1,000 horse-power, several chains in multiple are usually used. This type of chain is used on drives where close speed regulation and the absence of slip are essential.

Vibrations are less readily transmitted from the driven machine to the motor with a chain than with a gear drive, and they operate with much less noise. Chain drives render best service when running in a bath of oil and away from abrasive dusts. As chains possess but little stretch and are usually installed on very short centers, extreme care should be taken to see that the driving and driven shafts are perfectly parallel. Vertical drives should be avoided where possible.

The low speed type of chain may be any one of several designs. In general, they are made up of links which run over or fit around the teeth of a sprocket wheel. They are used extensively on material handling conveyors, bucket elevators and the like.

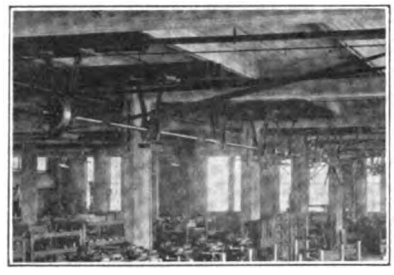
Couplings, Flexible

Flexible couplings permit a certain amount of flexibility in the connection between two shafts and also allow for small amounts of inaccuracy in alignment. There are many types of flexible couplings. One type consists of two flanges which are keyed fast to the abutting shaft ends and face one another. On the face of each flange is a circular row of projecting pins about which an endless belt is wrapped in and out. The belt and the pins transmit the torque. This type of coupling is used for the direct connection of motors to centrifugal pumps or wherever conditions are such that perfect alignment of the two shafts is difficult to secure and where the direction of rotation is not frequently changed. It is an excellent shock absorber and is often used for no other purpose than to keep vibrations from being transmitted from one shaft to another.

Another approved type consists of two flanges, one with projecting pins over which heavy, thick rubber bushings are placed. The companion flange has holes into which the bushings and pins fit. The rubber bushings act as cushions or shock absorbers. This type of coupling does not permit as much inaccuracy in alignment as does the one previously described. However, it is more adaptable where frequent reversing in direction of rotation is encountered. It is extensively used for electric elevator work.

Couplings, Rigid

Rigid or fixed couplings are a part of nearly every factory line-shaft. The three principal types are flange-faced, compression and jaw couplings. These couplings are restricted to applications where the shafts to be joined are perfectly aligned and are therefore used extensively for line shaft work. The flange-faced couplings is the most common of these types. It consists of two flanged sleeves, each bored to fit the shafts to be joined, the flanges being bolted together by several bolts which pass through them, the shearing stress carrying the torque. When the faces of the couplings are not true with respect to the bore, strain and friction are induced with resulting power losses. Couplings should be carefully inspected upon installation to avoid this condition, and inferior products should be avoided.



LINE SHAFT HANGERS AND BEARINGS

Drives, Group Belt

The group drive is that in which two or more machines are driven, by belts, from a common jackshaft driven by the same motor. In other words, each electric motor is made to serve a group of several machines. Group drive is to be distinguished from individual motor drive, in which a machine is provided with an exclusive motor, and with line shaft drive, where all the machines in a department are driven from a common source.

At plants where the machinery is group driven and alternating current is used for power, the power factor is invariably higher than in plants where the machinery is driven by individual motors. This is true because the squirrel cage induction motors, which are generally used, require practically the same amount of charging current at no load as they do at full load. Group drive motors run with steadier loads than individual drive motors because the load fluctuations of all the driven machines average themselves out with the group. Whereas, with individual drive the motors are of sufficient size to handle the peak power demands and the loads are usually fluctuating, leaving the motors operating partly loaded for much of the time.

This explains also why the total installed horse power of motors required for group driving a department of machinery is usually only one-fifth or one-fourth of that required for individually driving the same machinery. The maintenance cost of group drive is much less than that of individual drive. The more efficient and less expensive high speed motors are better adapted to group than to individual drive. Group drive motors are necessarily larger than individual drive motors and larger motors are more efficient than small motors. They are also of more rugged construction and break down less frequently. The electrical maintenance of group drive is therefore much less than that of individual drive.

As contrasted with line shaft drive, group drive provides flexibility and the means of shutting down groups not in use.

Drives, Individual Motor

This drive is characterized by the fact that an individual motor is provided for the machine in question, and has no other duty than to operate that machine. It may be connected to the machine in one of several ways; direct shaft connection; gears; chain, belt, etc. The advantage of individual motor drive, with any form of connection, lies in flexibility, since to operate the machine it is not necessary to run any but the one motor involved.

This is of especial advantage during slack seasons. Group drive motors are frequently operated only partly loaded at such times. When direct connected or geared, or chain drive is used, clear head room is provided by eliminating overhead belts. Machines requiring overhead crane service are therefore usually driven by individual motors.

Other advantages of individual drive as compared with group drive are that machines individually driven can be installed so as to conform to the most convenient ways of transporting material in progress, irrespective of counter-shafting and line shafting. Shops where the machinery is individually driven, are cleaner, more pleasing to look at, and the lighting is better generally.

Drive, Variable Speed

There is a growing necessity for the ability to vary speeds in power transmission more gradually and more accurately than can be done by step pulleys, and without the delay of gear ratio changes. Provision for this is made by "variable speed drives," in the form of transmission units to be installed between the source of power and the machine. By means of these units, the most favorable operating speeds may be instantly secured.

"Variable speed drives" are widely used on conveying equipment, automatic stokers, certain classes of machine tools, and many other applications requiring very accurate speed adjustment. They replace the ordinary countershaft in many instances.

Electric Motors

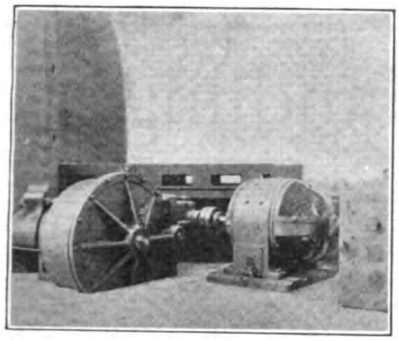
Squirrel cage induction motors, shunt wound direct current motors and synchronous motors are suitable for moderate starting duty. Direct current series or compound wound motors, wound rotor induction motors, high reactance squirrel cage induction motors and super-synchronous (revolving frame starting) motors are applied where starting duty is severe. Control devices, especially resistors, must be of liberal design to dissipate the heat generated in extra heavy or prolonged starting service.

Electric Motors, Adjustable Speed and Variable Speed

When the speed of a machine has to be set for various values that should not

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SPEED REDUCTION GEAR

change with varying loads, the motor must be of the adjustable speed class with close speed regulation. A shunt wound direct current motor or a commutator A.C. motor with shunt characteristic may be used. Speed regulation is not as good with the latter motor especially at reduced speeds. Some applications can utilize marked speed variation inversely with load in order to avoid overdrafts of power or to speed up operations. A series wound direct current motor or compound wound D.C. motor with a large proportion of series turns meets this condition as does the commutator A.C. motor with series characteristic and the wound rotor motor with considerable resistance in the secondary circuit. Machine tool drives, crane and hoist work, textile machinery, stokers and hundreds of other drives require either adjustable or varying speed or both.

Electric Motors, Constant Speed

The great majority of motor applications are for constant speed service and general purpose motors are most often used. The squirrel cage induction motor finds its great field in this class of service. Wound rotor induction motors are used in the larger sizes to minimize the inrush of starting current and for difficult starting as before mentioned. The synchronous motor, as its name implies, runs in step with the frequency of the power circuit, and therefore has zero speed regulation and they can be used only on constant speed work. They improve power factor and have high input-output efficiency. Unless of the super-synchronous type, they have rather low starting torque and usually have to be brought up to speed before the load is assumed.

Hangers, Drop

Drop Hangers are inverted, A-shaped frames, usually of cast iron or pressed steel. They are designed so as to be hung from the ceiling or overhead structures, for supporting bearings in which a shaft rotates. The bearings are held in the apex of the frame by means of adjusting screws, usually four in number, two being horizontal and two vertical, with the bearing supported on their points. The screws serve as a means of aligning the shafting for both horizontal and vertical planes. Pressed steel hangers are to be preferred for general service. They are a modern development combining light weight with great strength.

Pulleys, Cone

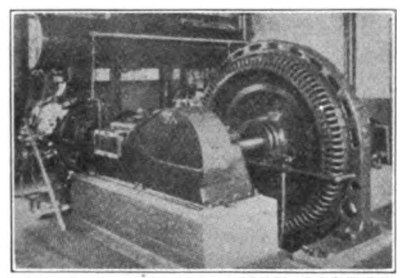
A cone pulley consists of two or more pulleys of different diameters constructed into one. Two of these pulleys used together in opposite directions, and in line with one another on parallel shafts, one on the driving shaft and one on the driven, make an efficient and simple speed regulator. They are extensively used on lathes, drill presses, milling machines, etc., or any belted drives where extreme accuracy in speed regulation is not essential.

Pulleys, Steel

The combination of light weight with great strength has won unequaled popularity for split steel pulleys; they are excellent for general service and can withstand hard usage and high speeds. Several types of these pulleys are available, but most of them differ only in some detail of construction that does not materially affect their power transmitting characteristics. Practically all steel pulleys can be furnished with split bushings for various sizes of shaft. They can also be had with sleeve bushings, permitting them to be used as loose pulleys. Most split pulleys, whether they be of cast iron, wood or steel, have clamp hubs and are held to the shaft by friction, clamp bolts being used to pull the bushings tightly against the shaft.

Frequently, a combination of this means and a key are used. This combination is recommended where considerable power is transmitted or when shock loads are encountered.

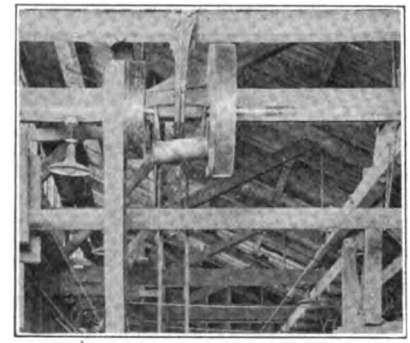
Driving pulleys serving tight and loose pulleys should be straight faced or cylindrical shaped. Others, where the belt is not to be shifted, should be slightly crowned. This crown should not exceed ⅛ inch per foot of width, and usually less will suffice to make the belt stay in the center.



SYNCHRONOUS TYPE MOTOR

Pulleys, Tight and Loose

Tight and loose pulleys are a means of starting and stopping the shaft on which they are mounted together, and in many cases answers the purpose of a friction clutch pulley. The tight pulley is fastened to the shaft while the loose pulley is fitted with a bearing and allowed to rotate around the shaft. A belt is shifted from one to the other at will by means of shifter forks. Poorly designed loose pulleys with common bearings are a source of high maintenance costs in industrial plants. Those having anti-friction require less attention and give uninterrupted service year after year. Some loose pulleys are of somewhat smaller diameter than their companion tight pulleys for the purpose of relieving the belt tension while running idle, thus reducing bearing friction and increasing belt life. On the side of the loose pulley next to the tight pulley is a flange approach at an angle of about 45 degrees and an outer diameter the same as that of the tight pulley. This assists in shifting the belt to the tight pulley and prevents the belt from creeping onto it unexpectedly, thus acting as a safety device.



TIGHT AND LOOSE PULLEY

Pulleys, Wood

In many industries where the humidity is not excessively high, wood pulleys have won favor over all other types. Owing to their very high coefficient of friction, they will transmit from 30 to 50 per cent more power than iron pulleys with the same belt tension. They are able to withstand peripheral speeds of three times the safe operating speed of cast-iron pulleys. They are light in weight and have true running qualities, but are not to be recommended for damp places. Most wood pulleys are of split construction.

While the rims of all wood pulleys are made of segmental pieces of hardwood, securely fastened together by glue, pins and various designs of interlocking joints, they differ considerably in the hub and arm construction. Some have hubs and arms of cast iron; others of wood, with split iron bushings; some with iron hubs and wood arms, etc.

Pulleys

Pulleys of cast iron, steel, wood and composition materials represent a considerable portion of the total investment in every group or line shaft power transmission system. Cast-iron pulleys are giving way to the lighter and more modern types which are better able to withstand the higher peripheral speeds and the harder service demanded. Cast-iron pulleys with hidden foundry flaws or fractures received in service handling have been responsible for many accidents.

In sizes of more than 6 feet and less than 12 inches diameter, cast-iron pulleys are used very extensively, but in most other sizes, representing the great majority, they are no longer the dominating type. On account of shrinking strains of unknown intensity and other hidden flaws common to cast iron pulleys, they are regarded as unsafe for speeds above 5,000 feet per minute. They are made in both solid and split construction.

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Making Mechanical Handling Pay Dividends

Questions Designed to Aid in Checking Up on Present Performance and Planning for the Future

Would mechanical handling of coal and ashes be more economical? Considering the distance from the railroad siding to boiler house what type of equipment is best suited?

Would a stationary conveyor or a portable machine fill the requirements for handling any kind of coal that may be used? If a portable machine will not do, what type of fixed conveyor will serve best?

The coal being run-of-mine, will the same equipment used for steam sizes handle it? If the coal must be crushed what auxiliary installation will be needed with the crusher?

Would it be desirable to have a fuel reserve? If such a reserve is necessary would it be good practice to store part of it in the boiler house for daily use and part of it in ground storage for emergencies?

The yearly tonnage used does not warrant a large expenditure for conveying equipment; therefore should portable machines or fixed conveyors be used for storing and reclaiming? Will it be necessary to install an extensive drag scraper outfit for this purpose?

It is desirable to check the weight of coal placed in the boiler house bunkers; can this be done while coal is being conveyed?

As it is necessary to make boiler tests should the coal be delivered to stokers through chutes or a weigh-larry?

Could an inexpensive chain conveyor and an elevator do the work of ash handling, or should a skip hoist be used? Would it be advantageous to use a steam jet conveyor, or would a water jet sluice be best suited?

When receiving bulk materials in box cars is it possible and economical to unload them mechanically instead of by hand?

Can the same kind of elevators, conveyors, etc., as are used for coal and ashes, be used for handling cement, lime and gravel?

How can various kinds of dry chemicals, such as soda ash, crushed lime, arsenic, lead acetate, carbon dust, etc., be best handled?

If the dust contained in the product is valuable can it be handled pneumatically and still recover the dust?

What can be done toward applying mechanical handling to the foundry; would any savings be made by handling molds, flasks and patterns mechanically? What standard equipment is available for this purpose?

What classes of equipment should be considered for handling sand and gravel? As sand must be handled both from the bank and from a river bed, is there a single unit capable of doing both?

The sand used contains considerable loam and requires washing. Can the screening and washing be done in one operation?

Can the same kind of screens be used for dry sand? What are the most efficient screens for this purpose?

Is there standardized equipment for sand handling operations?

Can the same kind of machinery be used for handling crushed stone?

As we must ship our sand dry, can we get a standard machine for loading box cars?

In the progressive assembly of parts, would assembly conveyors show an economy?

Is there some system of demountable truck bodies or tote boxes that could be used with a small lift truck or tractor for transferring parts between operations?

Piling boxes and bags is a problem that requires attention. Would some form of stacking conveyor or lift reduce this item of cost?

As the articles manufactured are small, would it be possible to handle them by a conveyor requiring little space; could they be handled pneumatically?

Is there a suitable form of conveyor for handling bottles, jars and other containers, as a standard product?

Is there any common type of equipment for handling the various articles used in a cannery, instead of by hand work?

Can some form of conveyor, not power operated, be used to advantage for lowering boxes from the various floors of the factory?

How much time is consumed in transporting parts from one operation to the next, as compared to the amount of time required on productive operations?

Could this non-productive time be materially reduced by planning the production layout to include mechanical handling between processes?

In considering the materials handling problem of one department, has due consideration been given to the possibility of linking its needs with those of other departments?

Has the materials handling system in use been the result of comprehensive study, or has it been a more or less haphazard growth? If the latter, would it pay to "start fresh," and if necessary scrap existing equipment in favor of a system that would cover all requirements?

Where the lift truck and skid system is in use, is full advantage being taken, in every department, of its flexibility and adaptability?

What is the percentage of idle time in the case of tractors and electric lift trucks? Is their work planned with a full appreciation of the fact that idle time is waste?

Where productive operations have undergone a change due to the greater use of automatic machines, have the handling methods kept pace, to reap the full advantage?

Where compressed air is available, is advantage being taken of air hoists as a means to speed up handling?

In planning the installation of conveyors for progressive assembly, has the factor of pace-setting through proper timing and synchronizing been given intensive study?

Would special body trailers enable the present tractor or truck equipment to serve additional departments, with resultant economies?

Would lifting magnets be applicable in certain cases where iron or steel is now being handled by chain or wire rope slings; and would sufficient time and labor be saved to justify the investment?

Are high priced machine tool operators called upon to lift and move parts that could be more efficiently handled by mechanical means?

How many men on the payroll can be classified only as "miscellaneous labor," and what has been done toward analyzing their work with a view to doing it more cheaply by mechanical methods?

Where men are now filling in a part of their time in handling heavy pieces by hand, has the actual cost of this work ever been calculated; and what would it cost to do the same thing mechanically?

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Compendium of Modern Equipment and Its Relation to Profitable Production

Section III—Materials Handling Equipment

Aerial Cableway

An installation consisting of a stationary suspension track-cable stretched between two towers, a trolley carrying a scoop or bucket, hoisting cables and a winding engine for operating the trolley. This type of apparatus is commonly used for sand and gravel excavating, but may also be used for rock or overburden. It conveys and elevates simultaneously and works either in dry sand or submerged in water.

Aerial Wire Rope Tramway

A system of conveying by which material is carried in buckets on a cable supported on a series of towers and passing distances amounting sometimes to miles over land, rivers, valleys and mountains. The loading and discharge stations are usually at opposite ends of the line, but intermediate unloading points may be arranged. Two systems are in use: the single cable, in which the buckets are fixed to the cable and travel with it, and the double cable, in which one stationary rope supports the buckets and the other propels them.

Air Hoist

A compact unit consisting of a compressed air engine and a hoisting drum. It may be used with chains and slings for handling lumber and in foundries for handling flasks, ladles, or heavy patterns. When equipped with a crane hook it may be used in boiler rooms for handling coal or ashes. The hoist is mounted on a trolley whose wheels are arranged to run on an I-beam track. The greatest efficiency of this device is where compressed air is easily accessible. Only moderate speed is possible by its use.

Apron Conveyor

This type of conveyor is made up of two parallel strands of chain, either of steel bars or malleable iron links, with rollers at every articulation, or pitch. The two strands are connected by wood or steel slats, depending on the material to be carried. In general wood apron conveyors are used for handling boxes, barrels, bales or other packed goods. Steel apron conveyors are used for handling granular or lumpy bulk materials. When used for this purpose, the steel slats are curved at the chain articulations so that each succeeding slat, or flight, overlaps the other. At each end of the slat, adjacent to the chain there is a vertical plate, which serves to prevent materials spilling over the edge. The addition of skirt boards between these vertical end plates permits the use of steel apron conveyors as feeders for other units.

Ash Ejector

A form of current conveyor by which ashes are removed from the fire rooms of steamers and discharged into the sea through the use of a jet of water. The usual form involves a hopper into which the ashes are shoveled. Recent developments of this system make it adaptable to boiler house service.



TYPICAL ASSEMBLY CONVEYORS

Ash Hoist

Apparatus for the removal of ashes from a fire-room, generally consisting of a bucket or can with means of raising and lowering it rapidly. The hoists may be operated by chain blocks and hand winches, or by air, steam, or hydraulic cylinders.

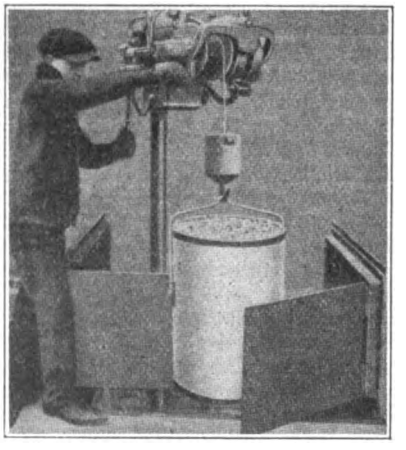
Ashes Elevator

Bucket elevators made up of malleable iron buckets carried on chains or belt are commonly used for taking ashes from the boiler room to storage bins or discharging direct to trucks or cars. Industrial cars in the basement are used to load the elevator. The bucket elevator is inexpensive, both as to installation and upkeep, and will materially reduce handling costs.

Assembly Conveyor

A slow moving conveyor specially designed for continuous assembling of a part which is to be produced in large quantities, with special stands, platforms, or other appliances for supporting the part to which others are gradually added. The conveyor is usually of the single or double strand chain type, the chain traveling in channels, passing around sprockets at the ends and returning beneath the working runway.

The use of this conveyor is coupled with an extreme division of labor of assembling, each operative performig but one function, and accompanying the conveyor for a short distance while performing the function. The parts to be assembled are brought to the stations by portable bins, feeder conveyors, chutes, overhead trolleys, elevators, or otherwise as necessary, and are continuously supplied.



MANUALLY OPERATED ASH HOIST

Boom, Loading

A lowering or retarding conveyor section mounted on a frame having a hinge at its upper end, and used to lower coal or coke to the bottom of hopper cars, the object being to avoid breakage. It may be part of a stationary conveyor in a preparation building, or it may be mounted on a traveling tower and used to load bulk materials into vessels. It is an efficient device for the rapid loading of cars or vessels with the minimum of labor.

Box Car Loader

A machine which places bulk materials in box cars, either at the ends or uniformly distributed over the length. The car loaders in common use are of the high speed portable belt, pneumatic and screw conveyor types. Most of these loaders enable one man to fill a car.

Bridge Crane

This is an apparatus consisting of a bridge structure, either stationary or movable, with a trolley hoist that is capable of carrying a lifting hook or a grab bucket. Bridge cranes may be used for carrying lumber, structural steel, cargoes or any bulk material that can be picked up by a grab bucket. These machines save considerable labor and make possible the storage and reclaiming of material that could not profitable be stocked out otherwise. The cost, however, permits of their use only for large scale operation.

Bucket

A container for temporarily holding quantities of bulk materials while being conveyed from one point to another. They may be classified according to the method of filling and usage as grab-buckets, dragline scraper buckets, excavator buckets, elevator buckets, skip buckets, etc.

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Bucket, Bottom Dump

A bucket which is emptied by opening or removing the bottom to allow the load to drop out. Steam shovel buckets are of this type, as are also clam-shell or grab-buckets.

Bucket, Grab

A bucket used for intermittent lifting, horizontal moving and depositing of bulk material, and which automatically loads itself by opening at the bottom. In this manner it forms bowl shaped parts which dig into the material and finally shut, enclosing a certain amount of it. The grab bucket is then lifted, swung to the desired position, and there opened, depositing the load. It is generally used in connection with some form of hoisting machine.

Bucket, Scraper

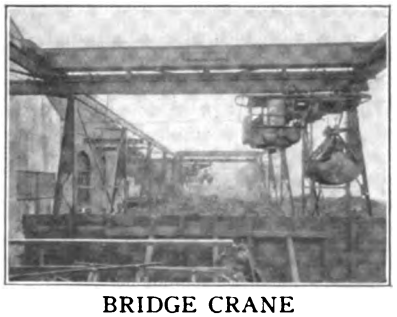
The scoop used in connection with dragline scrapers for moving materials over a storage area, either to place them in storage or for reclaiming.

Bucket, Skip

A bucket equipped with guide wheels and a lifting bail for use with a skip hoist. This bucket is filled by any suitable chute and hoisted to the desired point and discharged by turning upside-down. It is used for any kind of bulk materials.

Car Dumper

A machine for unloading open top railway cars of coal or other bulk material by inverting them. There are two types: The revolving dumper which does not lift the car except to rotate it about an axis, and the lifting dumper which elevates the car for discharging direct into vessels on high storage bins.



BRIDGE CRANE

Carrier, Pivoted Bucket

This is a term used to describe a chain conveyor consisting of two parallel strands of steel or malleable iron roller chain between which is mounted a series of sheet steel or malleable iron buckets. The buckets are made so that each bucket in the series overlaps the one preceding, thereby making an articulated line without gaps. The buckets are suspended from their central points and are free to swing so that their vertical center lines are always normal to a horizontal line. This arrangement permits the conveyor to be used simultaneously for horizontal conveying and for elevating. The principal uses of this type of conveyor are for handling coal and ashes in boiler houses, stone, cement clinker and other bulk materials of a similar nature. The pivoted bucket carrier combines in one unit, the functions of two or more separate machines and is particularly efficient in that its power consumption is low and the upkeep is not excessive.



GRAB BUCKET

Chute, Screening

A chute having a screen set in the bottom so that material passing over it will have the dust or "fines" separated from it. This type of chute is commonly used for loading coal from over head bins into wagons, the dust being retained in a separate hopper beneath the chute and emptied from time to time. It is also possible to attach a light chute of this kind to the discharge end of a portable conveyor. Its use effects considerable savings through the reclamation of the "fines," which in many cases are salable.

Conveyor, Belt

This is a conveyor consisting essentially of a carrying belt, intermediate rollers or idlers, for supporting the belt; head and tail pulleys and the supporting structure. The belt may be of canvas, rubber, impregnated layers of cotton duck or a thin flat steel band. For carrying bulk materials the belt is generally given a trough shape by the idlers, both on account of its greater carrying capacity and economy. For transporting packages the belts are usually flat. Troughing idlers usually consist of a series of three or more pulleys mounted on a shaft in one plane, the whole being supported on a board or a steel member. Intermediate rollers for flat belts generally consist of a straight face steel tube carried on a shaft with journals at either end.

Coal, ashes, sand, gravel, cement and stone are a few of the essential bulk materials that are carried by belt conveyors, but any other granular bulk material that does not adhere too closely to the surface of the belt, may be handled successfully.

Where materials are received in railroad hopper cars and the distance from the track to the point of delivery exceeds 50 or 60 feet it is customary to install a fixed belt conveyor. For shorter distances a portable unit may be used.

Belt conveyors are, under ordinary circumstances, the lowest in cost of power and upkeep. The first is true because of the low fractional resistance inherent in the design, and the second because of the comparatively small number of parts in which abrasion may take place.

The installation of belt conveyors to replace hand labor cannot fail to be profitable, and in some cases it pays for itself within a year.

Specific recommendations regarding the amount of conveying equipment that is justified in individual cases cannot be given here, but in general it is a question which is determined by the ordinary financial methods.

Conveyor, Cable

A conveyor of the drag type, consisting of an endless steel wire cable with discs attached at intervals; a U-shaped or V-shaped trough, and the required sprockets and power transmission elements. The trough is generally made of wood with a sheet steel lining. This type of conveyor may be used for non-abrasive bulk materials such as coal. Its most common application is in connection with coal tipples, for retarding the flow of coal down mountain slopes. It then transfers the run-of-mine coal from the mine to the tipple. Cable conveyors are also used extensively for hauling logs to saw mills or for the manufacture of wood pulp.

Conveyor, Drag

A conveyor in which material is moved or dragged along a trough by one or more chains, by a rope or cable, or by a revolving screw. The latter is used for bulk materials only; the others are used for both bulk and package materials.



ROLLING CAR DUMPER

Conveyor, Flight

A drag conveyor generally used for bulk materials, consisting of a series of scrapers or flights attached at intervals to a single strand or double strand of endless chains passing around sprockets at the ends of the run, and dragging material between the flights in a trough.

It may be loaded at any point in its conveying run and discharged through gates in the bottom of the trough or at the end of the run. The conveyor may operate horizontally or in inclines up to as much as 40°, at reduced capacity. Generally this type of conveyor may be loaded direct from a hopper or chute without the use of auxiliaries such as feeders, since it is not easily choked. Other types of conveyors, including belt conveyors and pivoted buckets require some kind of regulating device to prevent overloading, especially when the material contains a large proportion of lumps.

While drag conveyors may generally be used for any bulk materials, the best results are obtained in handling

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non-abrasive substances, or those that do not adhere to the flights or trough. For transferring steam sizes of coal from railroad tracks to the boiler house, over distances not exceeding 100 feet, a single strand flight conveyor is an efficient and labor saving, as well as a money saving device.

Conveyor, Gravity

A type of conveyor in which gravity is the operating force. The material moves on the conveyor but the latter itself does not generally progress. Spiral chutes, spiral roller conveyors and transfer chutes as a class, may be grouped under this head.

Conveyor, Gravity Discharge

A combination elevator and conveyor, consisting of two strands of chain, between which is suspended a series of V-shaped buckets. This conveyor will carry material horizontally and vertically simultaneously. When elevating the buckets rise with the point of the V downward, and on reaching the top of the vertical run, the chains pass over sprockets, thereby tilting the buckets. The latter discharge their contents into a horizontal trough and drag the material through the trough in the same manner as do the flights on a drag conveyor. A trough may also be introduced at the bottom of the conveyor, which can be made to assume any path required. Material dragged in the lower trough is brought to a curved section and the direction of travel changed from horizontal to vertical. This curved trough is known as a "corner turn" and is designed so that no material is spilled in the act of changing direction of travel. The discharge of material is through the bottom of the upper trough as in the flight conveyor.

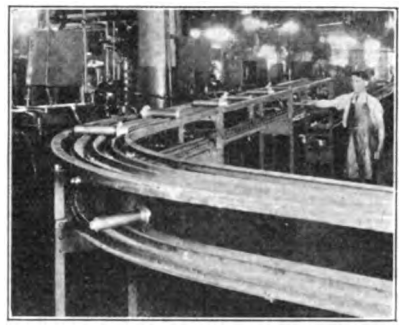
This type of conveyor is most commonly used for handling coal, both in small sizes and containing a large proportion of lumps. The use of Gravity discharge conveyors frequently effects savings in plant layout because of its double function of conveyor and elevator.



BELT CONVEYOR

Conveyor, Monorail

A continuous conveying system consisting of an endless chain connected to trolley carriers at intervals, the latter traveling on I-beam tracks. The trolleys are equipped with hooks, pans, trays or other means of supporting the articles to be conveyed. The most common uses of this type of conveyor are in assembly of manufactured articles, carrying automobile parts for painting and drying; in packing houses, textile plants, etc. An important point in many of these plants is that floor space is too valuable to be occupied by machinery. Monorail conveyors, by reason of being suspended, save floor space, and hence help reduce production costs.



GRAVITY CONVEYOR

Conveyor, Pan

A carrying conveyor for bulk materials, consisting of pans attached to endless chains passing around end sprockets and carried on suitable horizontal guides. The pans are generally made of cast iron or steel plate, each pan overlapping the one preceding. The conveyor may be either of the single or double strand chain type, usually equipped with rollers.

Pan conveyors may be used to handle any bulk materials that will not adhere to the pans. They may also be used for handling hot materials, such as cement clinker and hot coke or lime.

Conveyor, Pivoted Bucket

(See, Carrier, Pivoted Bucket.)

Conveyor, Pneumatic

A form of conveyor in which air in motion is the medium used to move material. Two distinct types are in use; one in which bulk or package material is handled in closed containers that closely fit the interior of a conveying duct. The containers are driven by a difference in pressure on the two ends of the carrier. The other type is one in which bulk material is handled loosely by reason of the current of air in which it is suspended. Also known as current conveying.

Three systems of applying pneumatic current conveying are in use: The vacuum or suction system, the pressure or blast system and a combination of the two.

Conveyor, Pneumatic Tube

A method of conveying small objects which can be easily inserted in a special container, by placing it in a tube which fits it closely and driving it through the tube from end to end by producing a difference of pressure on both ends of the container. A variety of arrangements is used but they can be broadly classed under the terms vacuum system and pressure system with some installations using a combination of the two. The pneumatic tube system was originally devised, and is still mostly used for conveying written communications or small articles within buildings or large establishments. It is possible however, to make the containers large enough to carry considerable material such as mail matter, including small packages.

Large general postoffices, department stores and other mercantile establishments use this system for the purposes described. The flexibility of the installation and the small amount of space it requires make it especially adaptable to such locations.

Conveyor, Pneumatic, Pressure System

This is a method of conveying bulk materials by drawing them into a duct by the injector action of a high pressure jet of air, discharged into the end of the duct and then carrying them along with the current to the outlet. It is especially applicable where it is desired to distribute material from a central location near which machinery can be placed, to several separated dis-distance than the vacuum system, but is dusty in operation. The dust, however, can be removed by passing the air through a separator where solid matter falls to the bottom. The air is discharged through a suction pipe unless it is important to save or remove the dust, in which case the air is filtered.

The pneumatic pressure system is a valued addition, to materials handling methods, particularly in dealing with poisonous or dangerous chemicals and valuable dust. It is in common use for handling soda ash, lime, powdered clay, carbon dust, arsenic, etc.

The same flexibility exists in this system as in the pneumatic tube installation. Materials to be handled with the greatest efficiency, must be dry, granular and be free from large pieces.



LOCOMOTIVE CRANE

Conveyor, Portable Belt

A belt conveyor with its pulleys, idlers and belt mounted on a structural steel frame and a wheeled truck. The transmission machinery and motive power, which may be either electric or gasoline, is an integral part of the construction and supplies power for operating the belt and in some cases for propelling the truck wheels.

This type of conveyor is used for unloading hopper cars without the use of pits and is made in standard lengths from 15 feet to 60 feet in length. It is the simplest form of conveying device that will perform all the functions of a fixed conveyor, while being lower in first cost. The use of portable conveyors makes possible the handling of

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all the materials which fixed belt conveyors will carry, without limitation. as to location. Fine materials as well as those containing a large proportion of lumps may be carried successfully on portable belt conveyors. The upkeep is somewhat higher than on fixed conveyors, but this is in part offset by the lower fixed charges due to low first cost.

Conveyor, Portable Wood Apron

A conveyor consisting of two strands of roller chain to which are attached narrow wood slats forming a continuous flexible platform or apron. It is carried on a structural steel frame mounted on a two wheel truck, and is reversible as to direction of travel. The discharge end may be raised or lowered so as to permit the use of this machine as a piler.

Portable wood apron conveyors are commonly used in warehouses for handling packages, boxes, bags and crates, but are not suitable for bulk materials.

Conveyor, Progressive

(See Assembly Conveyor.)

Conveyor, Roller Gravity

A gravity conveyor in which the containers to be conveyed are carried on rollers turning freely on axles fixed in supporting frames. The axes of the rollers are horizontal but the frames are set on a slight incline, so that packages placed on them will travel down the slope by gravity. The angle varies with the smoothness and weight of the package carried.

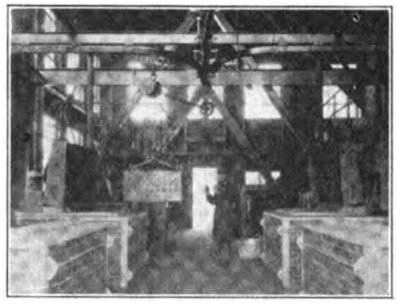
This type of conveyor has a very wide application in warehouses, manufacturing plants, bottling works and wherever packed or crated articles are to be handled. It is low in first cost and is one of the lowest in cost of maintenance.

Conveyor, Refuse Chain

This type of conveyor, described under the heading of "drag conveyor" is used to a large extent for handling saw-dust and hog-fuel from saws, planers, etc., to the boilers of a lumber mill. It may also be used for other refuse from manufacturing plants, and is inexpensive to install and operate. For the work described here a chain conveyor is used.

Conveyor, Retarding

A conveyor used to lower material down a slope and which acts at the same time to prevent excessive velocity of the material conveyed. In some cases the conveyor, by reason of the load carried, produces power and uses it only at starting and for braking. Retarding conveyors are generally either of the roller chain type with flights, or of the cable type. In either case the material is dragged in a trough. The principal use of such conveyors is in bringing coal from the mine to the tipple. A modification is also used for lowering coke into cars to avoid breakage. (See also "Conveyor, Boom" and "Conveyor, Cable.")



MONORAIL CONVEYOR

Conveyor, Screw

Essentially a screw conveyor consists of a central shaft or pipe around which a sheet steel spiral is wound, and which rotates in a U-shaped trough. Material is dragged through the trough by the action of the screw. There are two general forms of screw conveyors, the full-blade spiral and the ribbon blade. In the former the blade, or flight extends and is attached to the central shaft. In the latter a narrow spiral band is connected by gudgeons to the shaft but does not touch it. The full blade screw is used for dry, granular materials, such as coal, and the ribbon conveyor is used for handling sticky materials such as sugar, wet clay, etc.

Conveyor, Selective

A conveyor which will automatically deliver packages or other material to any point selected by the sender at the time of despatching.

The conveyor may be either of the belt or cable type.

Conveyor, Shuttle

This form of conveyor consists of a carrier element carried on a structural steel frame mounted on wheeled trucks. The conveyor is reversible and the truck frame is movable along a track in either direction. By these means materials received from a main conveyor, may be discharged at any desired point. The reversal of direction of the conveyor is generally effected through the reversing control of the electric driving motor and the reversing of the frame travel by mechanical means. Shuttle conveyors are only half the length of an ordinary conveyor running over the bins, so that their use usually shows a saving. Belts generally are best adapted to this type of construction and therefore most shuttles are belt conveyors. Any materials that can be handled by ordinary conveyors can be handled by a shuttle.



PORTABLE BELT CONVEYOR

Conveyor, Slat

Slat conveyors are generally of the double strand chain type as described under "conveyor, Portable Wood Apron," except that they are fixed in location and not adjustable as to height of discharge. The addition of lugs on the wooden slats makes them suitable for use as baggage ramps in addition to the uses cited for the portable unit.

Conveyor, Sling

A combination conveyor-elevator for loading and unloading ships and consisting of a light steel trussed frame which carries two strands of roller chain. The chains are connected at intervals by means of rods which support an endless canvas belt forming loops between successive bars. The truss with its chains and canvas loops may be cantilevered over the deck of a vessel or suspended from the ship's tackle, with the pendant loops at one end hanging in the hold. The loop at the other end reaches down to the wharf, and the whole combination forms a continuous apron from hold to dock. The chains are driven by an electric motor and articles placed in the canvas loops as they pass the loading point in the hold, will be elevated to the deck, carried horizontally over the latter, lowered to the wharf, then taken off by hand. As the loads pass the turns made by the sprockets at each change of direction, they are rolled to new positions in the canvas slings. They will not be accidentally discharged during such turnings if they have been properly loaded and are not too large. This type of equipment is suitable for handling miscellaneous cargo and is one of the very limited kinds that will handle bunches of bananas without serious damage. The installation of sling conveyors is in many cases an absolute necessity, where docking time is limited and labor is expensive.

Conveyor, Steam Jet

A type of current conveyor in which high velocity steam is the carrying medium. It consists essentially of a cast iron duct with intake openings at intervals and the necessary steam nozzles and elbows for making changes in direction. One end of the duct is open to the atmosphere and the other, or discharge end, is led into a storage tank or hopper. At an intermediate point between the inlet and outlet a jet of steam is introduced into the duct. The rush of air in the open end of the pipe carries material past the steam nozzle; from that point on, the material is forced by the direct action of the jet through the duct and out at the discharge end.

Steam jet conveyors are used almost entirely for handling ashes and as they are low in first cost as well as not excessive in maintenance, they serve to reduce handling charges.

Conveyor, Water Jet

This type of current conveyor employs a high velocity stream of water as the prime mover. A cast iron duct is fitted with a series of hoppers whose in-

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teriors are fitted with sloping shelves. Material deposited on the shelves receives the impact of a stream of water and is washed off into the duct, other water nozzles in the duct carry the material to the discharge point, generally a sump. Water jet conveyors will carry only horizontally. The most frequent application is in large power plants, for removing ashes from the stoker pits. The use of this device in large plants is a recent development that has proven to be a great labor saving agency.

Conveyor, Wood Apron

(See "Conveyor, Slat.")

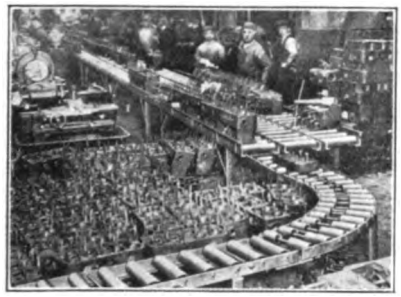
Crane, Bridge Storage

This is a term applied to a gantry crane especially designed for the unloading of material in bulk, such as ore, coal, sand, gravel, etc., from cars or vessels, and placing it in open storage piles; also for reclaiming such material from the piles and loading it on conveyors, cars or in vessels. The material is handled by a grab bucket carried by a movable trolley. An electric hoisting engine is located in one of the supporting towers of the bridge. The trolley may be operated by steel wire rope cables or by an independent motor. In the latter case the operator travels in a cab with the trolley and controls the various functions of the bucket. The bridge towers rest on wheeled trucks driven by electric motors for moving the bridge over the storage area. The trolley may also be arranged for control from the main hoisting engine room. In this case the operator does not travel with the trolley.

Bridge storage cranes are suited only for very large operations where the annual tonnage in and out of storage will show a low cost per ton handled, when consideration is given to interest on investment and other fixed charges.

Crane, Cargo

A crane especially adapted to the transferring of cargo between a vessel's hold and a wharf or lighter. (See also "Conveyor, Sling.")



ROLLER GRAVITY CONVEYOR

Crane, Foundry

A type of rotary jib crane with a trolley running on the top of the jib and operated by hand or power. It has been used extensively in foundry practice in capacities of one to ten tons.

Crane, Locomotive

A rotary travelling crane consisting of a pillar crane with a hinged boom mounted on a turn table, the whole being mounted on a wheeled carriage designed either for standard or narrow gauge track. The motions possible with a locomotive crane are: hoisting, rotary, radial and traveling on the track. It may also be mounted on crawler or caterpillar trucks, in which case it is independent of guiding tracks for travelling.

When equipped with a grab bucket the locomotive crane will handle bulk materials such as coal, ashes, sand, gravel, etc. It is used for loading and unloading cars or vessels, placing in or reclaiming from storage, etc. By substituting a lifting magnet for the bucket a variety of steel or iron articles may be handled. It may also be used to carry lumber by the use of chain slings. Locomotive cranes may be driven by electric motors, steam engines or gasoline engines, and are used almost universally where a flexible efficient unit is required.

Crane, Overhead Traveling

A crane consisting of a steel girder construction supported at the ends on wheels traveling on elevated runways, and having a trolley traversing the bridge or girder, a hoist built into the trolley, and motors with transmission gears for operating the machine and apparatus for controlling it. The trolley may be hand operated or motor driven. The load is ordinarily hung on a hook by slings of rope or chain.

This type of crane is generally used in shops for assembling machinery, carrying structural steel in the shop or storage yards, for carrying lumber, marble or other stone, and generally for hauling materials other than in bulk.

Drag Line Scraper

A system of conveying consisting of a scoop bucket or scraper, wire rope haul and winding drums or hoisting engine with which the bucket may be moved over any portion of a predetermined storage area. The latter is marked out by a series of steel posts spaced 30 to 40 feet apart around the perimeter, which may be of any shape. The posts are distinguished by the terms "head post" and "back posts," depending on their respective functions. The head post is used for attaching the leading sheaves for guiding the hoisting rope. The back posts are used in pairs, each pair holding a loop of the rope. The ropes extending from head post to the back post loops form a triangle which is the path of travel of the working rope and the return rope. By reversing the direction of travel of the engine and changing the location of the back post loops or bridles, any part of the storage area may be reached, both for placing in storage or reclaiming. When reclaiming, the position of the scraper bucket must also be changed.

This system of conveying is used only for bulk materials, most commonly for coal, sand and gravel and similar material. By reason of its flexibility and comparatively low cost it is especially suitable for all but the largest installations. Also as but one unit is used for storing and reclaiming, operating cost, per ton handled is low.

Dredge, Dipper

A floating dredge in which the digging element consists of a dipper mounted on a handle and operated from a boom which may swing about a vertical axis, the whole being mounted on the front end of a scow. Except that it has a longer boom and dipper handle, and a higher A-frame it is substantially the same as a steam shovel, and its operation is described under that heading.

Dredge, Hydraulic

A machine for excavating material from river channels, harbors. etc., by drawing it into a centrifugal pump through a suction pipe. The hydraulic dredge is commonly used for taking out sand and gravel from submerged banks.

Drag Line Excavator

An excavating machine consisting of a drag scraper or a scraper bucket operated by a crane, derrick, slack rope cable way or other similar apparatus.

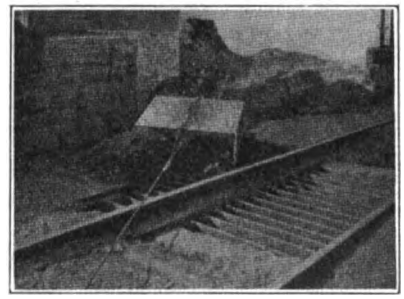
This type of excavator is frequently used for taking out sand from pits and submerged banks. When mounted in the manner of a locomotive crane and fitted with a boom it may be used for earth excavating.

Demountable Body System

A system of motorized freight terminal transportation consisting of a fleet of trucks with standard demountable bodies. The latter are already filled when trucks arrive at loading points, so that full and empty truck bodies may be exchanged without loss of time.

Derrick, Stiff Leg

A derrick consisting of a mast and swinging boom with a hoisting engine for operating the boom and an auxiliary drum for the slewing motion. The derrick may be used with a grab bucket for handling bulk materials or with hooks and chains for handling construction material, such as building stone, structural steel, lumber and the like.



DRAG LINE SCRAPER

Elevator, Barrel

A continuous vertical or inclined elevator having two strands of chain running over sprockets at top and bottom with special curved arms attached to them to lift barrels from a loading platform and deliver them over the head wheels to an inclined runway. It may also be arranged to discharge at intermediate points.

Elevator, Bucket

A continuous elevator consisting of a chain or belt having buckets attached at intervals. The head and foot are

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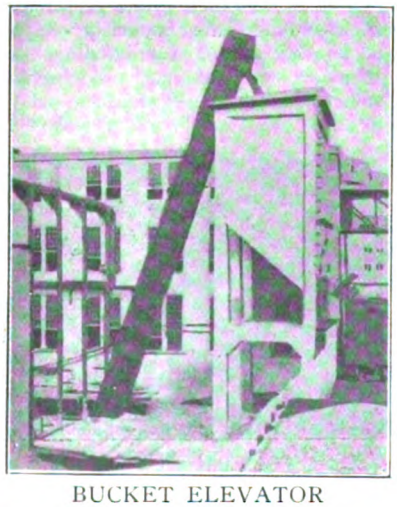
mounted in a frame for supporting shafting and pulleys. Buckets may be spaced or continuous on the belt. The latter are known as continuous bucket elevators and the former spaced bucket elevators. Spaced bucket elevators are usually of the centrifugal discharge type and are relatively high speed machines. Continuous bucket elevators are generally operated at slow speed. Bucket elevators are used for all bulk materials that do not adhere to the buckets. They have been standardized by various manufacturers and are in universal use in practically every industry.

Elevator, Package

A term used to include the various materials handling elevators of the vertical or inclined type, with trays, shelves or rigid arms of various forms and curvatures attached to one or more strands of endless chain. Articles laid

Feeder, Apron

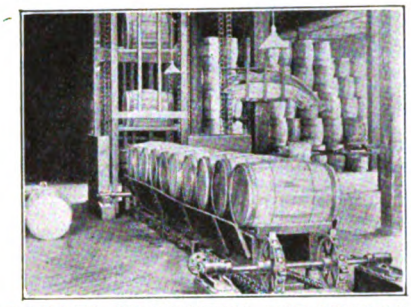
A section of steel apron conveyor made up of two strands of roller chain and overlapping steel plates with skirt boards set just inside of the end plates of the pans. The use of skirt boards permits the use of narrower conveyors than would be the case without them. Apron feeders are used to deliver material uniformly to other conveyors, crushers or elevators. When bulk materials containing a large proportion of lumps are to be transferred to a belt conveyor or pivoted bucket carrier it is necessary to use a feeder to prevent overloading. The most common use of the apron feeder is for delivering coal from track of hopper to the crusher in connection with a boiler plant. It will operate either horizontally or on incline up to 30 degrees.



BUCKET ELEVATOR

Feeder, Cutting

A device which feeds a bulk material such as moist sand, from a hopper discharge opening onto a conveyor, consisting of a series of parallel flat bars pivoted vertically on fixed pins at one end and at the other pivoted on a bar which can be oscillated horizontally. The oscillations of the bars continually cut or slice off the sand which crowds down through the hopper opening. This type of feeder is mostly used for getting molding sand out of the tempered sand hopper in foundries. Its use eliminates a great deal of labor that would otherwise be required to poke out the sand which is of a somewhat sticky nature and will not flow in chutes.



BARREL ELEVATOR AND FEEDER

Feeder, Belt

A short belt conveyor having special idlers which turn up the edges of the belt, or having flat roll idlers, and skirt boards similar to those on an apron feeder. The functions of the belt feeder are the same as those of the apron, except it will not operate successfully on inclines as steep as the chain conveyor will.

Feeder, Reciprocating

This consists of a shallow pan or a flat plate mounted on rollers and an eccentric or crank, which, by means of suitable transmission machinery, imparts a reciprocating motion to the pan or plate. Skirt boards similar to those on belt or apron feeders are used to regulate the quantity of material carried. Each stroke of the pan moves a definite amount of material forward, and on the return stroke the material is restrained by a vertical plate at the back of the feeder. The material that has been pushed forward then falls off the opposite end of the pan. The length of strokes and their number can be regulated, so that the amount delivered can be varied.

Reciprocating feeders perform the same functions as the apron feeders and belt feeders, but require less head room than either, if the latter are run horizontally. They are less expensive. Apron feeders run on an incline, however, require less depth than the reciprocating feeder of the belt feeder. This is an important consideration in cases where any of these units are used with crushers and the depth of foundations is limited owing to ground water, rock, or other causes.

Feeder, Roll

An automatic feeder consisting of a cast iron drum with horizontal vanes forming pockets. It is placed under and slightly to one side of a discharge opening in such a position that material will not flow when the roll is at rest, but when it is rotated slowly in one direction, material will be carried in the pockets and discharged into a chute.

Roll feeders are generally used under track hoppers or bins for regulating the flow of sand, ore, coal and similar materials. It is inexpensive to install but is not suitable for large capacities.

Feeder, Shaking

This is a reciprocating type feeder similar to reciprocating plate feeders, except that one end is suspended from rods which are adjustable in length and that it is inclined downward toward the discharge point. The adjustable rods permit variation in the inclination of the feeder pan. This design of feeder is more positive in action than the horizontal type and will handle a larger amount with the same width of pan.

Gantry (See "Bridge Crane")

Grizzly, Rotary

A type of screen consisting of a series of parallel shafts with a number of cast iron notched discs on each shaft, equally spaced; a cast iron base frame and chain drives connecting all the shafts, each rotating at a slightly different speed than the others. The upper part of the base frame is inclined toward the discharge end of the screen and carries the bearings supporting the shafts. The motive power is generally taken from the head pulley or sprockets of the conveyor which brings the material to the screen, the connection between the two being by means of chains and sprockets. Material is delivered to the upper end of the screen, resting on the edges of the discs and is passed along by their rotation, the fines dropping between them. Rotary grizzlies are used for screening coke, coal, gravel, stone and ore. Ore and stone grizzlies are generally driven through a train of gears, instead of by chains. Rotary grizzlies are standardized to handle coke from 30 tons per hour to stone at the rate of 600 tons per hour. They are highly efficient screening devices and require much less horsepower than other types of screen. They also require considerably less floor space than revolving screens of equal capacity.

Hoist, Air (See Air Hoist)



WEIGHING LARRY

Hoist, Monorail

A term applied to a crane consisting of a hoist carried by a trolley traveling on an overhead monorail track. It may vary in form from a simple hand chain hoist on a trolley to a motor-operated hoist and trolley.

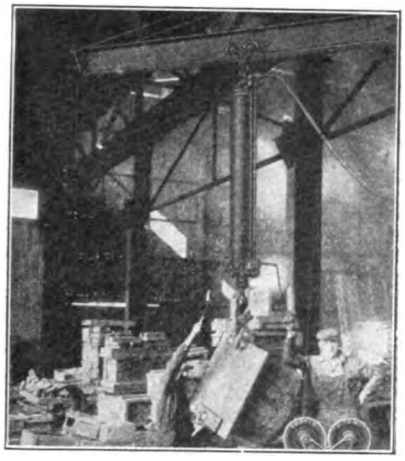
This type of hoist is frequently used in machine shops for assembly work, lifting packages and light loads in general.

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Hopper, Track

A large hopper permanently installed under a railroad track and used to transfer the contents of a hopper bottom car to a conveying device. It usually consists of a masonry pit having two girders spanning it and carrying the rails, and with a steel plate hopper fitted around and below these girders. An automatic feeder is generally placed beneath the hopper receiving material from it and discharging to a system of conveyors.



AIR HOIST

Hopper, Traveling

A hopper mounted on wheels running on a track along which it may be moved. This is done generally for loading a horizontal conveyor at different fixed locations as in the case of a locomotive crane equipped with a grab bucket.

Jet, Water (See "Conveyor, Water Jet")

Larry, Weighing

A larry which has its load carrying body or hopper mounted on scale levers so that it weighs the load it carries. The weighing may be automatically performed and recorded or it may require manual operation of a lever to print a card showing the weight. The hopper and scale mechanism are generally mounted on a structural, steel chassis which may be propelled along an overhead track by a manually operated chain or by an electric motor. Larries under 2,000 lbs. capacity are generally hand operated. The most common use of weigh larries is for feeding stokers, gas generators and the like. Their use eliminates a great deal of hand labor with consequent savings in operating costs.

Loader, Box Car (See "Box Car Loader")

Log Stacker

An inclined conveyor, generally of the chain type used for piling logs or pulp wood into a large stack. In the usual form, the incline is arranged as a cantilever from a machine traveling on tracks parallel to the stack. The entire apparatus is movable on the track either by a self contained motor or by an auxiliary tractor.

Magnets, Lifting

An electro-magnetic device used extensively for lifting quantities of iron or steel. Passing direct current through a coil which contains a soft iron core, makes the latter a strong magnet. This electro-magnet is suspended from a crane and moved to pick up and hold magnetic material during transportation. Circular lifting magnets have the greatest magnetism and are used for handling pig iron, scrap and other irregular materials. Bipolar lifting magnets with horizontal cores are used for transporting rails, beams and heavy structures of considerable length. Rectangular magnets may be required for flexible plates which tend to pull away from the core by their deflection, or else two or more circular lifting magnets suspended from the same frame may be used to overcome this difficulty.

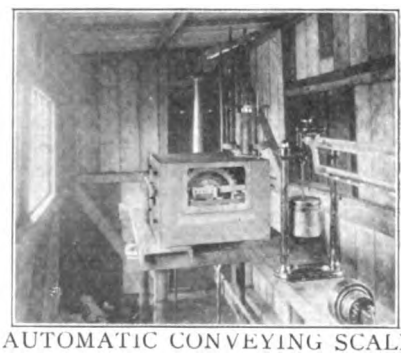
Mast and Gaff, Unloader

A modified derrick used for unloading coal and other bulk materials from the hold of a vessel by a grab bucket and delivering it to an elevated point such as the receiving hopper of a conveyor, coal crusher, storage pocket, etc. The mast is braced by guys at its top and by stiff-legs at the heel of the gaff. The gaff is a boom having its heel pivoted about halfway up the mast instead of near its base as in the ordinary derrick; its outer end or point is supported by a variable or fixed topping lift to the top of the mast. A two rope grab bucket is suspended from the gaff or boom. by its operating ropes, which pass over sheaves at the gaff point, thence to guide sheaves at the ends of a cross tree rigidly attached to the mast at the gaff heel and finally to the drums of a hoisting engine.

Picking Conveyor

A term applied to a steel apron or belt conveyor on which material like coal is spread out in a thin layer and moved slowly past pickers, who remove the refuse by hand. It is similar in construction to apron conveyors described under the latter heading, except that no skirt boards are used since the work requires a thin layer of material.

Ramp (See "Conveyor, Wood Apron")



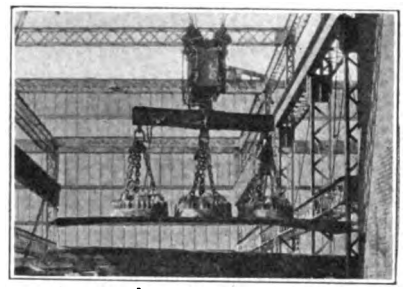
AUTOMATIC CONVEYING SCALE

Scale, Automatic Conveying

A scale arranged to weigh automatically, bulk materials carried on a conveyor while in transit. This device usually consists of a section of the loaded side of the conveyor disconnected from its longitudinal supports, the independent portion being carried on suspension rods and the mechanism of a dial type scale.

Scale, Aerial Wire Rope Tramway

A weighing device sometimes installed at one of the terminal stations of a double rope system a short section of steel track is independently supported by scale beams and can be made to indicate or record the weight of a carrier and bucket passing over it.



LIFTING MAGNETS

Scale, Traveling Larry (See "Larry, Weighing")

Screen, Grizzly (See "Grizzly, Rotary")

Screen, Revolving

A screening device in which wire cloth, perforated plate or other screen material is arranged around the exterior of a cylindrical, conical, hexagonal or other form of frame, supported so that it can rotate with its axis horizontal or slightly inclined. The material to be screened is delivered to the interior at one end and, as it works toward the other, is separated into two or more portions graded as to size.

Revolving screens may be used for all bulk materials that do not tend to adhere to the screen surface, such as coal, coke, sand, ore, wood chips, etc. They may also be used in connection with a stream of water for screening and washing materials containing loam or soils, as in the case of sand and gravel. They are then known as washing screens and are usually conical, a number of short screens being mounted on a common shaft.

Revolving screens are also frequently used in foundries for removing gaggers, scrap iron, etc., in used sand previous to reconditioning.

Screen, Shaking

A screen held in a frame in a slightly inclined position and reciprocated or shaken horizontally by some means to agitate the material passing over it and to assist in its movement. The screen is supported at its four corners and at intermediate points if its length requires, by rod and pin suspension or by rollers from a track below.

Recent developments have resulted in a more efficient type of shaking screen. The screening element is supported at the high point of the incline, by a flat spring suspension and at its lower, or discharge end by a shaft having eccentrics with roller bearings attached to

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the frame of the screen cloth. The shaft is rotated at a moderate speed and a combined vertical and horizontal motion is given to the material. The entire machine is mounted on a self-contained cast iron base.

This type of screen has a higher screening capacity than the suspended screen, produces less vibration and requires less floor space for installation. Shaking screens may be used for all bulk materials that can be handled by revolving screens, but are not suitable for washing or wet screening.

Screen, Vibrating

A form of gravity screen in which the screening element is stretched taut and kept in vibration either by electrical or mechanical means.

In some forms of vibrating screens, the frame supporting the screen cloth is in vibration as well as the cloth. In other forms, in which only the cloth is vibrated, this is accomplished by means of light hammer blows against the wire cloth, and is destructive of the fabric.

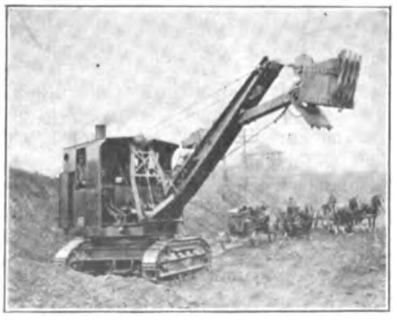
The most recent type of vibrating screen is one in which the vibrations are set up by the rotation at high speed, of a tubular shaft carrying unbalanced weights which are adjustable as to the degree of balance. The vibrations are transmitted by vertical side plates to the screen cloth, through a series of coil springs. The latter absorb excess vibrations and prevent their escape into the supporting frame.

Vibrating screens are suitable for dry bulk materials containing few lumps, are of moderate capacity and are best adapted to fine screening.

Separator, Magnetic

An electro-magnetic device for separating iron or steel pieces from a stream of bulk material so as to prevent damage to machines to which it may be passing. The most common type consists of a magnetic pulley for a belt conveyor, in which the iron and steel is held against the belt while it passes around the pulley after it has delivered the other material.

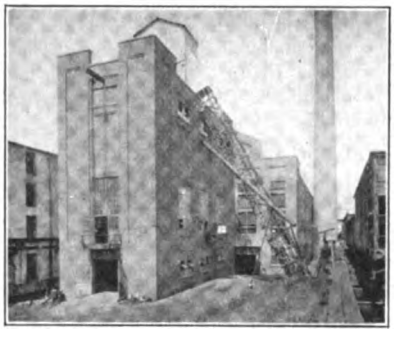
Magnetic separators are generally used to remove tramp iron from coal before delivery to pulverizers or crushers. It is also customary to use these separators in foundries for removing scrap iron, gaggers, etc., from molding sand during the reconditioning process.



POWER SHOVEL WITH CATERPILLAR TREAD

Shovel, Power

A power operated machine for assisting in the unloading of bulk material from box cars, consisting of a large scoop, with handles at the back for guiding, connected by a rope led over suitably arranged sheaves to an automatic winch. The operator carries the scoop to either end of the car, the rope unwinding freely from the drum. Upon thrusting the scoop into the material the rope is momentarily slackened and a counterweight on the drum mechanism automatically reverses the drum and throws in a jaw clutch. This winds up the rope and draws the scoop with its load to the car door, at which point a trip on the mechanism disengages the clutch and the operation may be repeated.



SKIP HOIST

Shovel, Steam or Gasoline

A power driven excavator in which the digging element is usually a scoop or dipper mounted on a handle and operated by a combination of a geared attachment to a boom with wire ropes or chains attached to the dipper and also operated from the boom.

This apparatus with its operating machinery, boiler, etc., is mounted on a car with flat or flanged wheels, and is usually self-propelled. In recent developments it is mounted on caterpillar treads. Steam power is in most general use, but internal combustion engines are also used.

Steam shovels are commonly used in taking out material from sand banks, excavating for foundations, in road building, quarrying and similar operations requiring large capacity and power.

Skip Hoist

An apparatus for the intermittent hoisting of bulk material, consisting of a tower with guides, or an inclined runway with tracks on which the load carrying bucket travels. Steel wire hoisting rope leads from the bucket over sheaves at the top of the tower and thence to a single drum hoisting engine. This is usually an electrically operated machine operated through a control panel and a push button station for stopping or starting. A hopper with loading spout and gate at the bottom is arranged for loading the skip bucket when it is in the pit, and it is emptied at the top by dumping. The various operations may be manually controlled, partly automatic or fully automatic. An automatic skip is one which operates continuously, starting up when the load in the skip has become equal to a predetermined amount shutting off on the way up the loading chute, dumping at the top, waiting a sufficient interval for all the contents to pass out and returning to the loading pit at the bottom, where it automatically opens the loading gate and is ready to repeat the cycle.

Spiral, Gravity Roller

A gravity conveyor in which packages move downward on a roller runway arranged in a helical form around a central vertical axis. On account of the small slope required for conveying on rollers, a number of turns of the spiral are necessary for conveying gently from floor to floor and the length of runway thus provided gives large storage capacity.

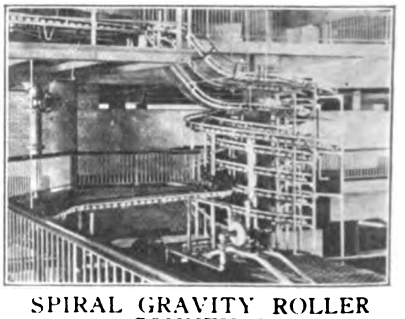
Gravity roller spirals are most naturally loaded at the top and discharged at the bottom in connection with lines of gravity roller conveyor at both places, but intermediate loading and discharge may also be accomplished with the aid of hinged switches or diverters. Spiral gravity rollers are only suitable for handling packages or articles placed in containers with flat bottoms. Cases of bottles, boxes, crates and a great variety of manufactured articles are being handled in this manner, by practically every industry to speed up production and reduce cost.

Stocking and Reclaiming Bridge (See "Crane, Bridge")

Telpher

A crane consisting of an electrically operated hoist suspended from one or more trolleys running on an overhead monorail track and having a cage or cab to accommodate the operator. Telphers may be equipped with grab-buckets for handling bulk materials, or with slings and hooks for handling lumber, stone, structural material and the like.

The supporting structure is one of the principal items of cost of telphers, but when it is considered that this form of conveying may make turns around and over obstructions, it compares favorably with other conveyors whose path is limited to rectangular turns. The carrying capacity, however, is dependent on the length of haul and decreases as the latter increases.



SPIRAL GRAVITY ROLLER CONVEYOR

Tier Lift

A machine consisting of a vertical frame with a platform slidably attached, and a hoist operated either manually or by power. It is generally mounted on a wheeled truck which is propelled wherever necessary. Tier lifts are used to raise heavy packages to a high elevation for piling or trans-

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fer to a conveyor. They may also be used in connection with tote boxes in the same manner as described for lift trucks.

The tier lift is a development in handling methods which finds application in practically every industry and the use of even a single machine will help reduce operating cost.

Tote Boxes

Receptacles of rectangular shape generally made of sheet metal, used for temporary storage of small articles, and which are placed on low platforms that can be picked up by some form of truck or carrier. The use of tote boxes in connection with these separate platforms eliminates a great deal of labor and speeds up the transfer of materials in process, from one department to another.

Truck Lift

A small, wheeled carrier consisting of a structural steel frame with a vertically acting, independent platform, a handle which is used for drawing the vehicle about, and also for raising and lowering the platform. The latter is designed so that it can be placed under a low table holding a stock of tote boxes or other containers and by operating the handle, the table is lifted by the truck platform. Lift trucks are made in various types, either for propulsion by man power or by motor power and the lifting may also be accomplished by power or manual operation of the lever. The lifting element may be a platform, fingers, arms or other forms suitable to the work.

The combination of a lift truck with a stock of tote boxes and movable platforms or tables is an advance over the hand truck method of handling that makes possible great savings in time, and releases labor for other work.

Tower, Coal

A term applied to any one of a number of types of coal unloading installations involving a tower-like structure into which coal is hoisted by a grab bucket or a bucket elevator, and from which it moves to its destination by chutes, spouts, conveyors or cars. Often the tower is on wheels and can be moved along the wharf where it is located to suit the hatchways of the vessel being unloaded. The use of such unloading towers is generally profitable only where large capacities are required.

Track, Industrial

A general term covering rails and accessories for either portable or permanent railways.

Used in connection with small dump cars industrial track is a labor saving device of many possible applications in many industries.

Truck

A wheeled vehicle capable of running on reasonably smooth surfaces without tracks and able to carry freight. Trucks may be classed according to the service performed as industrial, or motor, the latter terms being commonly applied to power trucks running on highways; according to the method of moving them as hand, trailer or power. A power truck may be driven by a gasoline or other internal combustion engine; by an electric motor supplied with current from a storage battery carried by the truck. Trucks may also be classified as fixed platform trucks able to pick up and discharge their loads or able to elevate packages to be stacked or tiered on high racks or piles.

Tractor

A term applied to a self propelled trackless wheeled vehicle which is powered and designed with a view to drawing one or more other vehicles bearing useful loads. When the tractor also carries a load itself, it is called a tractor-truck. The power plant may be driven by a gasoline or oil engine, or by a storage battery and electric motor.

Tractor-trucks and tractors may be used in connection with a demountable body system, tote boxes or with trailers to carry a variety of articles in containers. The amount of labor saving possible with such an installation will, in most cases, pay for the initial cost in a short period of time.

Transfer Car

A self-propelled car used for regularly transferring bulk material from one point to another in an industrial plant, as for example, from an unloading machine to bins, pockets or ground storage. Transfer cars are made with hopper bottoms, gable bottoms, or sloping bottoms, for various methods of dumping. They are usually electrically operated and run singly, but may be coupled in trains if desired.

Trolley, Monorail

A trolley or truck running on a single rail and used for supporting a hoisting unit. The track wheels may run on top of a rectangular or I beam or on the lower flanges of an I beam. At least two wheels are used for a top-running and four for a bottom running trolley. If sharp curves must be traversed, two four-wheel trolleys or monorail trucks are connected by a swivel to a bar on which the hoisting unit is hung. Where very heavy loads must be carried, as many as sixteen wheels, arranged as four, four-wheeled trolleys, may be used. These are arranged in pairs, each pair supporting its own equalizing bar, which in turn supports a main bar, giving the greatest flexibility.

The hoisting unit is usually independent and is either hung onto an eye or attached by bolts to the trolley. Most monorail trolleys are hand traversed for light loads and short distances, but for heavy loads and great distances a power driven hoist is used. This is usually operated by a small electric motor geared to the trolley wheels, and independent of the hoisting motor.

Such hoists are not generally used for bulk materials. For monorail trolleys suitable for these materials, see "Telpher."

Unloader, Automatic Ore

A machine designed for the rapid unloading of iron ore from the holds of vessels of the type developed on the Great Lakes with numerous narrow hatchways extending nearly the full width of the ship but narrow in a fore and aft direction. The unloader consists of a large grab bucket mounted eccentrically on the lower end of a vertical leg and which can be rotated about a vertical axis. This leg is hinged at its top and at a point about a third of the way down, to two oscillating beams, which are connected at their inner or shore ends to horizontal axes between vertical columns carried on one end of a trolley. The two leg beams and columns form a parallel motion and the hoisting bucket can then be directed to any part of the hold.

The trolley is mounted on wheels on a bridge extending at right angles to the wharf; another trolley carrying a bottom dumping weighing hopper runs on rails beneath the bridge, parallel to the top trolley. The entire unloading machine travels on rails parallel to the wharf and may be moved from hatch to hatch of the vessel as desired. The operator's station is inside the vertical leg just above the bucket in which position he has an unobstructed view of the latter and can maneuver it so as to take up all the ore in the vessel's hold.

Unloader, Self Unloading Ship

This type of vessel carries its own bulk unloading equipment, generally of the conveyor type. One installation includes holds built with hopper bottoms discharging through suitable gates onto two belt conveyors running the length of the vessel under the holds and discharging to an elevator at the bow. This elevator raises the material above the deck, where it is in turn received by another conveyor mounted on a swinging boom of variable elevation, which can deliver the material in any direction beyond the side of the vessel and at any height within its range.

Many ships carrying package freight have their own handling machinery. The use of such unloading equipment greatly reduces time in port and eliminates demurrage.

Valve

A device for controlling or diverting the flow of bulk materials in a conveyor trough or a chute.

Wharf, Coke

An inclined plane, generally lined with cast plates and having a track parallel to its top edge for discharging hot coke from quenching cars. Coke wharves are used for the purpose of cooling the coke before delivery to a conveyor parallel to the lower edge of the wharf.

Winch

A stationary horizontal shaft, geared drawn machine, hand or power driven which can exert a pull on a rope or chain while winding it on a drum and can be used for hoisting or hauling purposes, according to the arrangement of rope leading from the drum. Various forms of winches are used on conveyors for raising and lowering the hinged part of a frame. They are also used for the adjustment of chutes or other parts of conveying equipment.

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Getting the Utmost from Production Equipment

Questions Designed to Aid in Checking Up on Present Performance and Planning for the Future

Is full advantage being taken of the flexibility of air tools?

Are the work benches well built and kept in good condition?

Is full advantage being taken of the possibilities of semi-automatic and automatic machines on forging and castings?

Would special purpose automatic chucks effect a saving in time or labor?

Would automatic counters on the production machine save time now wasted in manual counting?

Do the threading dies stand up as long as they should?

Is full use being made of the savings possible through the use of multiple spindle drills or multiple drill heads?

Would high speed steel drills be a paying investment on certain classes of work?

Is there a department where dust or fumes interfere with working conditions?

Are the limits of accuracy carefully chosen to allow as much tolerance as possible?

Is the machinery guarded against accidents with full appreciation of the savings in both lost time and in insurance premium?

Would ball or roller bearings on line shaft hangers result in a material saving in friction and in maintenance cost?

Is the illumination such as to provide uniform light of the correct intensity for the work being done?

Does production show a decrease under artificial illumination; an indication that the lighting needs investigation?

Would modern automatic or continuous milling machines reduce costs on certain operations?

Would machine moulding, with its large labor savings, be applicable in the foundry?

Does the motor control equipment take care of starting and stopping requirements without difficulty?

Are lubricating and cutting oils supplied to the machine without involving a waste of time on the part of the machine operators?

Would direct-motor-driven polishing and grinding machines save power and upkeep on line drives?

Are the power presses tooled up to give minimum costs in the quantity produced?

Are operating speeds checked up to make sure of maximum efficiency on cutting operations?

Is time being wasted in counting parts which could be weighed?

Would adjustable reamers effect a saving over the other type?

Would force feed lubrication pay, especially in the case of those machine tools which are on a heavy production schedule?

Are cuts and feeds being checked up to assure maximum production from expensive machine tools?

Are lathe tools and other cutting tools kept in condition at all times, to avoid production time losses?

Are single cuts being taken on work where multiple cuts would more than pay for the necessary equipment?

Are tooling set-ups and fixtures the result of painstaking study looking toward maximum productive time?

Are losses being encountered due to the use of the wrong type of screw machine for any particular job?

Is full advantage being taken of special sheet metal working machinery?

Would swaging reduce the amount of material needed on some of the work?

Have automatic tapping machines been investigated as to their cost cutting possibilities for your production requirement?

Would "high speed" steel taps produce a saving?

Are the bench vises suited to the work they are called upon to do; do they hold the work accurately?

Are metal parts being washed by hand; is the quantity such that washing machines might show a worth while saving?

Are broaching machines being used on long splines?

Are the hardening and tempering furnaces of a type to keep pace with production requirements?

Are boring mills being employed for turning heavy castings?

Are grinding machines being used on work that requires accuracy?

Would power hammers effect a saving on heavy work?

Has investigation been made of the possible economies resulting from replacing cast parts with stamped metal parts?

Are cutting speeds checked up, to see that the work is giving the best possible efficiency with the particular tool and operation?

Are the jigs and fixtures adequate to the work?

Are automatic or semi-automatic feeds being used on power presses, to reduce costs on big runs?

Are stock and tools so placed as to involve a minimum of delay on the part of the operator in putting through the work?

In processing, is full advantage being taken of automatic temperature and pressure control apparatus?

Is the right type of shear available, to save time, power and labor on shearing operations?

Are the thread cutting machines producing good threads at correct cost?

Are the bench vises so placed as to facilitate the work, and are they suited to the work demanded of them?

Do the machine vises hold the work accurately, and with minimum requirement as to time spent in adjusting?

Would modern welding equipment afford a means to cut production costs?

Would the oxy-acetylene torch perform certain cutting operations more cheaply than doing them by machine?

Is there a "bad traffic hold-up" somewhere in the chain of production processes; if so, would rearrangement or additional equipment solve the trouble and pay dividends?

Are the cutting tools getting efficient cooling and lubrication at the cutting edge, independent of the variable human factor?

Are the gages, supplied to operators of machine tools, so designed as to minimize lost time due to their use?

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Compendium of Modern Equipment and Its Relation to Profitable Production

Section IV—Production and Shop Equipment

Air Tools

Portable drills and chipping hammers, operated by compressed air, and pneumatics and rammers, for foundry use, are widely distributed and used with profit. They provide flexibility and permit the tool to go to the work instead of taking the work to the tool. Particularly useful on heavy apparatus, construction and assembly.

Air Washers

Air washers provide means for eliminating dust from the air, and for supplying air with any desired degree of moisture or dryness. Of particular value in processes requiring a closely regulated atmosphere, such as silk, textiles, tobacco manufacture, etc. Also for paint and varnish rooms for eliminating dust, etc.

Belt Fasteners

Portable belt fasteners allow the millwright to take the tool to the work and quickly fasten small belts right on the job. Power driven belt fasteners installed in the millwright department are used for the larger belts that require heavy fasteners.

Bench Legs

Pressed steel and cast iron bench legs are available for factory use and have supplanted the old fashioned "wooden leg." They are furnished in a number of styles and sizes for single as well as double benches.



PORTABLE AIR HAMMER

Benches

Design and arrangement of factory work benches is important from a number of standpoints. Height of working surface and location affects productivity of bench workers. Relative location with respect to successive operations is important from the handling standpoint. Cheaply built benches are an expensive investment.

Blueprint Machines

Blueprint machines should be considered wherever there is enough work in the drafting department to keep one or more men or boys busy at the printing frames. They enable the labor costs to be substantially reduced and insure uniform and legible output.

Boring and Turning Mills

Boring mills of the vertical and horizontal types are advantageously used for large scale production of castings and forgings as they are admirably adapted to this class of work. For very heavy castings and forgings the vertical type makes for ease in fastening as the weight of the piece tends to help hold it in place.

Broaching Machines

Broaching machines, of both the hydraulic and mechanical type, are considered of great value in large-scale mechanical production. They enable the economical production of splines, special keyseats and keyways and irregular contours.

Chucking Machines

The possibilities of multiple tooling for the production of small as well as large quantities of castings and forgings, makes the chucking machines of particular importance as a modern cost saving tool. When of the semi-automatic or full automatic type, it permits one operator to run several machines.

Chucks

Drill, lathe, milling machine and special purpose chucks, of various types, operating mechanically by manual control, or automatically, by compressed air, or magnetic attraction, are highly important items of shop equipment. Inasmuch as these comparatively inexpensive attachments often limit the production rate of expensive machine tools, they should be chosen with great care and without particular regard for first cost.

Counting Machines

Counting machines, or production counters, are of great value wherever machine operations are such that the stroke or the revolutions of the machine are an indication of output. Also used for counting product parts by dropping the parts, as finished, into chutes to which counters are attached.

Cutters, Bolt

Where special or standard bolts are to be made instead of purchased, a bolt cutter is indispensable. Also a highly useful maintenance and construction tool for factories other than, as well as, machine shops.

Cutters, Milling

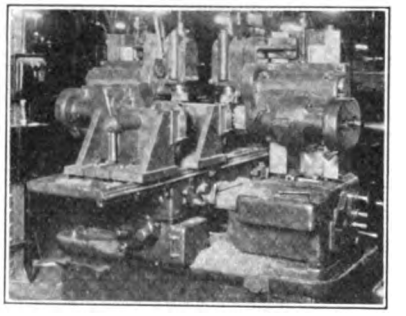
Milling cutters are supplied in a wide variety of standard types and sizes. To avoid confusion and lost motion it is advisable to standardize factory requirements as much as possible to the sizes and types best adapted to the product. Spares should always be available to prevent production delays.

Dies, Threading

Threading dies, used in all mechanical industries are of importance from two angles, first in reproducing correct size and second, in standing up under repeated operation. The first cost of these tools, like that of most small tool equipment, is of little importance as compared with these qualities.

Drill Heads, Multiple

Multiple drill head attachments have the effect of converting the single spindle drilling machine into a multi-spindle tool, and of speeding output in proportion. Particularly valuable in jig work.



MILLING MACHINE AND CUTTERS

Drilling Machines

Undoubtedly the most useful all around machine in any shop is the "drill press." This applies whether it is located in the repair departments or in the production department. Inasmuch as drilling holes is the most common mechanical operation, it is good policy to see that sufficient and proper means are provided for the purpose.

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Drills, Metal Working

Hole drilling is the most common operation in the mechanical industries. From this standpoint, it is one of the most important. The capacity of the drill is the limiting feature in production in many cases. Whenever this condition exists, "high speed" steel drills are a profitable investment even though the cost exceeds the carbon steel drill considerably.

Exhaust Equipment

Many departments should have a ventilating system to change the air frequently on account of dust or fumes. The value of this equipment lies in the fact that it makes working conditions better and therefore attracts a better type of men. The states generally prescribe their minimum requirements for suction in dust collecting systems for polishing and buffing rooms, but frequently there are other departments in the plant where working conditions, from the dust and fume standpoint, should be bettered.

Files

Files are the most common hand tools in the mechanical industries. An operator may have but one hammer, but he will have several files in his drawer. The uses of files are so numerous and so varied that a large variety of types and sizes are available. Here again it pays to standardize as far as practicable and to always insist on quality first.



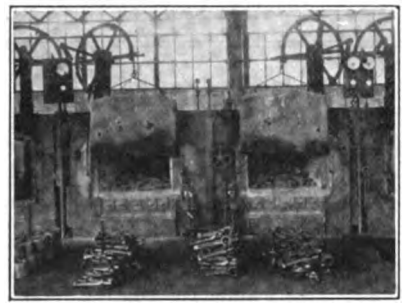
MULTIPLE SPINDLE DRILL

Furnaces

Hardening and tempering furnaces in the toolroom play an important part in the quality and life of the tools turned out and therefore have an important effect on the cost of tools. The furnaces used on production work have a large influence on the quality of the product itself and the selection of the proper type of furnace for each job is very important.

Gages, Measuring

In present day machine shop practice it is not possible to go very far on the manufacture of interchangeable parts without facing the need of a large number of measuring gages for depth, diameter, height, surface, taper and threads. The adoption of the "go" and "no go" limits of accuracy for each individual piece has a very important bearing on the costs of the product, and limits must therefore be made with great care and with due consideration to all the factors involved. With the right kind of gages it is possible to use lower priced men with consequent savings in costs.



HEAT TREATING FURNACES

Gages, Pressure

More gages are being used today than ever before because it has been demonstrated that it pays to have every operator know the exact pressure of the material he is handling. Gages for pressure and vacuum are used on a multitude of applications, too numerous to mention. The high pressures require hydraulic gages and ammonia gages must be all steel construction to resist the action of the ammonia. The service for which the gage is intended is the important point to consider in selecting new gages.

Gear Cutting Machines

The need in industry for better quality and lower costs on all kinds of gears has brought gear cutting machines to their present state of development. The cutting of the various types of bevel, helical, spiral, spur and worm gears has been developed to a fine degree of accuracy and with it all a large reduction in the time consumed. This factor of lowering of costs makes this equipment extremely important.

Grinding Machines (Production)

The art of grinding, in the production of mechanical goods, has advanced very rapidly. Modern precision quantity production would be impossible without the grinder. It must form a part of the tool equipment and an important one.

Guards, Machine

Well-guarded machinery and equipment is a valuable asset as it saves insurance premiums and keeps the trained men on the job. Loss of time by skilled men due to accidents that could have been avoided, is an economic loss and has its effect on raising costs due to temporarily breaking in other men. Guards on belts, gears, moving parts and point of operation all tend to minimize the danger of accident and are generally good investments.

Hammers, Power

Power hammers multiply the power of the blow that a man could strike a hundred fold and make the production of oddly shaped forgings a simple and economical matter as compared with the hand method. They are especially economical on large forgings.

Hangers, Shaft

Hangers are now made of pressed steel as well as cast iron. For group drives the lineshaft hangers may be of the plain babbitt bearings that require frequent oiling or if the installation is permanent the use of ball or roller bearings will probably return a saving on the extra investment on account of savings in friction and labor of oiling.

Hardness Testing Instruments

The uses for hardness testing instruments vary, from checking raw materials coming in, to making the final tests on finished products. They are of exceptional value in checking the hardness of tools to find defects before they can hold up production in the shop. They are a real necessity in every shop laboratory.

Humidifying Equipment

Humidifying equipment is necessary for processes that require a closely regulated humidity to create conditions most favorable for the product. The textile industries require constant conditions of humidity to keep the product from shrinking or stretching. Other industries such as wood and tobacco drying require careful attention to humidity to keep the product uniform by duplicating previous conditions.



GRINDING MACHINE

Indicators, Speed

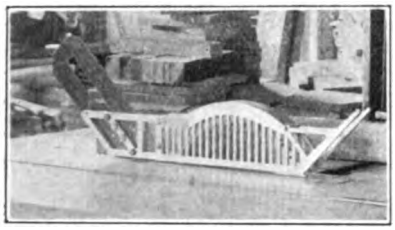
Speed indicators provide means for checking speeds on all equipment throughout the plant. Hand tachometers allow the reading of r.p.m. direct, without the need of a watch, making them an especially valuable piece of test apparatus to have in the hands of the proper shop man.

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Instruments, Recording

Temperature and pressure are very important factors in industry, for many products depend almost entirely on correct temperature and pressure for their quality. Recording instruments provide an accurate record of conditions so that the man in charge may study the charts and supervise processes to be sure that each day's output is in accordance with the pressure and temperature schedule that has been previously determined on.



CIRCULAR SAW GUARD

Jigs and Fixtures

Jigs and fixtures have just as important a bearing on quantity and quality of product as the machines on which they are used. The probable number of pieces to be machined should be the deciding factor on the design of jigs and fixtures, whether they should be made to last for several years or just to make a small quantity of pieces. When time is limited or when the toolroom force is inadequate to make the necessary jigs and fixtures, it may be advisable to have this work done by specialists in this line.

Lathes

Engine lathes are not largely used on production work on account of the highly specialized machines that have taken their place, but in the toolroom and for all kinds of turning jobs the engine lathe is of great value. Fox and turret lathes are an adaptation of the engine lathe to perform special quantity production jobs more quickly.

Lighting Fixtures

Good lighting increases production and therefore reduces costs. In order to have good lighting it is necessary to have good lighting fixtures, correctly spaced and at correct mounting height, to produce uniform illumination of correct intensity on the working plane. The difference in cost between good and poor lighting is relatively small and it is good policy to see that there is sufficient light to get maximum production.

Measuring Machines

Precision measuring machines provide means for making exceedingly accurate measurements on gages. They are usually installed in a room in which the temperature and humidity are held constant in order to eliminate temperature errors. The more common types of measuring machines that are regularly used throughout the shop are designed to give dependable accuracy within the limits required.

Meters

Meters are widely used for measuring the amount of air, gas, oil, steam or water used in various processes, in order to check up on the performance of the equipment and also to give accurate figures for charging each department for the materials it uses. Indicating meters must be read and a record kept of all readings, whereas recording meters have the advantage of showing the variations in use over a period of a day or week and are therefore very desirable.

Micrometers

Micrometers are one of the most widely used devices for measuring diameters and lengths. The average micrometer used by the men in the shop has a capacity of only one inch but the tool cribs are ordinarily equipped with one or more sets up to six inches. Their accuracy is easily determined by checking with gage blocks.

Milling Machines

Milling machines are becoming a larger factor in economical machining as their capacity for large scale production is increased. They are built in both horizontal and vertical types, and the development of the automatic and continuous machines has brought them to the front as one of the most important pieces of cost saving equipment in the shop. Universal milling machines on account of their adaptability to all kinds of jobs, are considered indispensable for tool room use.

Molding Machines

Molding machines make it easy for the foundry men to increase their output with less effort, because the machine does the heavy work. These machines may be of the rollover or jarring types, depending on the class of work. The possibilities for saving time are very large with molding machines, and they reduce labor costs and insure a uniformity in the size of castings that is not possible with hand molding.



SHAFTING AND HANGERS

Motors, Electric

Electric motors are an important factor in increasing the productive capacity of manpower. The selection of the proper type of motor and its control equipment for each individual service is very important. When the starting, stopping or speed regulation requirements are known, it is possible to find a suitable motor that has been designed especially to meet those requirements. Direct current motors are largely used in plants generating their own current. D. C. motors have certain characteristics that make them very desirable where variable speeds are required. A. C. motors may also be had in slip ring types for variable speeds but induction motors make up the greatest percentage of A. C. motors used in industry. Synchronous motors are often used on large units to improve the power factor on A. C. installations.



LIGHTING EQUIPMENT

Oil Handling Systems

The uses of oil in manufacturing plants are so many and so varied that the selection of the correct oil handling system is an important matter. The possibilities for savings, by having an up-to-date system, are large and the savings soon pay for the installation of the equipment. Tanks may be installed below ground, where the fire hazard is great, and pumps may then be conveniently located. A good system saves oil and with measuring pumps it makes easy the charging of each department with its proportionate share of expense.

Oil Extractors

Oil extractors provide means for reclaiming oil from oily chips and the savings in this direction are substantial. Similar machines may be used for cleaning oily waste and wipers. Some equipment for this work makes use of steam in addition to the centrifugal force. A department for doing this work enables the costs for oil to be materially reduced, and therefore the equipment should be chosen with great care.

Pipe Threading Machines

Pipe cutting and threading machines although used in all plants in the pipefitting departments are also widely used on large scale mechanical production. They do very rapid and accurate work and are easy to operate.

Planers

For machining long straight surfaces especially on large heavy castings the planer takes a place if importance as a cost saving tool. With multiple tools

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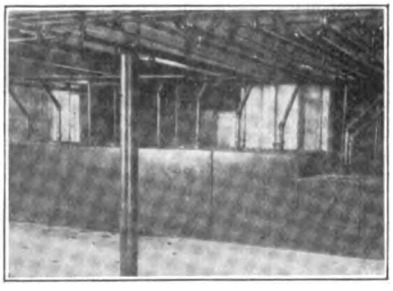
and heavy cuts the production possibilities are large. For special work the open side planer has been developed.

Polishing Machines

Polishing and buffing machines are widely used where the product has polished brass or nickeled finish. The high speeds used require machines with well-oiled long babbitt bearings or the newer ball or roller bearings. Belt driven types are arranged for overhead drive or drive below or on the floor. The motor driven types are widely used and are usually equipped with fully enclosed motors to keep out the dust.

Presses, Arbor

Arbor presses are used throughout the plant for inserting and removing arbors from milling cutters and many other jobs. The selection of the proper size for the work to be done is important.



OIL STORAGE

Presses, Foot and Power

Power presses are used on a variety of jobs such as bending, blanking, cupping, forming, perforating, punching and stamping metal. With automatic or semi-automatic feeds they present possibilities for cost reduction. The performance of presses is largely dependent on the dies, as the proper fitting of dies limits the length of life of the die and limits the quality as well as the quantity of the output. For light intermittent work foot presses are often used, especially if they have to be kept set up for a small operation that cannot be done in large quantities on the power presses.

Pulleys

Pulleys have an important bearing on the power transmitted through them to the belting. They must be carefully selected to be of the right diameter and width to deliver the power required at the correct speed. The possibilities for improving the power transmission by a careful study of the problem are great, and the amount of power saved, by using correct sizes of pulleys and belts, is often very large. Steel pulleys are light and strong, but when exact fractional diameters are required the turned cast iron or wood pulley is necessary. Fibre pulleys are largely used as motor pulleys.

Punching Machines

Automatic punching machines are capable of producing a wide variety of products and are very economical on account of practically no labor costs. They are important as a cost saving tool where the quantities are very large.



STOCK STORAGE RACKS

Racks

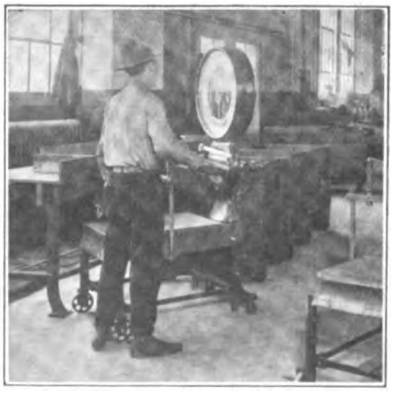
Steel racks for stock and tools have practically supplanted the old fashioned wooden racks because they are easy to erect or take apart and are adjustable. The adjustable feature is very important because of the varying requirements for space from time to time. With interchangeable shelves and partitions it is possible to make bins of any size desired in a few minutes. The growth of departments often necessitates moving racks to another location in which case the steel racks are especially desirable as it is an easy matter to take them apart and move them.

Reamers

Holes that have to be of a very accurate diameter require reaming to exact size. Reamers are made solid and adjustable as well as tapered and straight. Adjustable reamers have interchangeable blades locked in place while solid reamers as their name implies are of one piece. Each type have their advantages for certain applications. Reamers are used only on important work and therefore other angles besides the first cost should be considered.

Regulators, Pressure and Temperature

Automatic pressure and temperature regulators or controllers provide means for automatically controlling the pressure or temperature in a process or operation. Efficient operation is made possible, which in turn makes for maximum production at lowest cost. Automatic control results in uniformity of product, especially where the heat treatment and pressure are both important factors in the process.



FACTORY SCALES

Riveting Machines

Fastening together light stampings by riveting machines is a method frequently used on large scale production. These machines are driven by belt or direct motor drive for shop use and are used for riveting large quantities of the same parts whereas the pneumatic riveters are brought to the job on large jobs.

Sawing Machines

Sawing machines for metal are of two types for cold sawing, the circular and hack saw types, and for the so-called hot sawing, the high speed friction type. Factors such as the size of the work, the quantity of cuts per day, and accuracy required should be carefully considered in selecting sawing equipment as each type has advantages for special work.



SHEET METAL WORKING MACHINERY

Scales

Scales are great savers of time and labor when used for counting, and their value throughout the plant is not generally recognized. The dial type scale which is direct reading tends to cut down mistakes and this is bound to result in a saving. The possibilities for using scales from the time the raw material comes into the receiving room, all through the shop processes, to checking the weight of the finished product in the shipping room, are enormous and this equipment therefore forms an important part of the shop equipment.

Screw Machines

Screw machines, by their ability to use several tools cutting at the same time, have contributed one of the largest factors to low cost production of turned parts. Screw machines are made in hand, automatic and multiple spindle types, each type being best adapted to certain sizes and quantities to be produced. The automatic types allow one operator to run several machines which makes a great saving in labor.

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Shafting, Steel

Shafting is a very important item of equipment in plants using group drive. It should be of large enough diameter to transmit the power without distortion. The couplings should be carefully tightened to keep the joined ends in line and every effort should be made to keep the shafting lined up to reduce friction at the bearings, whether they be of the plain babbitt or ball or roller types. The savings in power due to friction are a cost saving item just the same as a saving on a machine tool.

Shapers

Shapers are of great value for cutting straight flat surfaces accurately, but they are not widely used on large scale production work.

Shearing Machines

Shearing machines are used for cutting metal in strips or irregular shapes. The straight knife type is used for cutting up sheets and the rotary type is used for cutting either straight lengths or irregular shapes.

Sheet Metal Working Machinery

Sheet metal working machinery is variously used in making bent or formed sheet metal parts in large scale production. Several types of machines among which are bending rolls, bending brakes, folders, groovers and forming presses, are used in this work. The correct equipment presents possibilities for savings on quantity production due to the small labor cost compared with hand work.

Stools and Chairs

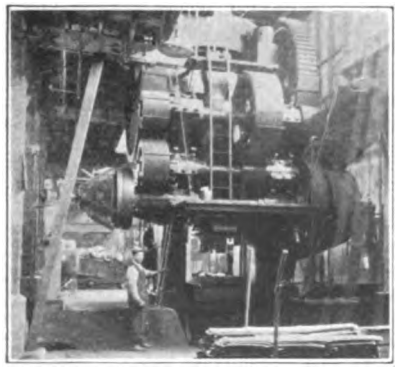
For light bench work it is well known that increased production results when the workers are comfortably seated. Stools and chairs of steel, adjustable to the height of the individual worker, reduce fatigue and tend to increase production, and are therefore an important item of cost saving shop equipment.

Swaging Machines

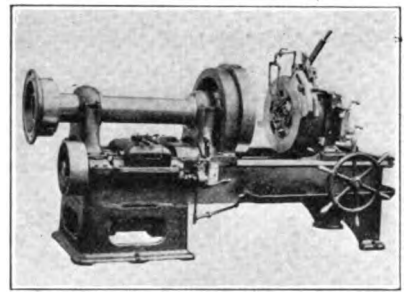
Swaging machines are used to reduce or taper rods or tubes. They are used to save material and machining operations, and present possibilities for cost saving on jobs for which they are adapted.

Tapping Machines

Tapping machines are widely used on large quantity production especially on small diameter tapped holes. The semi-automatic types are limited only by the feeding speeds and are an important cost saving tool.



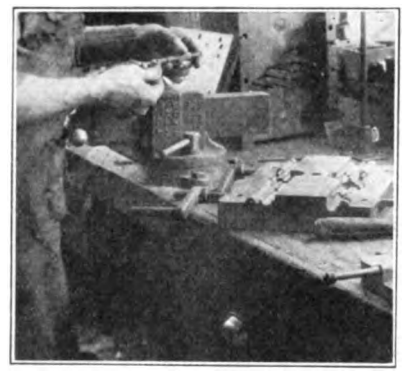
HEAVY FORMING PRESS



THREADING MACHINE

Taps

Taps are of two types, the plain solid and the adjustable. Just as with drills, the capacity of the tap is often the limiting feature in production, and "high speed" steel taps are then a good investment. The choice of taps, and the speed at which they should be run, depends on the hardness of the material and the accuracy required in each case.



BENCH VISE

Thermometers

Industrial thermometers are widely used to accurately measure the temperatures of materials in pipes or tanks during a process or operation. Because of the fact that many products depend on accurate temperatures during the process for their successful manufacture, temperature is becoming a more and more important item. The glass enclosed types of thermometers must be mounted directly on pipes or apparatus, while the dial distance types may have the bulb only mounted on the apparatus with a capillary tube leading to the dial thermometer that may be mounted some distance away.

Threading Machinery

There are three different types of machines for this work, thread cutting, milling and rolling machines. For the accurate class of work the threads must be cut or milled. Thread cutting machines equipped with self opening die heads present possibilities for cost saving on large scale production of accurately cut threads. Thread milling machines of the semi-automatic type present similar possibilities for cost saving on the work for which they are adapted.

Tool Holders

Tool holders, by making use of small interchangeable bits are economical of the costly "high speed" steel, and are very important items of shop equipment. They save forging labor and steel. Tool holders should be selected without putting too much stress on first cost because they affect the production so largely that their cost is a comparatively unimportant item in the final cost of thousands of pieces.

Vises, Bench and Machine

Vises play a very important part in bench work by holding the piece during a hand operation. Swivel vises allow of swinging the work around at any angle. Vises are used on drilling and milling machines, planers and shapers for holding the work during an operation. Machine vises play an important part in production, as the speed with which they are operated and their ability to hold the piece in place depends on their design and efficient operation.

Washing Machines, Metal Parts

Metal part washing machines may be profitably used for cleaning any metal parts that can be cleaned by dipping or scrubbing by hand. Due to their automatic operation the quantity of cleaned parts per hour is very large, thus reducing labor costs materially. A very profitable piece of cost saving shop equipment.

Welding Machines, Electric

Electric welding machines are widely used for welding and assembling rod or sheet metal parts. They are made in several types such as arc, butt, seam, and spot welding machines, each type being built for a particular purpose to make high production possible and thereby reduce costs. In view of the possibilities for cost saving by the use of this equipment, it should be selected with great care in order to get the type best adapted to the work. The speed with which electric welding works and the quality of the work are the main reasons for its adoption in many industries.

Wrenches

Wrenches are very common hand tools in metal working industries especially. There are various types and sizes of monkey, open end, ratchet, socket and tap wrenches to fit every need in the most efficient and time saving way.



ELECTRIC WELDING

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Reducing Depreciation and Waste by Better Maintenance

Questions Designed to Aid in Checking Up on Present Performance and Planning for the Future

Is the responsibility for maintenance so placed as to insure proper organization?

How much money for electric light is being wasted because of dirty windows?

Are there frequent breakdowns of motors serving important departments?

Do the concrete floors tend to powder on the surface; are they smooth; are they kept clean?

Are the trucking aisles kept clear of obstructions at all times?

Is the oil reclaimed from chips, and is oily waste cleaned and reclaimed?

Is the lighting installation regularly cleaned to insure full illumination from the equipment installed?

Are stairways well lighted to prevent accidents?

Are the electric trucks kept fully charged, and are trucks maintained at all times in good repair?

Are spare parts available for all important equipment, and is full advantage taken in this respect of standardization wherever possible?

Are the walls and ceilings kept clean and well painted as an aid to better illumination?

Is time wasted in trying to find executives or individuals in various parts of the plant?

Does the water in the sprinkler tanks freeze in cold weather and do the leader pipes also freeze up?

Is it a practice to paint exposed steel work before rust gets in its destructive work?

Is the heating system thoroughly efficient, and is it being handicapped by heat losses due to badly fitting sash?

Is the plant warm enough in the morning to keep the men from wasting time trying to get warm?

Are the sprinklers ready for a fire or has someone left an important valve closed after making a repair?

Do line shaft bearings burn out occasionally, indicating a need for attention to alignment as well as to lubrication?

Are the motors over loaded; or are they under loaded, resulting in poor power factor?

Do the pipes, valves and fittings leak here and there?

Is the power getting all the way to the tool or is a large proportion of it being lost through belt slippage?

Are the outside crane driving mechanisms protected from the rain?

Is important equipment such as elevators or cranes inspected on regular schedule for stall or possibility of accident?

Are inspection reports made on all motors periodically to show their conditions?

Are floor scrubbing machines being used on oily floors, or is the oil allowed to accumulate and ruin both floor and working conditions?

Are the millwrights organized so as to be available quickly in case of breakdowns?

Are line shafts regularly checked up for alignment?

Are return heaters on heating coils so anchored as to throw the expansion to the mitre ends?

Would unit heaters be more easily maintained in large high ceiling buildings?

Is heater piping properly insulated where it passes through exposed places that require no heat?

Are the boiler tubes kept free of scale in order to get the most steam per pound of coal?

Is full advantage being taken of the light reflecting qualities of white paint on ceilings and walls?

Is a regular painting schedule in force as a means of slowing up depreciation?

Are pipe lines painted with identifying colors to save time and mistakes in maintenance and repair jobs?

Would it improve lighting conditions to paint the machinery in a light color?

Are lift truck platforms kept in repair?

Is full advantage being taken of the spray method of painting large surfaces?

Is the insulation on steam mains inspected and kept in good condition?

Is a spare parts stockroom kept for the maintenance department, so that parts will be immediately available in case of emergency?

Are the roofs regularly inspected and kept in repair to avoid leaks, rather than to repair them after damage has been done?

Are belts kept at correct tension, or do you tolerate the costly practice of letting individual operators follow their fancy; with lessened service from experience belting?

Is the fencing around the plant designed to protect, or is it merely a make-shift?

Are periodic tests made to check up motor loads, as a means of determining what changes would forestall overloading or underloading?

Are main drive motor belts cemented endless, or do you subject this drive to the added troubles due to less efficient methods of belt joining?

Are the electric extension wires on portable equipment kept reeled up when not in use?

Is the surface of each work bench kept in repair, so that it does not slow up the work that must be done on it?

Are the fuse costs abnormal; and, if so, is it due to overloads, or would a rearrangement of circuits be advisable?

Are all "live" terminals of the electrical system so installed as to make them foolproof?

Are cracked or broken window panes attended to immediately, before they cause either expensive loss of heat or damage from the weather?

Are the fire extinguishers inspected and kept ready for the always possible fire?

Are cracks in concrete floors repaired before they get a chance to damage truck wheels?

Are cracks in exterior concrete work repaired before the weather gets in its destructive work?

Would door closing mechanisms save enough time for truck operators, to make them a paying investment?

Is the ventilation system regularly inspected, so that production may not be affected by a breakdown?

Is the maintenance item on floors, due to increased trucking requirements, so high as to indicate the need for a more suitable type of flooring?

Would a change in the type of wheels used on trucks result in lessened floor maintenance cost?

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Compendium of Modern Equipment and Its Relation to Profitable Production

Section V—Maintenance of Equipment

Air Conditioning Apparatus

By keeping water pumps and spray heads in proper working order the chances of trouble during working hours are minimized. Periodical inspection and careful attention when trouble is first noticed will materially reduce the labor spent on maintenance on this equipment as on all other similar items. Clean spare units should be kept on hand to replace dirty ones where the viscous substance unit type of air cleaners are used and where the rotating type of viscous substance cleaner is used the moving parts must be kept well oiled or greased.

Bearings, Ball and Roller

Ball and roller bearings require packing with the proper grade of grease at least every six months on light service. Where the service is severe the length of time between packings must be determined by experiment.

Bearings, Oilless

Bearings in out-of-the-way locations are often neglected and oilless bearings are very well adapted for these hard-to-get-at places.

Bearings, Self or Ring Oiling

These bearings require filling at least once a week and require the services of an oiler if they are used on line shafts and countershafts in the plant.

Belt Dressing

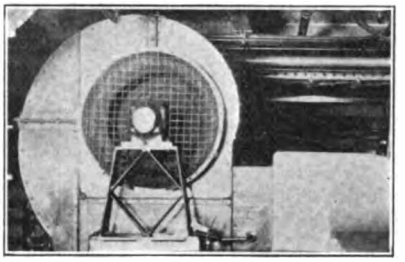
Slippage and the amount of power required can be materially reduced by judicious application of belt dressing. With large belts this reduction of waste is a big factor.



BELT FASTENING

Belt Fasteners

Belt fastening machines are of two kinds, portable and power driven. The larger belts may be more easily fastened on the power driven machines that are usually located in the millwright room, but for quick repairs on belts some distance from the millwright's room the portable fasteners save time and money by getting the machinery running more quickly.



CENTRIFUGAL BLOWER

Belt Shifters

These must work freely and easily and stay in the on or off position until operated. Very little attention is required, an occasional oiling sufficing for the better types.

Belting, Canvas, Leather and Rubber

Canvas belt is used on many installations of conveyors and power transmission. The joints should be carefully made and watched to avoid catching. Leather belting is most extensively used for power transmission and although its use is reduced by individual motor driven machinery and equipment, it is still the most used type of power transmission and therefore requires more attention than is often given to it. Good leather belting with cemented or well fastened joints may be installed with the correct tension to deliver the horsepower required, but unless it is kept in good condition and again given the correct tension some weeks after installation a great deal of power may be lost. Getting the power way through to the tool doing the actual work with the least waste is goal of every maintenance man. Rubber belting is particularly adapted for damp or wet locations and for conveyor belts. The tough surface of these belts resists very well the wear and tear of sharp corners on such substances as coal.

Bench Legs

The pressed steel bench legs. now so extensively used require no attention except to see that stretcher pieces of wood are securely bolted to them to keep the bench rigid. As tops of the bench wear out a new top can be put on without disturbing the legs or stretcher pieces.

Blowers, Centrifugal or Rotary

The high speeds at which these blowers run make necessary the use of ball or roller bearings or constant attention to oil cups if plain bearings are used. Glass oil cups with a reserve large enough to carry over a day in case the oiler is late are a good way of avoiding bearing troubles.

Blowers, Soot

Oiling of moving parts on automatic or hand-operated blowers is essential to proper functioning. When nozzles burn out new ones should be available in the spare parts stockroom or in the power plant materials crib.

Boiler Compounds

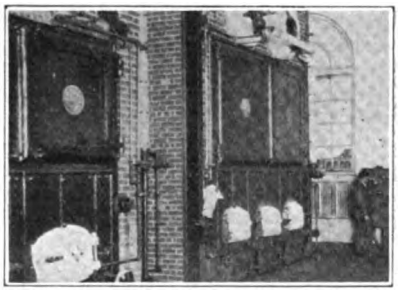
The use of boiler compounds of the correct kind materially reduces the amount of maintenance on boiler tubes and as scale is an insulator that keeps the heat from making steam, it is much cheaper to pay a small amount for boiler compounds and water softening equipment than to pay for excess coal and maintenance labor cleaning tubes.

Boilers

The maintenance of boilers only is a real job in a large sized plant as it is quite usual to have one or two spare boilers so that one may be repaired without interfering with the plant's steam requirements. Brickwork and arches should be laid up with high temperature cement to resist the forced draft fires, and only best quality brick should be used in order to make the time interval between repairs as long as possible.

Brick, Fire and Insulating

Fire brick should be of the highest quality obtainable so that it will last as long as possible because the labor cost is much larger than material cost. This is even more important in the case of fire brick blocks. The insulating brick, used to protect the common brick and also to conserve the heat, should be as efficient an insulator as possible in order to save space.



POWER HOUSE BOILERS

Buckets

Grab buckets are subjected to very severe service and are exposed to the weather. The working parts should be kept well greased in order to move freely.

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Buffing and Polishing Machines

The high speeds at which these machines run make ball or roller bearings advisable in order to reduce maintenance expense. With ring oiling bearings the reservoirs should be filled every day or two.



DRYERS FOR COTTON WASTE

Buildings, Factory

New buildings of concrete construction with steel sash require painting of the exterior of the sash every three years especially near salt water. Painting of concrete surfaces with waterproofing compounds saves the concrete from absorbing water that would make the building damp inside and cause spoiling of the concrete surface if frost got under the skin.

Burners, Oil, Powdered Fuel

The maintenance of correct flame on oil burners is important to get efficient combustion. All moving parts on burners or auxiliary equipment must be periodically oiled or greased. The same is true on powdered fuel pulverizers and other equipment. Correct atomization of oil and correct fineness of powdered fuel will give constant efficient operation and time spent in maintaining these results is well spent.

Cars, Industrial

Cars on severe service such as hopper or dump cars should be frequently inspected and repaired if necessary. The running gear should be greased or oiled once a week at least.

Chains, Conveyor and Driving

Conveyor chains are of single link variety with large teeth on sprockets and cheap renewable links to replace worn spots in chains. Driving chains are usually high speed type with several links across the width of the chain and comparatively small teeth on the sprockets as compared with conveyor sprockets. Driving chains should be regularly greased or run in a bath of grease or oil in a metal guard. Center distances should be long enough to allow the chain to sag slightly on the top side for smooth operation.

Chairs, Industrial

If machine or bench workers can sit at their work they will be less fatigued at night and consequently get out more production in a day. The right type of chair or stool will often allow the use of women on light jobs. Each chair should be adjustable to the individual using it.

Chimneys, Steel

Steel chimneys should be painted with a good quality paint once every three years in order to avoid rusting.

Circuit Breakers

Electric lines subjected to frequent overloads for which there is some good reason should be protected by circuit breakers to eliminate expense of replacing blown fuses.

Cleaners, Metal and Waste

The oil in steel chips is easily reclaimed by centrifugal chip separators, some types cleaning by centrifugal action only and others by steam in addition to the centrifugal action. Oily waste is also easily cleaned by steam and centrifugal action and the saving of oil from chips and waste more than repays the expense of maintaining this service department. The centrifugals operate at high speeds and if not mounted on ball bearings they must be frequently oiled.

Cleaning Materials

The maintenance departments use large quantities of cleaning materials for walls, ceilings, windows and floors, and the selection of the correct material for each job results in a large saving of money.



CONCRETE FLOOR

Coal and Ash Handling Equipment

This equipment, whether it be of the belt or bucket type, is subjected to grit and dust so that bearings are quickly worn out unless they are properly lubricated. Spare parts must be kept on hand at all times so as to make repairs quickly should a breakdown occur during working hours. Inspection and repair work when necessary is the only way to keep this equipment going day after day.

Compressors, Air

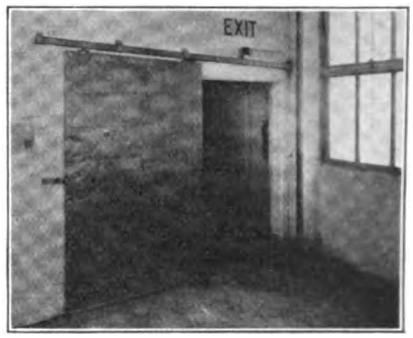
The large air compressors in the power plant are usually well taken care of but small compressors located out in the plant should be carefully watched in order to keep them running.

Concrete Floors

Concrete floors subjected to severe trucking should be hardened by a good hardener. If holes appear they should be promptly patched and if necessary an entirely new surface of hardened concrete should be laid over the old floor.

Conveying Equipment

This often is subjected to severe service and the oiling and greasing of bearings in out of the way locations is often neglected. Belts should be inspected regularly to repair or cut out badly worn spots and bearings on rollers inspected for wear. The driving end of the conveyor is the place needing the most attention.



FIRE DOOR

Countershafts

These are a very important part of the group drive as much power can be wasted with slipping of clutches. They must be regularly oiled and inspected for wear and tightened up occasionally. The belt tension down to the machine must be enough to deliver the power to the tool but not so tight as to wear bearings and cause friction.

Couplings

Rigid couplings on line and jack shafts should be carefully lined up at installation and checked from time to time to see that they haven't loosened and thrown the shaft out of line, causing friction. Flexible couplings of various types are used for transmitting power at a slight angle, each type requiring a regular inspection of wearing points.

Cranes

Electric cranes on severe out-of-door or indoor service should have daily inspection on account of the danger of accidents to men working under them. A printed inspection form to be filled in by the inspector is the only safe way to keep the large cranes on the job every day. There are so many mechanical and electrical wearing parts on a crane that eternal vigilance is the only way to discover small troubles before they can cause damage. The smaller hand and jib cranes do not require any more than occasional inspection and oiling.

Crushers

Coal crushers are usually located in a pit and therefore subject to water and grit getting into bearings unless precautions are taken.

Doors

Entrance and exit doors should be kept in good repair to see that hinges and latches are tight. Once a door gets out of order it soon is racked to pieces by continued slamming. Doors be-

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tween departments are usually sliding doors that remain open during working hours but the doors that have to be kept closed should be arranged with quick opening attachments or be double swing doors so that truckers will not lose time closing them. These should be armored with steel plates to protect them.

Drills

Portable electric and pneumatic drills and other tools should be inspected each time they are returned to the crib and if repairs are necessary they should be made at once.

Drinking Fountains

The floor type of fountain is often equipped with a filter that should be cleaned as often as necessary to keep the filter working efficiently. The refrigerated water fountains require little attention but the iced types get damaged by rough handling of ice.

Drying Apparatus

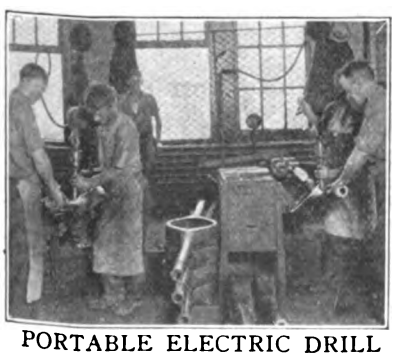
The maintenance of this equipment is largely the care of fan and driving mechanism and if moving parts are kept oiled and greased with the correct lubricant for this service.

Dust Collectors

These are usually on the roof or on a steel framework and require painting every two or three years and relining occasionally if handling gritty substances.

Dust Collecting Systems

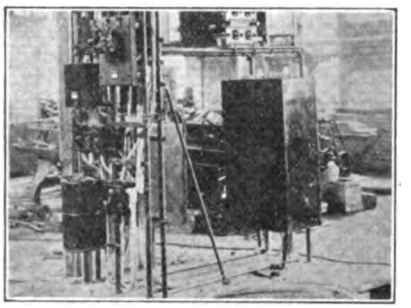
The maintenance of original suction depends on cleanliness of the piping. Handhole cleanouts every five or six feet and at all elbows facilitate this work. Fans and motors run at extremely high speeds and require careful attention to lubrication. The selection of the proper type of fan at the time of original installation has an important bearing on the efficiency of any dust collecting system. When a large amount of air is drawn out of a building the heat waste is enormous and it is often advisable to wash the air and return it to the building again as clean washed and heated air, thus saving the amount of heat required to warm up cold air to the room temperature.



PORTABLE ELECTRIC DRILL

Electrical Wiring

The maintenance of power and light wiring is a very important item because a breakdown in a main feeder would shut down a large amount of machinery. With wiring in conduit the chance of damage to insulation is overcome and with correctly installed fuses and circuit breakers a short circuit cannot pass very far back towards the main feeders. Renewable fuses often cut down fuse expense on account of comparatively small cost of the replaced part. High grade insulation on all important wiring will pay in the long run.



ELECTRIC WIRING

Elevators

The maintenance of elevators is divided into two groups, the electrical and mechanical parts. The severe service on electric contact fingers makes inspection of these parts daily a necessity as arcing soon burns out the contacts. Spare replace parts should be kept on hand for all such parts. The inspection of cables on passenger elevators especially should be thorough and worn or frayed cables quickly replaced. Drums must be watched to see that the cable winds up in the grooves in order not to cut the cable. Safety devices should be inspected and tested occasionally. A daily inspection of all important elevators for electrical and mechanical defects is the only way to keep them in good condition.

Fans, Exhaust

These usually run at high speeds and require regular attention to lubrication. In the case of acid vapors or other gas that corrode the blades of the fan the use of special metal for the blades or acid proof paint is necessary to keep the fan in good condition.

Fences

On account of their low upkeep expense, wire fences have almost entirely replaced wood. With posts of steel firmly anchored in concrete or in the ground these fences are strong enough to keep out undesirables and have the advantage of being open so they may be seen through. Gates must be sturdily constructed to stand closing continually. The painting of these wire fences every three years is about the only maintenance expense.

Fire Protection

This equipment for fire protection is so important that a special man should inspect it frequently and report anything needing attention. Extinguishers must be refilled every six months and hose should be inspected to see that it does not harden and crack from ageing. Weights and fusible links on self-closing fire doors should be inspected because truckers often block these doors open for convenience. Hose houses in the yards cannot be locked, so the equipment should be carefully looked over every week.

Flooring

Holes in floors are dangerous to the men and often cause spoilage to materials being trucked over them when pieces fall out of the trucks. Smooth floors save time and labor in trucking and are a paying investment. Wooden floors are easily repaired but patching on concrete floors must be carefully done to make the job permanent. Dusty concrete floors may be hardened with any of the hardeners on the market.

Foundry Equipment

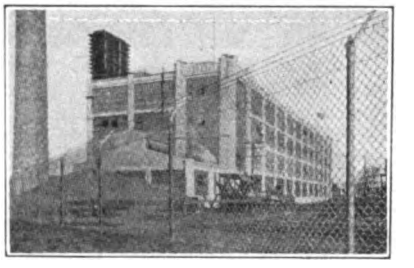
The equipment and conveyors for sand and core handling is usually very rugged but on account of the ever present grit the bearings must be either oilless or be given frequent attention by oiling or greasing.

Furnaces

Replacing brickwork in furnaces is a job that should be well done. Only the highest grade refractories and cement should be used on this work because of the high labor cost compared with the cost of material and also because shutting down of the furnace cuts down production. Burners for oil or gas furnaces should be adjusted to correct flame quality and new heads installed if old ones become burned.

Gear Drives

Gear drives are used on many machines having individual motor drive as distances between centers may be very small compared with other drives, and high speeds on motors are easily reduced to usable speeds. Gear drives are usually used on slower speed machines and equipment and when the whole train of gears is encased a suitable lubricant should fill the casing so that not much attention is required.



FACTORY FENCE

Glass

Window glass in most plants is plain or ribbed wire glass. The ribbed glass diffuses the daylight better but the dust settles in the ribs and it must be kept clean in order to save money on electric light bills. With good cleaning materials the cost of window cleaning will be more than made up by savings in electricity.

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Greases, Lubricating

In order to make sure that the correct grade of grease is used on each job, a survey of requirements should be made by a lubricating engineer, the results charted and recommendations followed.



FIRE PROTECTION

Grease Cups

Periodical filling of grease cups in out of the way places is one thing that should be checked up by an inspector in order to save bearings from undue wear. Cups should be large enough to carry over a few days in case of delay due to the greaser being out for sickness or some other reason.

Guards

Machine guards on moving parts and point of operation are absolutely necessary to prevent men from getting injured. The expanded metal or wire guards used so extensively do not shut out light and give the same protection as solid guards. All guards should be carefully fitted to each machine and be so made that they will interfere as little as possible with the operator's movements.

Hammers, Drop, Pneumatic and Steam

The boards in drop hammers should be renewed at the first sign of cracking and safety first should be the motto on all hammers. Air and steam hammers should be kept well lubricated and all safety devices should be kept in working order.

Hangers, Shaft

Ring oiling shaft hangers should be oiled every day or two. This requires the services of an oiler and many plants therefore find it advisable to shift to ball or roller bearings in their line-shafts. These types of bearings also reduce friction and pay for themselves in a few years.

Heating, Direct and Indirect

Steam heating by coils of pipe under the windows is the most used system in plants. The pipes must be kept from sagging to prevent water hammer and radiator valves and traps kept in good condition. With indirect radiation the fans and motor drives must be kept lubricated and valves on steam coils kept in good order so that as many coils as are necessary may be turned on. This, of course, may be done automatically by a temperature controller.

Hoists, Electric, Hand, Pneumatic

Cables or chains on all hoists should be carefully inspected once a week. Contacts on electric controllers should be inspected and kept in repair to avoid accidents. Attention must be paid to lubrication of all bearings on motor drive and hoist. Pneumatic hoists require little attention. They are used where a gentle motion is required, such as lifting flasks in foundries.

Hoppers, Coal and Ash

Coal hoppers of steel must be kept well painted to prevent rust, and on account of the sulphuric acid developed in ashes by the addition of water, ash hoppers are even more likely to rust than are coal hoppers.

Hose, Air, Gas, Oil, Steam, and Water

All kinds of hose deteriorate rapidly but the maintenance of these items may be reduced by reeling up hose not in use and storing it out of the weather.

Ice Making Machinery

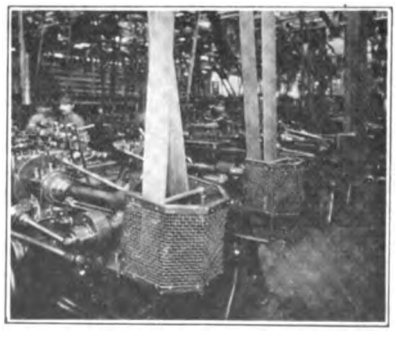
The small compressors used for icing water for circulating through the plant require the usual maintenance of compressors, mainly attention to gland packing and lubrication.

Idlers, Belt

When belt drives must be on very short centers it is necessary to have idlers to increase the arc of contact on the pulleys. These idlers are usually weighted to give tension to the belt. This causes wear on idler bearings if they are not properly lubricated.

Indicator Posts

These should be marked with enameled signs indicating exactly what each valve controls, because in an emergency this will save time and money. These posts are often located at corners of plant roadways and in such locations they should be protected by three or more bumpers. They are usually painted red to indicate fire protection equipment. They must be kept sealed at all times and periodical inspection should be made to see that all valves are sealed open or shut as desired.



MACHINE GUARDS

Instruments, Recording Pressure and Temperature

On important processes where absolute accuracy is necessary these instruments should be checked in the laboratory periodically and any slight adjustments made at that time. These instruments should be kept locked to prevent tampering by unauthorized persons in the plant.



SHAFTING AND HANGERS

Insulating Materials for High and Low Temperatures

Few people realize the enormous losses each year due to improper insulation on steam and other hot pipes. It is best to err on the side of too thick insulation than the other way because the tendency is to use too thin or too low quality insulation on most jobs. When repairs are made the insulation should be replaced as soon as possible. On low temperature or refrigeration pipes the value of covering is equally as important.

Insulation, Electrical

Insulation on important power and light wires must be kept in perfect condition to assure continuity of service. Wiring carefully drawn into conduit and joined at metal junction boxes is not likely to get damaged. All old open wiring should be put into conduit if it is feeding important departments because insulation is subject to damage on open wiring and may cause a short circuit and consequent shut down.

Jacks, Hydraulic and Screw

Hydraulic jacks must be kept properly filled with the correct grade of oil. Screw jacks require occasional grease.

Joints, Expansion

Large diameter pipes should be inspected from time to time and any bolts or nuts that may have become loosened due to movement of the pipe should be tightened up.

Lamps, Incandescent

Incandescent lamps make for easy maintenance as they burn for a thousand hours without renewal. Lamp renewals and cleaning may be done by unskilled men whereas other types of lights require skilled men for maintenance. By standardizing on one or two sizes of lamps for local lighting and two sizes or three sizes of lamps for the general lighting the stock of lamps may be reduced. Dust should be wiped off of lamps every two weeks or at least every month, and in dusty locations it will pay to dust them every week. The efficiency of any lamp is reduced very materially by a small layer of dust.

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Lighting

The layout of a lighting system is so important that it should be done with great care so that the illumination will be uniform all over the room. The maintenance of many old lighting systems is so excessive that it is often much better to install a complete new system with all wiring in conduit and units properly spaced.

Lockers, Steel

The management of the plant owes it to every employee to give him a safe place to keep his clothes during working hours. The best solution of this problem is one or more convenient locker rooms with a fireproof steel locker for each man. The lockers should be well ventilated as the men's clothes are frequently oily.

Lubricants

The selection of the proper lubricant for each type of service is important and if necessary a lubricating engineer should be called in and his recommendations followed.

Machinery

A well equipped machine repair department is a paying investment. Space parts and bearings should be kept in stock for all important machines. In order to reduce the number of parts to be kept in stock, those for groups of similar machines only may be stocked if it is felt the investment bulks too large. There should be overhead cranes of some kind in the repair department in order to remove parts of machines during repairs.

Magnets, Lifting

On account of the heavy pull on the electric current all magnet control contacts must be carefully watched as no effort should be spared to make things safe for men working under the magnet.

Meters, Gas, Oil, Steam, Water

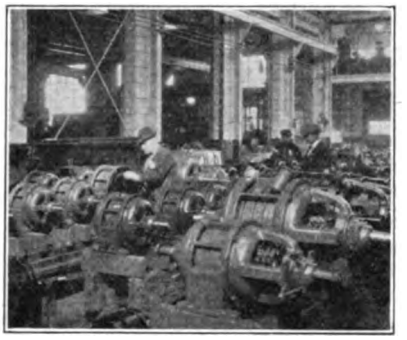
A bypass should be installed around all meters so that they may be taken out for repairs if necessary or to take a calibration test.



LIGHTING INSTALLATION

Motors

Motors should be blown out with compressed air every week. The windings should be inspected once a year and varnished if necessary. Motor bearings are very important and all babbitt or bronze bearings should be washed out once a week and refilled with fresh oil. Ball bearings should be repacked as often as necessary depending on the service. The tension of motor belts has a great deal to do with bearing troubles. Where it is possible to standardize on two or three sizes of motors throughout the plant it is well to have one of each size motor complete with a starter ready to rush into service when a breakdown occurs. However, with inspection to report dangerous overloads the breakdowns of motors should not occur often, especially if they are equipped with overload relays. A record should be kept of all motors to show when repairs and inspections have been made so that repairs may be anticipated.



ELECTRIC MOTORS

Oil Storage Systems

Underground or floor mounted tanks with pumps make an ideal method of storing and issuing oil. The old idea of oil barrels with spigots is wasteful and dangerous on account of the fire hazard.

Packing

Packing on flanged pipe joints must be renewed as necessary but with the high grade packings now available for every service the length of time between renewals has been greatly increased. Packing of valve stems throughout the plant should be taken care of regularly to prevent leaks from dropping down on goods, causing spoilage and rusting.

Painting

Painting is one of the most important jobs done by the maintenance men, and if the plant is large, one or more gangs of painters must keep going through the plant continually. Painting pays for itself in the long run, both from the standpoint of saving electricity by keeping interiors white and also by keeping exteriors from being deteriorated and rusted by rain and snow. A program of painting may be laid out ahead of time and in this way each building will receive its share of the work in turn. Steel sash must be thoroughly scraped clean, and given a priming coat if rusty, before painting. The members of this sash are so small that rust quickly eats them up unless they are kept well painted. For a permanent job on inside work the so-called mill white paints are now generally used as they stay white longer than the white lead and oil paint. Inside painting may be done by hand or by spray guns depending on the amount of work to be done and also on the nature of the work being manufactured in the room. If men can be temporarily moved out of a small portion of the department a couple of men with a spray gun can quickly paint that portion and keep moving through the department. Piping should be painted with distinguishing colors, according to a master chart so that workmen making repairs can easily find the correct pipe.

Partitions, Fireproof, Steel, Wire

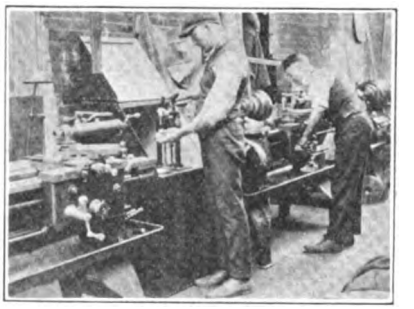
Fireproof tile partitions should be protected at door openings by steel angle irons so that in case of fire the door will close tight. This is especially important on sliding fireproof doors. Steel and wire partitions must be well braced on account of the small size of the sections. They must also be well fastened to the floor to resist jolts by trucks.

Piping, Gas, Heating, Oil, Sprinkler, Water

All heating mains should be covered to deliver hot steam to the farthest radiator, and cold water pipes should be covered if they are likely to drip on finished work in humid weather. All valves should be packed around the stem when the packing has been compressed tightly and still leaks. It is a good idea to repack steam valves every fall as the packing dries out. Sprinkler valves should be kept sealed to comply with insurance requirements. When piping is run overhead along the windows it should be kept far enough away from them to allow top windows to swing in when opening. This point is often overlooked. If pipes are supported on adjustable hangers they may be easily leveled up.

Plumbing Fixtures

All fixtures should be tile or porcelain enameled to be sure that they may be kept clean. The health of the men is largely influenced by the cleanliness of toilet rooms and the selection of sanitary fixtures is a long step toward real cleanliness. Simplicity and the reduction of the number of parts exposed to tampering is the aim of manufacturers of high grade equipment. Men should be allowed to wash in running water or in individual wash bowls in order to prevent the spread of disease.



MACHINE SHOP OIL SUPPLY

Portable Conveyors

Portable conveyors operating in the plant yard are exposed to the weather and motors and other driving parts

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should be protected from the weather. It is a good plan to have a tarpaulin to cover these parts when not in use. These conveyors should be frequently painted to prevent rusting and the electric cable should be kept reeled up when not in use.

Pulleys, Fibre, Steel, Wood

Steel pulleys have practically replaced all other types for line-shaft drives on account of their strength and lightness and ease of installation on account of being split in two parts. They require practically no maintenance. Fibre pulleys are used on motors, and are excellent for this service. Wooden pulleys are seldom used except on special jobs requiring a very wide belt or a very large pulley.

Pulverized Coal Equipment

This equipment consists of pulverizers, fans and blowers and dust collectors and is usually installed as a unit. The main things to take care of are bearings on account of the high speeds used.

Pumps, Fire

Fire pumps are idle for months and years, but they must be kept in good condition for that emergency that may come at any moment. They should be carefully inspected and operated at regular intervals to see that they are in good working order. If they are down in a pit the drainage of the pit should be watched.

Radiators, Steam and Water

Wall radiators should be hung on adjustable hangers so they may be lined up when they sag. The amount of heat given off by a radiator varies with the temperature of the steam or hot water entering it, and the temperature and velocity of the air passing it. There should be room enough back of wall radiators to allow thorough circulation to get best results. The distance in the clear between wall and radiator should be not less than two and a half inches. Hot water radiators must be larger than those required for steam because the temperature of the circulated hot water is much lower than steam.



SPRAY PAINTING

Reflectors, Lamp

Lamp reflectors should be chosen that will make the illumination on the working plane uniform, with mounting heights and spaces between lamps correctly figured. The steel reflectors with porcelain enamel finish are easily cleaned and retain their efficiency for a long time. Silvered glass reflectors are excellent where a concentrated light is required and for high mounted interior lighting where there is little chance of breakage. Reflectors should be cleaned once a month in ordinary use or twice a month in dusty locations. Where surrounding conditions are dry and comparatively free from dust, wiping with a damp cloth is usually sufficient. In damp atmospheres, or where oily deposits of grime are the rule, it pays to use some one of the modern cleaning compounds which will quickly dissolve such deposits. In the more extreme cases where reflectors become coated with deposits that defy ordinary cleaning methods, chemical solvents must be resorted to, and the intervals between cleanings should be shortened accordingly.

Rheostats

It is necessary to use a rheostat in starting up a direct current motor and unless the operator handles the rheostat carefully the contacts are likely to burn out. New spare parts should be kept in stock to be able to replace these burned contacts before they burn out.

Roads, Paving

The quick repair of a hole in a road will save a great deal of money in the long run. Roads get into bad condition during the winter largely on this account because repairs are delayed till spring. A supply of crushed stone should be on hand to make temporary repairs.

Roofing

Tar or asphalt and gravel roofs are largely used on flat roofs on industrial plants on account of their long wearing qualities. If repairs are necessary the new work should be carefully done with hot tar or asphalt in order to get a good bond between the old and new work.

Sanitation

The use of a good disinfectant in all locker rooms, wash rooms and toilet rooms is absolutely necessary to prevent spread of disease. Taking care of the health of the men in the plant is good business. A combination cleaning compound and disinfectant may also be used for all floor cleaning throughout the plant.

Sash Operating Devices

These should be oiled occasionally to make opening and closing easy and to prevent noise. The horizontal runs on monitors are in an out of the way location and therefore are likely to be neglected.

Scales

Scales must be accurate or they are useless. If there are a number of scales in the plant a regular inspection should be made every month, each one being checked with test weights and any found out of calibration should be quickly repaired.

Shafting

Shafting should be kept bright and covered with a thin film of oil to prevent rusting. A piece of emery cloth on a stick will remove rust if it has started and a coat of thin oil will prevent rusting again. Shafting should be carefully lined up every three or six months as there is a great loss of power with shafting out of line.

Shelving

The use of steel shelving allows the shelves and bins to be made larger or smaller to accommodate varying quantities of parts in stock. This is a great saving over wood shelving in the long run. Steel shelving has the added advantage of being easily taken apart and moved to another location. In a growing plant this is an important point in its favor.

Shutters

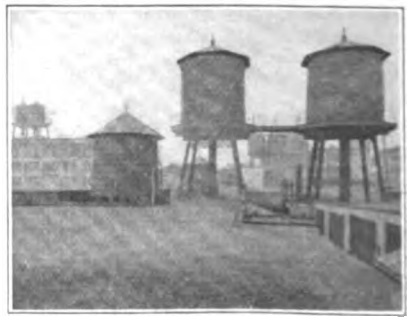
Steel shutters on doors and windows exposed to a fire hazard should be kept in good condition by frequent painting to prevent rust, and hinges and latches should work freely in order to have them shut tightly.

Skylights

It is a good plan to protect glass in skylights by a wire netting on a framework about a foot above the skylight. The glass should preferably be wire glass and held in place on the metal frames by clips and well caulked with a special non-hardening glazing compound. Skylights are exposed to rain and snow and the steel framework must be painted every year or two to prevent rusting.

Sprinkler Systems

Sprinkler systems should have two sources of supply in order to be effective if one source should fail. Outside tanks must be heated with steam coils to prevent freezing and any outside mains leading down from the tanks should be well insulated and preferably have a steam pipe alongside the main and inside the insulation. The temperature in sprinklered buildings should not be allowed to drop down below 40 degrees F. at night, as there is a danger of freezing. In buildings that are not heated a dry pipe sprinkler system must be used. In this system the pipes have air under pressure in them and when a head goes off it releases the pressure and operates the main water



FACTORY ROOF

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valve, which is located in a heated part of the building, allowing water to rush through the sprinkler pipes.

Stacks, Steel

Steel stacks must be painted with a special stack paint every two years to prevent rusting as they are self-supporting and rust would weaken them. Guy wires must be kept fairly tight to support the stack against the winds.

Stair Treads

Stair treads should be of a non-slip mixture to avoid accidents to the men. When they become smooth from long wear they should be replaced. They are usually held down by screws that fasten into inserts in the concrete stairs or by wood screws on old wooden stairs.

Standpipes

Standpipes should be located at strategic points and have a coil of fifty or a hundred feet of hose ready for instant use. A small amount of water at the start of a fire will save a great amount of damage.

Stepladders

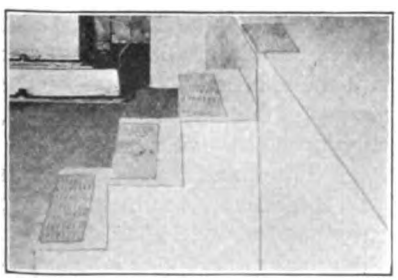
The stepladders used by the maintenance men should be sturdy and spread far enough at the bottom to be solid when a man is at the top. Any weak spots should be fixed immediately as men get careless when they are accustomed to working on ladders.

Stools

Stools made of steel resist the wear and tear much better than wooden ones. A department with similar work to be done should have one kind of stool that is best adapted to that work and standardize on it. In this way the efficiency of the workers will be raised.

Switches

There should be an emergency switch easily accessible to shut off each motor in a department in case of an accident. Every man should know where these switches are located.



STAIR TREADS

Tanks

Underground oil storage tanks may be in a concrete pit or set directly in the ground with a small pit over the piping outlet and manholes. In the case of pits the drainage should be looked after to see that it does not get clogged up. Tanks in pits will last longer as they may be painted as often as necessary whereas tanks in the ground begin rusting after a few years.

Toilet Room Floors and Partitions

Floors in all toilet rooms should be of concrete or tile with a gradual slope to a central drain so that they may be washed down with a hose. Tile walls are ideal as they too may be washed down with a hose. The partitions between toilets should be of steel to prevent vermin from lodging in them. They should be about a foot above the floor to make cleaning easy.

Track, Industrial

Track should be kept lined up so that cars will not tip off. The switch points and turntables require special attention to keep them in good order to eliminate accidents and delays. Where roads or walks cross the tracks the level of the road should be kept level with the top of the track and proper clearance maintained at the side of the rail for car wheel flanges.

Tractors and Trailers

Electric storage battery tractors are widely used for towing trailers through the plant and yards. Trailers should be designed to track immediately behind the tractor so that short turns may be made. Trailer bodies should be designed especially for the particular service so that maintenance will be reduced to a minimum. The batteries in the tractors should be charged each night at a central charging outfit.

Trucks, Electric and Elevating

Electric trucks with the elevating platforms are probably the most used type of handling equipment. The platforms should be rugged, either wood with steel frames or of pressed steel throughout and they should be of a standard size so that they may be used either with hand or electric elevating trucks. Operators should be cautioned not to overload an electric truck as they are so likely to do to save a trip, as constant overloading shortens the life of a truck. Rubber tires should be replaced when they get badly worn or chewed up as constant pounding on uneven tires damages the truck and the goods on it. The labor saving possible with lift trucks and platforms, compared with single trucks, is enormous where there is a great deal of hauling to be done. Electric trucks should be charged each night.

Vacuum Cleaning

Portable electric-driven vacuum cleaners may be used with good results for cleaning ceilings, walls and floors and also for removing dust from out of the way places on machinery. If the dust is a fire hazard it should be removed regularly.

Ventilators

Natural draft ventilators require occasional oiling if they swing with the wind, and all types should be regularly painted to prevent rusting as they are exposed to the weather on the outside and often to wet vapors on the inside.

Waterproofing

Concrete buildings that allow moisture to seep through should be waterproofed on the outside to prevent dampness and its annoying discomfort to the men and also to prevent ruining the interior paint. Floors of all basements should be waterproofed when they are laid and given surface treatments if they show slight dampness.

Welders, Electric

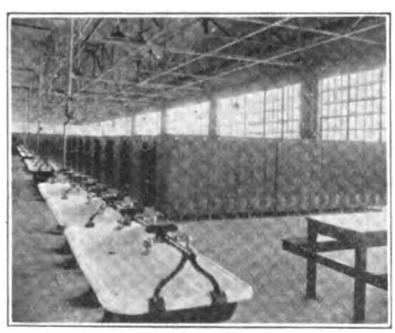
These electric welders pull such a heavy current that they should have a separate feed line to prevent fluctuations from interfering with other motors and lights.

Wire, Electric

Electric wires and cables should be inclosed in conduits throughout the plant in order to prevent damage to the insulation and as a precaution against fire. Only the best quality of insulation should be used on important feeders as the expense of a breakdown for a few hours will more than pay for the best insulation obtainable. Junction boxes should be installed at every turn so that wires may be pulled through straight runs.

Wood Block Flooring

Wood block flooring is extensively used in shops having heavy trucking or where large castings are handled, on account of the fact that wood blocks do not injure the finished surface of heavy pieces of castings. Maintenance of these floors is easy because worn spots may be removed and new blocks inserted. One type of this flooring has blocks fastened to a strip of wood which is easily laid over old floors or new.



WASH ROOM AND LOCKERS

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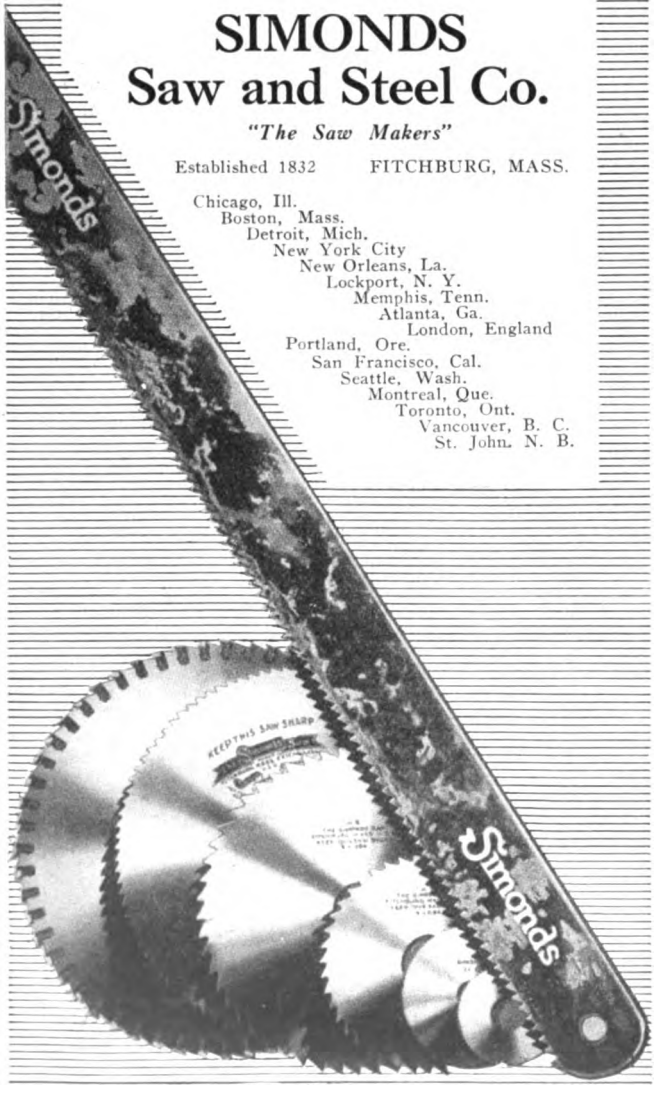
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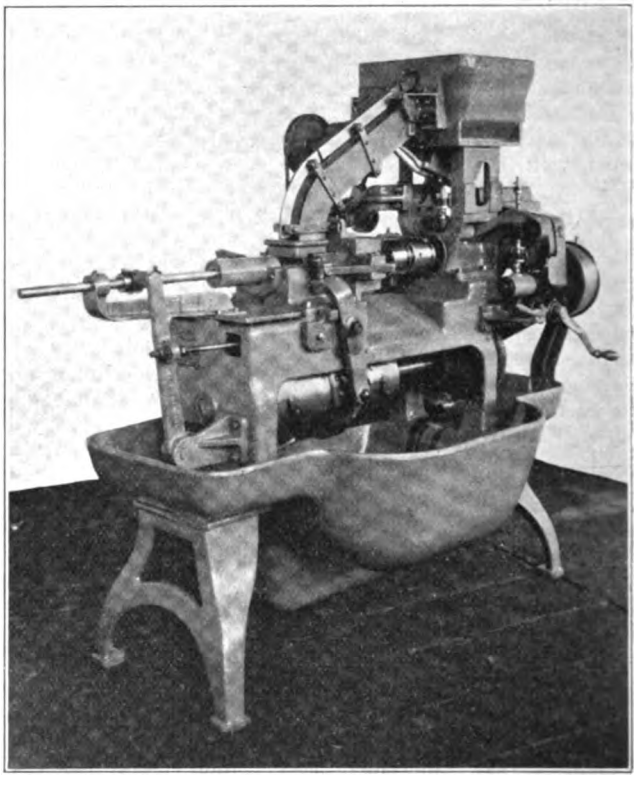
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An Automatic Cap Screw and Bolt Threading Machine

THE KENT MACHINE COMPANY has recently placed on the market a Cap Screw and Bolt Threading Machine, in two sizes. This threading machine may be adapted to the threading of cap screws or the threading of machine or special bolts. It is entirely automatic in its action and is adjustable to accommodate a range of sizes within the capacity of the machine.

The hopper feed is so designed that the only change needed for different sizes is the agitating plate in the center of the hopper and the required number of these plates is furnished with each machine. These are readily attached and detached and the change from one to the other is a matter of only a few minutes' time. The delivery chute from the hopper to the machine proper is adjustable within the range of the machine. When the machine is used for threading cap screws the chute from



the hopper delivers the cap screw blank to a carrier from which it is transferred to holding jaws for the threading operation. The cap screw is held by the head of the blank and an internal trip on the die head regulates the length of thread on the screw. When threading bolts the action of feeding is very similar to that of the cap screw just described, with the exception that the bolt is held in the clamping jaws by the shank of the bolt, thereby insuring a thread concentric with the shank.

The Kent Automatic Cap Screw and Bolt Threader is built in two sizes arranged respectively for handling cap screws up to ½" in diameter and above ½" in diameter. The smaller machine is designed to accommodate screws 3¼" under the head and will thread the body of the screw a length of 2½" and the larger machine will thread screws 4" under the head and will cut a thread 2½" in length.

The machine is belt driven, with countershaft. One belt only is used for driving purposes.

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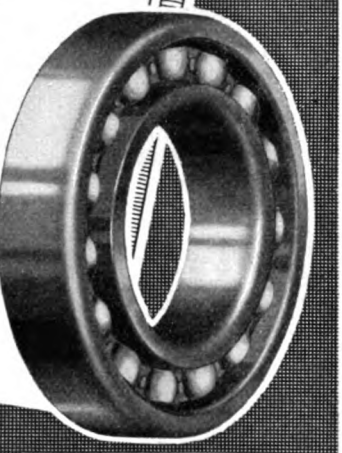
Outsell Because They Excel

NEW DEPARTURE BALL BEARINGS are a product of superior excellence, developed by special steels, processes and controlled by exclusive devices. Persistence in the pursuit of quality has brought as a reward an unexampled demand from the leaders in American industry. Growth has brought greatly increased responsibility for the maintenance of high standards as well as unusual facilities for research and continued improvement.

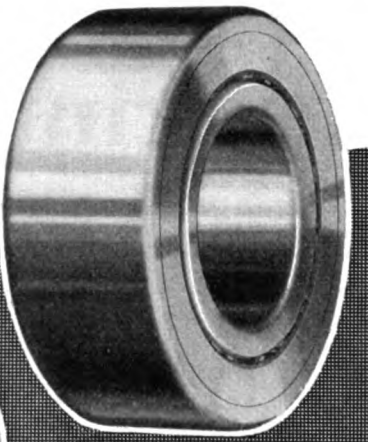
There is a New Departure type for every need. Engineering service—as excellent and dependable as the New Departure product—is yours for the asking.

The New Departure Mfg. Co.

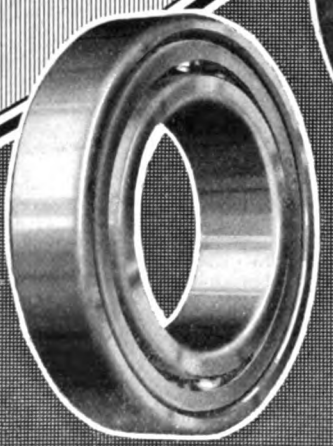
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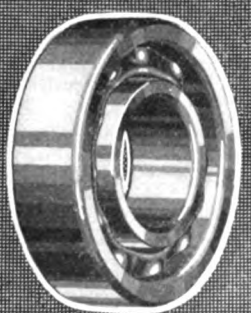
SINGLE ROW TYPE
The acme of perfection in a precision high duty radial load ball bearing. When so recommended by our Engineers, may take thrusts up to 20 per cent. of its rated radial capacity.



DOUBLE ROW TYPE
The famous "triple duty" ball bearing, resisting radial loads and thrust from any direction. Has two rows of balls and ball raceways with opposed angular lines of contact. Unit construction. Non-adjustable.



RADAX TYPE
A high quality, high duty, non-separable radial and single-direction thrust load carrier, by means of angular contact of balls and races.

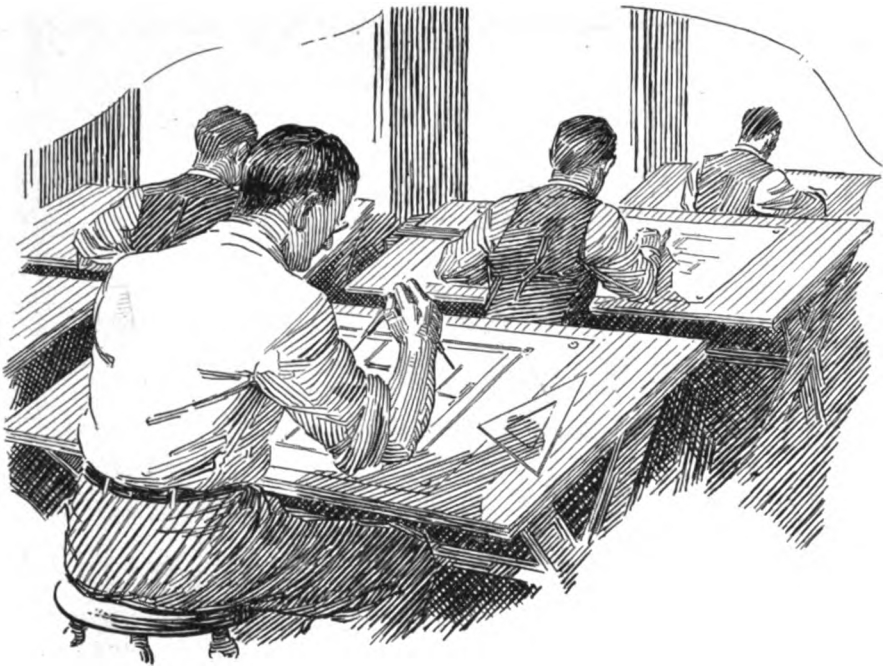


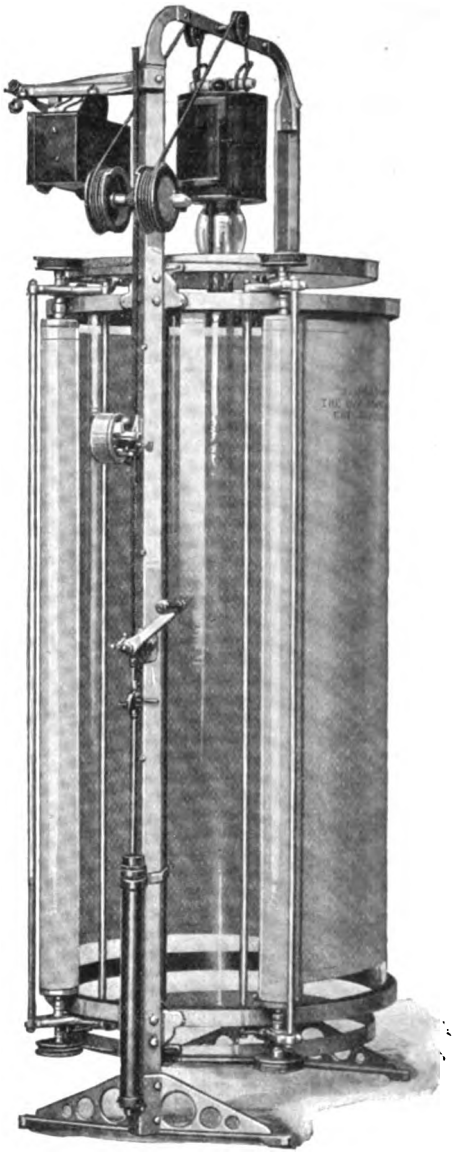
MAGNETO TYPE
A separable type, precision ball bearing for use in small electric devices. Commercially silent. Perfect interchangeability of parts.

New Departure Quality Ball Bearings

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Why Not Make Your Own Blue Prints?

In Many Instances Savings of as Much as 50c on Every $1.00 Have Been Made

Do you realize that you can cut your blue print bill considerably and save yourself a great deal of time by installing your own blue printing equipment? It doesn't make any difference if you use but a small quantity of blue prints a month, a Pease-Vertical Blue Printing Machine will save you time and money. In fact, many plants find they can cut their blue-print costs right in half.

Convenient—Quick—Economical

You can install a Pease-Vertical Blue Printing Machine in one corner of your drafting room for it requires less space than the ordinary desk. It is never in the way, does not interfere with the regular work of the department, nor are there any expensive installation charges.

With a Pease-Vertical, you can get finished prints—each one clear and permanent—within 4 minutes after the tracing is completed. There is no time lost in sending the tracing out, no delivery promises that are not fulfilled, no chance for errors for the work is under your control at all times.

Why continue to put up with delays in getting prints when it is so easy to produce them in your own plant at substantial savings?

Let Us Send the Facts No Obligation

You are under no obligation whatsoever in asking for detailed information about the Pease-Vertical Blue Printing Machine. We shall be glad to show you how you can cut your blue print bill as scores of other plants have done. Just ask for the facts. They will be sent immediately.

Here is a machine that will turn out perfect blue prints regardless of weather condition at a faster rate of speed than is possible with any other equipment of its type. Don't fail to investigate this machine.

Free Catalog Gives Complete Data

Write at once for a copy of our new Catalog M-28, giving full information about the Pease-Vertical Blue Printing Machine as well as other types of Pease Blue Printing Machines.

We are confident we can save you money and time. Get the facts.

THE C. F. PEASE COMPANY

Largest Manufacturers of Blue Printing Machinery in the World

828 N. Franklin St., Chicago

PEASE

BLUE PRINTING MACHINERY

"Let Blue Prints Tell Your Story

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Your Profits Depend on the Invisible Workers

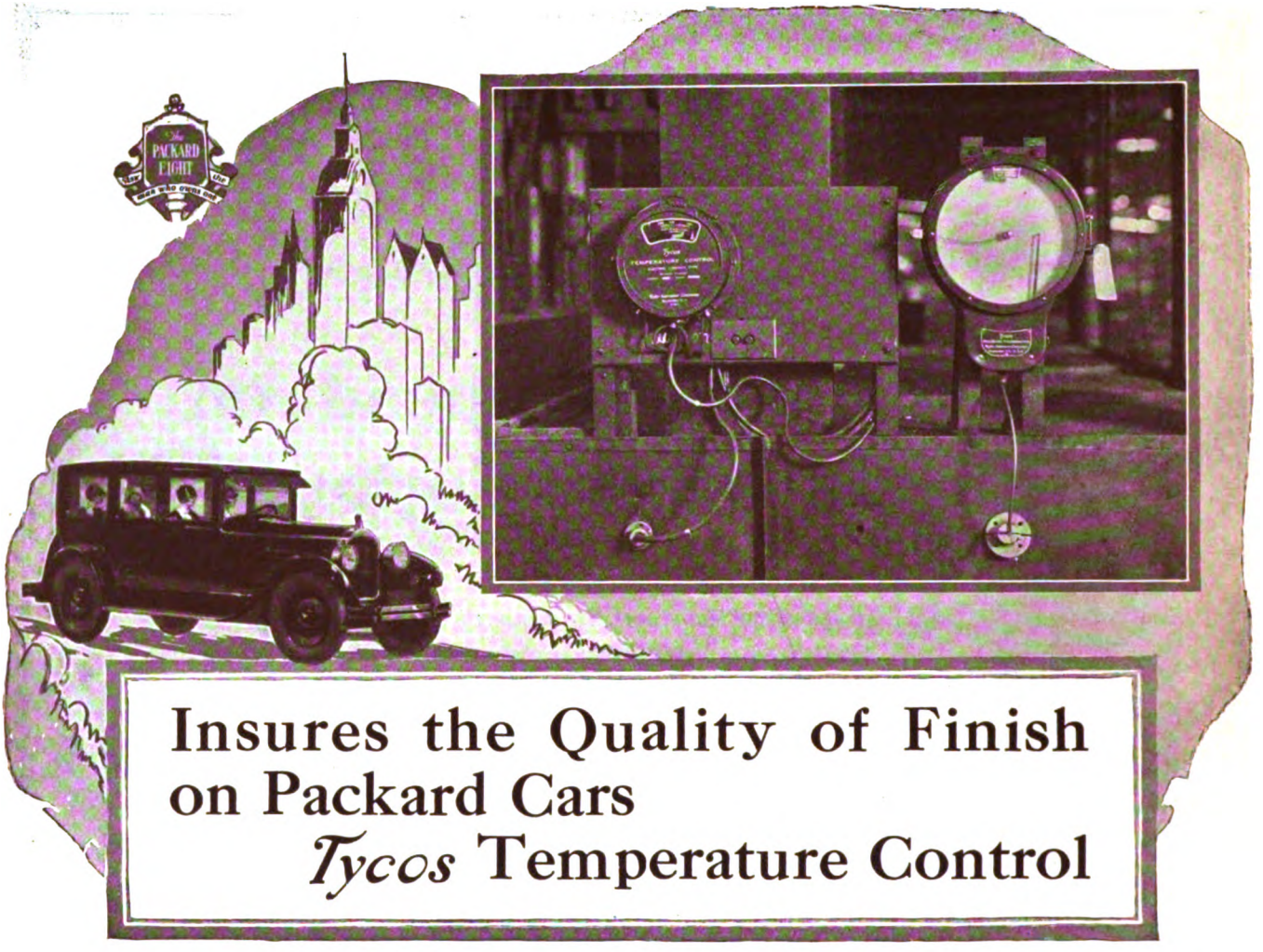
EACH wage earner in American industry is provided with three and three-quarters horsepower with which to do his work. This average figure is obtained from the latest industrial census. It gives each wage earner the equivalent of a gang of fifty-six men working under him, at his direction.

Thus if you have a plant employing 100 men, with average power facilities, you have one hundred visible men at work, but in addition you have the equivalent, in physical effort, of 5800 invisible workers.

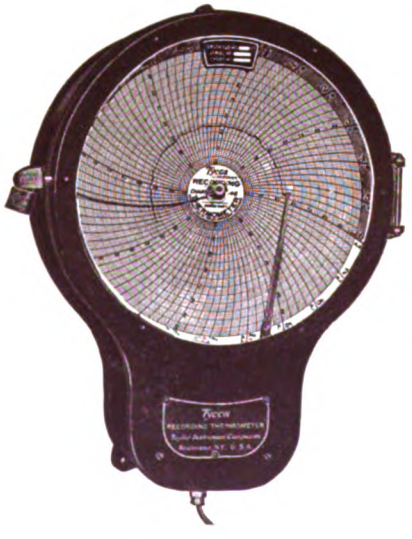
Your profit and production are not made by the few visible workers, but by the vast invisible power army that they direct.

How to increase this invisible army, how to keep it from idleness and to conserve its efforts—for your profit—is shown in the following pages.

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Insures the Quality of Finish on Packard Cars *Tycos* Temperature Control



From chassis to the final finish, every part on a Packard is as near perfect as human engineering ability and modern machinery can make it. And the exceptional care taken in every step of the manufacture has resulted in the Packard performance and the Packard reputation.

We feel quite proud that *Tycos* Instruments have a part in insuring the high quality of finish that goes into Packard Cars. In all finishing ovens temperatures are checked with *Tycos* Recording Thermometers.

Says E. R. McPherson, Engineer Construction and Maintenance Department, Packard Motor Car Company, Detroit;

"Dependable *Taylor* instruments are helping produce the Packard quality finish. We are using *Tycos* recording thermometers in the deoxodine cleaning room, where the bodies are prepared for varnishing; the finishing preheat rooms; the color varnish room, and the floco room, where the final coat of varnish is applied.

"Other *Tycos* recording thermometers control the chasis oven, where the frames are baked after being enameled; and also the cylinder block enamel ovens. Thus *Tycos* are controlling very vital steps in our processes enabling us to hold temperatures within narrow limits day in and day out.

"Our various finishing processes require different temperatures ranging from 90° to 300°F. By the use of the recording thermometers we have a check on oven operation at all times, and also a check on each lot of finished work.

"As a result of this close supervision, more care is exercised by the workers, and a better, more uniform finish is assured."

Tycos engineering service is at your disposal to study the particular needs of your industry. May we send you a booklet describing some of the special apparatus made for your business?

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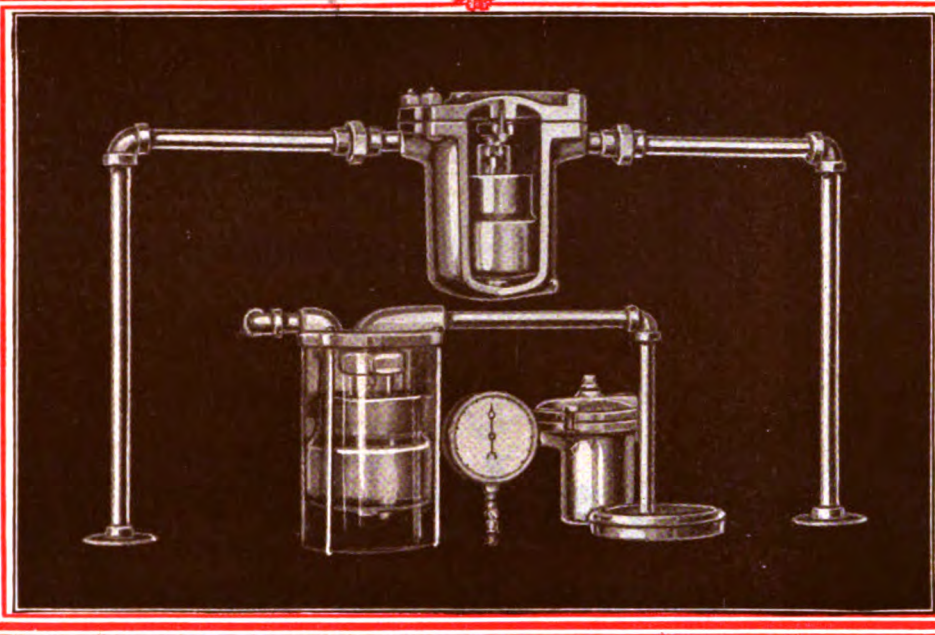
Tycos Temperature Instruments

INDICATING · RECORDING · CONTROLLING

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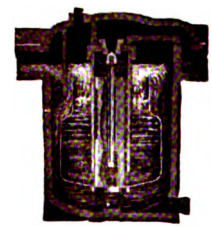
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ILLINOIS
HEATING SYSTEMS



See This Glass Model in Operation
at the Power Show—Booth 232-233

A FEATURE attraction—a glass model of the three-quarter inch No. 35 Eclipse Steam Trap—operating under actual working conditions. It will illustrate the remarkable snap action—the instantaneous opening and closing of the valve. It will also demonstrate the extreme separation of valve and seat when open, whereby wire drawing, scoring and cutting is eliminated. There will also be on display a complete line of Steam and Vapor Specialties.

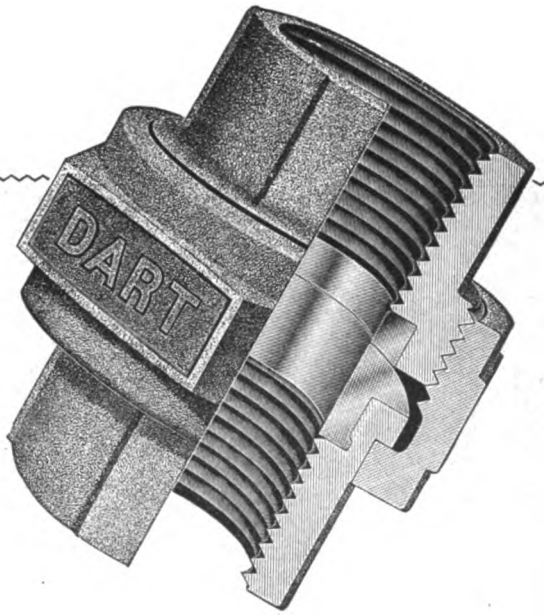


Write for Bulletin 320

Be sure to visit us and get acquainted with this remarkable trap.

REPRESENTATIVES IN 40 CITIES OF U.S.A.
ILLINOIS ENGINEERING COMPANY
ROBT. L. GIFFORD President INCORPORATED 1900
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The Dart Guarantee Protects You

Any Dart Union that leaks as a result of defective material or workmanship will be replaced free of charge by TWO DART UNIONS of the same size.

Dart Unions Stay Tight

The Fairbanks Service

for Lower Steam Costs—

Modern methods in your production should be followed through with higher power plant efficiency which means the elimination of a great deal of maintenance, repair and replacement of unions and valves on steam lines.

The nearest Fairbanks office is ready to show the way to steam conservation.

Dart Unions stay tight. Bronze to bronze seating surfaces are ground together into an absolute tight seating ball and socket joint. Bronze cannot corrode or rust—therefore, tight joints are positively assured. And, for the same reason, Dart Unions last indefinitely and are used over and over again when steam lines are replaced.

With the Fairbanks Renewable Iron Body Gate Valves, new seat rings and other replacement of parts are made by one man, (formerly two men required with old-fashioned valves) and without taking the valves from the line.

Write the nearest Fairbanks office for complete valve catalog—showing all types we manufacture.



Fig. 01

Bronze Globe and Angle Valves



Fig. 0302



Fig. 0310



Fig. 0313

Fairbanks Renewable Iron Body Gate Valves

The Fairbanks Company

New York, N. Y.

Dealers in All Principal Cities

Fairbanks

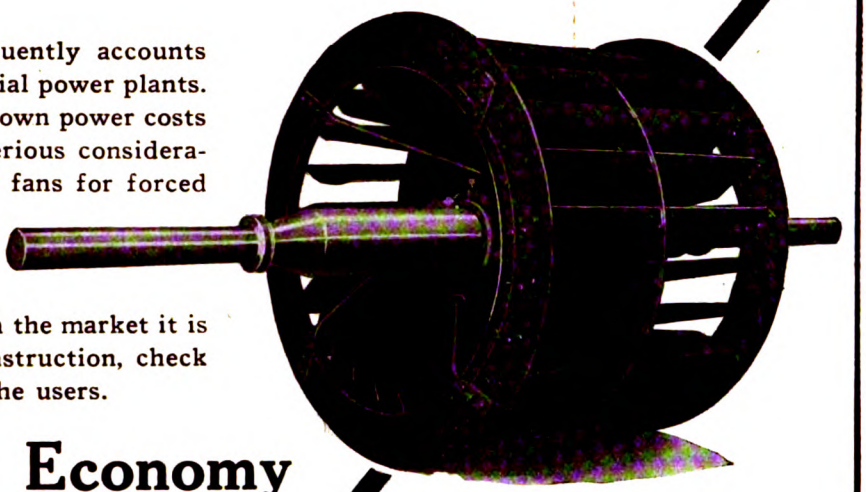
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More horsepower per lb. of coal

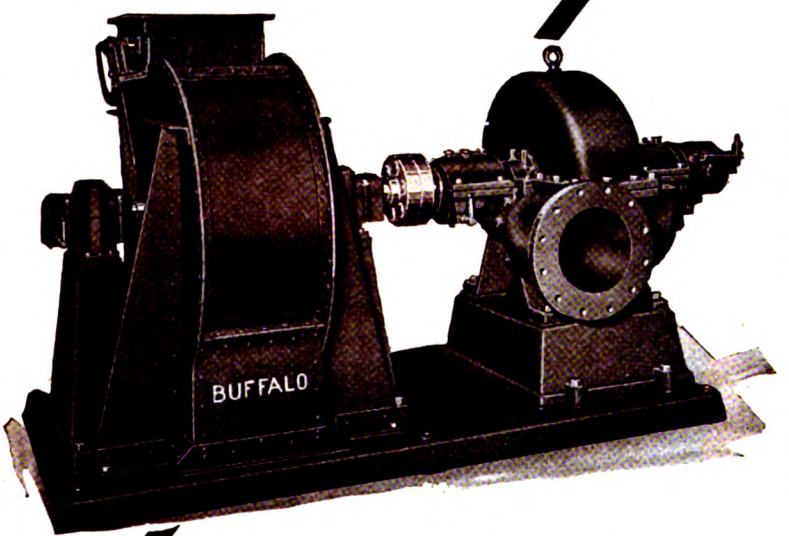
The right draft equipment frequently accounts for the fine records made by industrial power plants. Those executives who believe their own power costs are high can well afford to give serious consideration to the selection of the proper fans for forced and induced draft.

In order to judge the relative merits of the various makes of mechanical draft equipment now on the market it is only necessary to compare the construction, check up the performance, and look up the users.



Efficiency and Economy

Buffalo fans for forced or induced draft are noted for efficiency and economy in operation and maintenance. Housings, wheels, bearings, couplings —the complete fan, in fact, is built to stand the most severe service. This combined with the advanced design of Buffalo fans, is responsible for their wide use by the large industrial concerns and public service companies.



See this equipment at the Power Show Space 73-

We are exhibiting part of the complete Buffalo line of power plant equipment at the New York Power Show, December 6th to 11th. Be sure to visit Space 73 and examine this equipment for yourself. Even a casual inspection will prove interesting.

Ask for Catalog 730

This describes Buffalo Mechanical Draft Apparatus in full and gives much data of value to the engineer. Your copy is ready—ask for it.

BUFFALO FORGE COMPANY

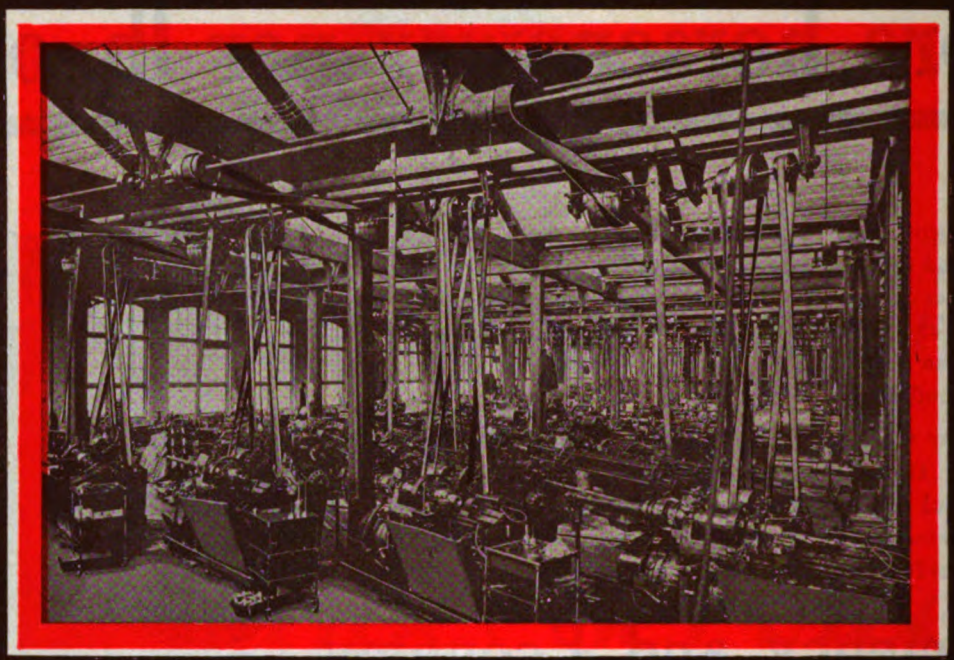
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In Canada—Canadian Blower & Forge Co., Ltd. Kitchener, Ont.

"Buffalo"

Mechanical Draft Apparatus

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The executive knows that more dollar for dollar value is possible if he looks for the name of the manufacturer, and satisfies himself that long years of service are back of that name.



DUXBAK BELTING
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For real value in BELTING see that

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Watch for the Trademark 10 Years from Today

There is no variation in Duxbak Belting. If you buy a Duxbak Belt today you can duplicate it 10 years from today in thickness, weight and tannage—just because of the trademark.

Every Duxbak Belt costs less because it lasts so much longer. Duxbak Belting carries an unconditional guarantee of good service.

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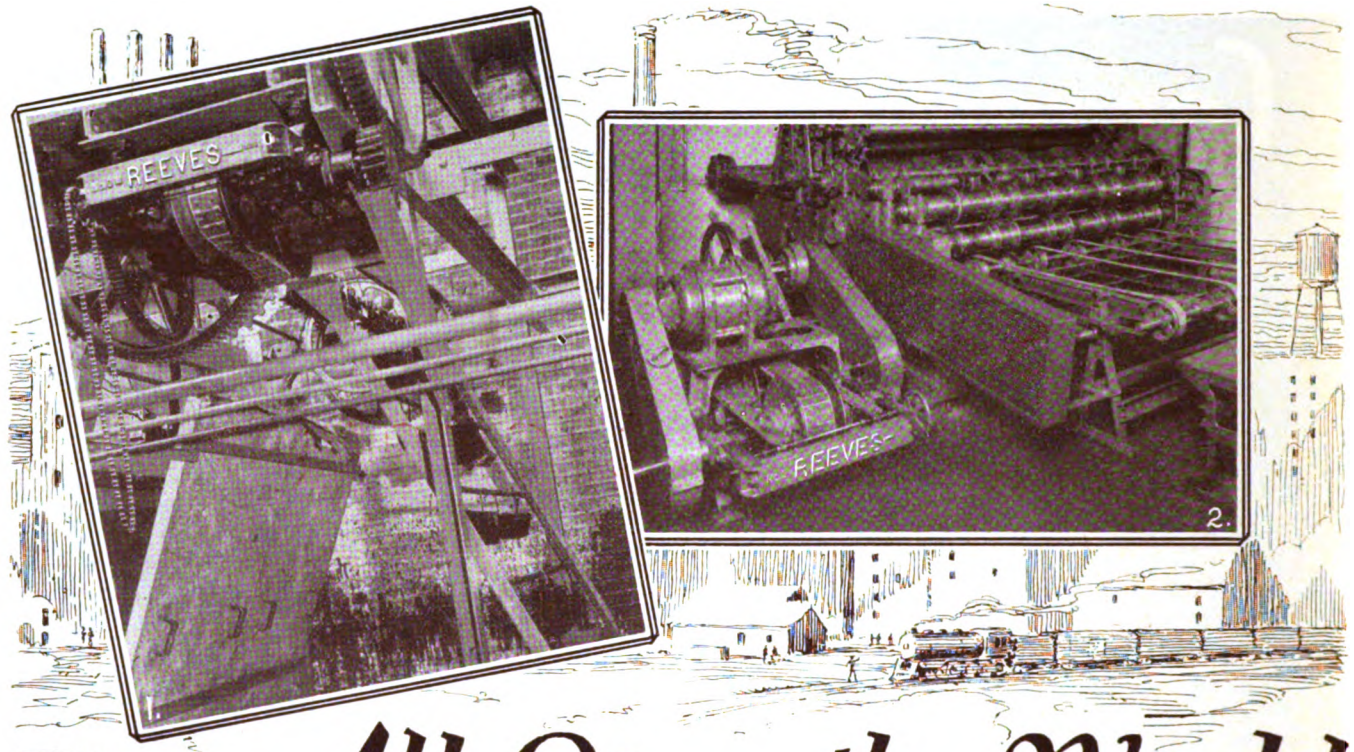
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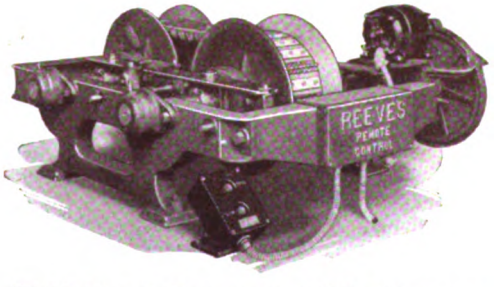
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All Over the World the Vital Necessity

No. 1 The REEVES driving a continuous paint conveyor at the Stephens-Adamson Mfg. Company, Aurora, Illinois.

No. 2 A REEVES-controlled Printer and Slotter manufactured by the F. X. Hooper Company, Glenarm, Maryland.



PUSH a button marked "Fast," or one marked "Slow," and get *instantly* the exact speed you need on any machine! The REEVES Electrical Remote Control puts speed flexibility *right at your fingertips*—enables you to get *any* speed at *any* time on *any* machine from *any* place in your plant. Simple, positive, "fool-proof"—a control which will last as long as the REEVES Transmission itself.

MODERN production methods will not tolerate make-shifts in variable speed control. Speed control is too important—too *vital!* Speed control devices that give just a few *steps* in speed are too limited. For efficient results, you must be able to get *any* speed between fastest and slowest, even to the smallest fraction of a revolution.

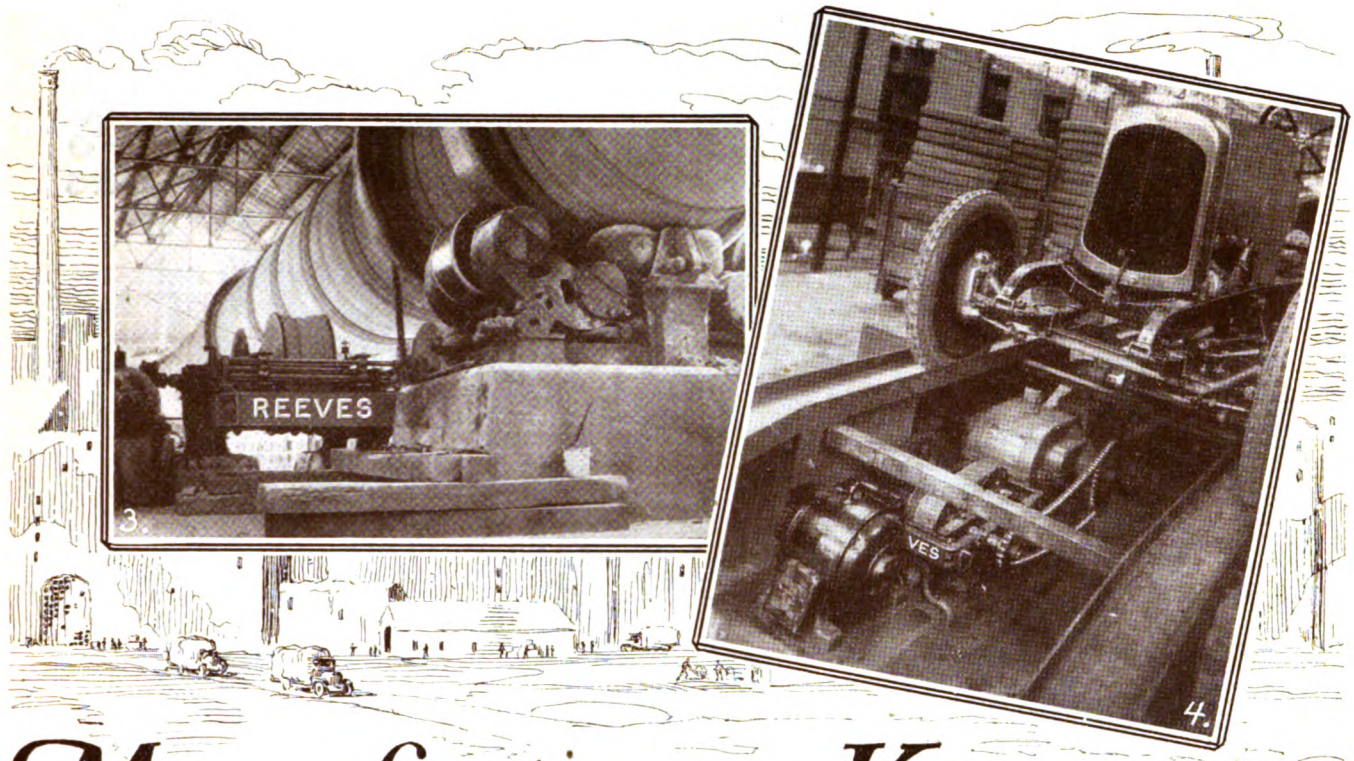
In *your* industry, the need for speed flexibility has been definitely established. It has been translated into dollars and cents. It has been definitely proved that speed flexibility cuts down production costs, reduces material handling expense, speeds up production, and often improves the quality of the product manufactured.

The REEVES Transmission represents the *only* method which gives the *vital* flexibility that modern production demands. During the past ten years, almost 40,000 REEVES Transmissions have been installed in industrial plants throughout the world. The list

—INDUSTRY COMES TO REEVES

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Manufacturers Know for Speed Flexibility!

of enthusiastic REEVES users includes well-known manufacturers in almost every industry.

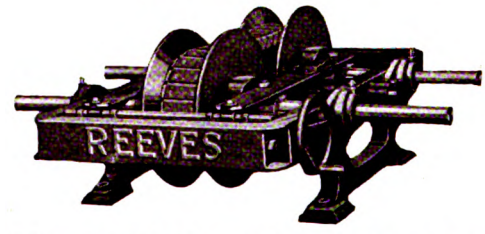
Look about you in your plant. Think of the machines and conveyors that would be more efficient and more productive if they were absolutely *flexible*. Think how much more useful they would be if you could run them at *any* speed you desired. Our new catalog L-66 will show you the REEVES applications in your industry—the names of your fellow manufacturers who use the REEVES—and the actual figures which make speed flexibility *absolutely VITAL*. Send for it today.

REEVES PULLEY COMPANY
Established 1887
Columbus, Indiana

REEVES
Variable Speed Transmission

No.3 The REEVES driving a lime kiln at the Standard Lime & Stone Company of Millville, West Virginia.

No.4 The REEVES giving speed flexibility to an assembly conveyor of the Citroen Automobile Company in Paris, France.



THE REEVES Transmission is a simple, compact, mechanical device which receives power at a constant speed and delivers it at any speed desired to any machine, conveyor or group. It will maintain one set speed indefinitely, or may be changed instantly to *any* speed desired. It is easy to install—runs equally well when mounted on the floor, wall, or ceiling. Or, it may be incorporated as a part of the machine you wish it to regulate. Inexpensive, but it is accurate and dependable, always.

FOR ACCURATE SPEED CONTROL—

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The most practical way to reduce your belting cost is to buy belting that will give you the most efficient service per dollar invested. "You will find this quality in COCHECO BELTING," say its users everywhere.

COCHECO BELTING is the last word in efficiency and durability, a combination of finest leather and expert workmanship—backed by eighty years of experience in belt making.

Let us tell you more about it. We shall be glad to receive your inquiries.

I. B. WILLIAMS & SONS

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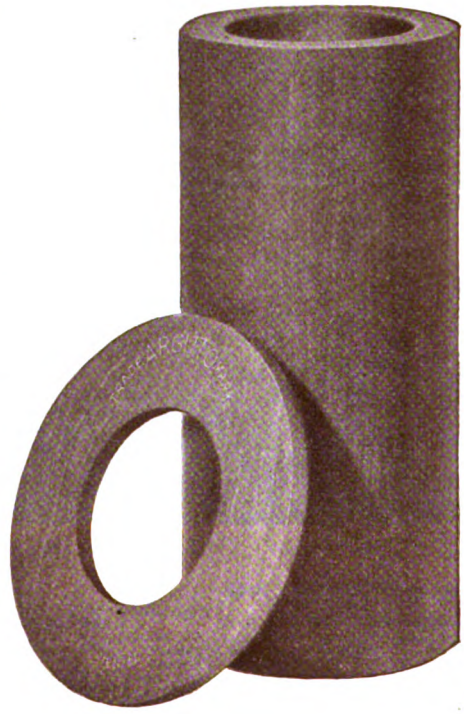


Arguto Goes "Dry"

THE big question before the house today, gentlemen, is—"Shall we put up with expensive metallic bearings that lap up our oil by the gallon and then fail us at the first lack of attention, or shall we rid ourselves of this nuisance for once and for all by installing Arguto—the bearing that goes 20 years without a drop of oil or a moment's attention?"

On this particular question I expect a unanimous vote for the leader of the "drys."

Your request will bring complete information on this remarkable non-metallic bearing.

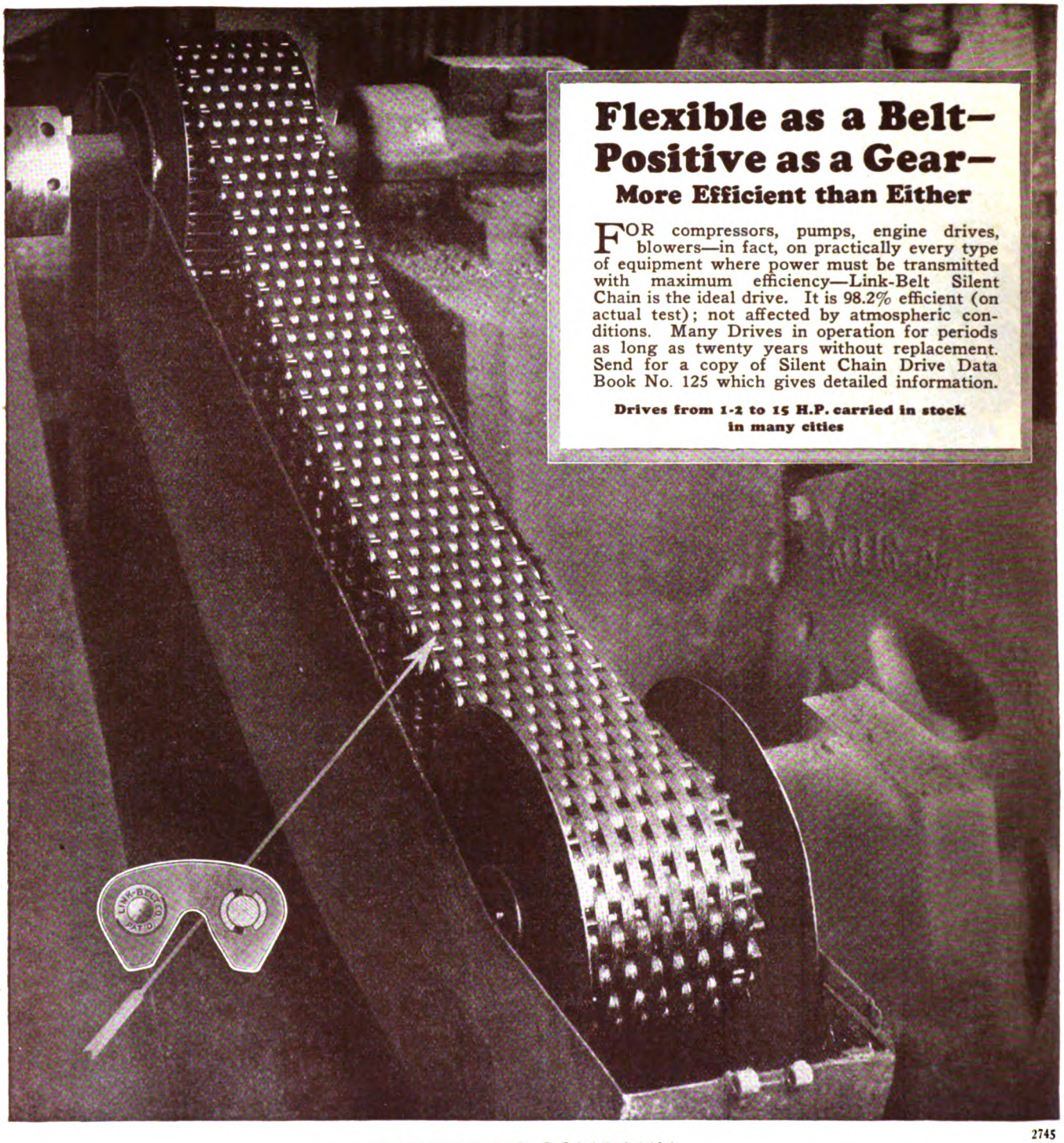


Arguto Oilless Bearing Co.
Wayne Junction, Philadelphia, Pa.

Arguto OILLESS BEARINGS

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More Efficient than Either

FOR compressors, pumps, engine drives, blowers—in fact, on practically every type of equipment where power must be transmitted with maximum efficiency—Link-Belt Silent Chain is the ideal drive. It is 98.2% efficient (on actual test); not affected by atmospheric conditions. Many Drives in operation for periods as long as twenty years without replacement. Send for a copy of Silent Chain Drive Data Book No. 125 which gives detailed information.

Drives from 1-2 to 15 H.P. carried in stock in many cities

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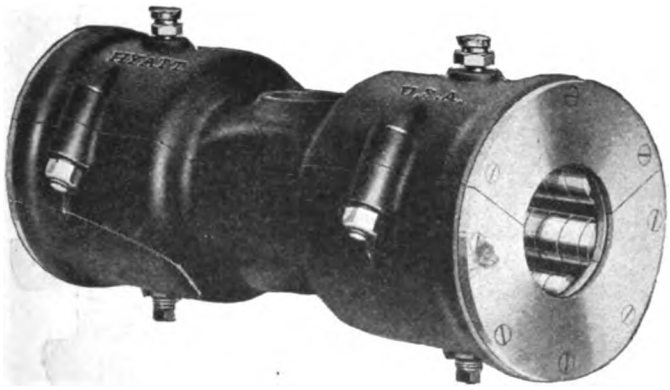
LINK-BELT

Efficient Silent Chain Drives

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Hyatt Line Shaft Bearings save 15% of your total power bill



The new narrow center Hyatt Line Shaft Bearings fits all hangers, size for size.

A CHANGE over to Hyatt Line Shaft Bearings will literally add capacity to your plant—without increasing the horsepower of your drive.

It is an investment that will pay for itself the first year or two, cutting time, labor and replacement costs to the bone. Thousands of Hyatts have brought a substantial return, consistently, for twenty and even thirty years.

The true rolling motion of the Hyatt bearing conveys full power quietly into production. It is a constant protection against friction and wear.

Hyatt Roller Bearings can be installed without tearing down shafting, pulleys or hangers. The bearings, and their boxes, are furnished split so they can be placed around the shafts and bolted securely together in a few minutes' time.

There is a mill supply dealer near you who sells Hyatt Line Shaft Bearings. Let us tell you who he is, if you don't know.

HYATT ROLLER BEARING COMPANY
NEWARK, NEW JERSEY
Pacific Coast Address: Oakland, Cal.

Extracts of letters received from satisfied Hyatt users:

"Hyatt bearings in our line shaft reduced the friction load at least 50 per cent. and possibly 60 per cent. These bearings have been in continual use for 20 years . . . and have never cost us one dollar since they were installed."

"It requires 20 per cent. less power to pull our lint room with these bearings."

"We found that the Hyatt bearings paid for themselves in between six and seven months' time."

"We are still getting the same fine service from our Hyatt bearings that we have been getting for the last 25 years."

"The cost of maintenance has been practically nothing."

"We have never lost a minute due to failure of any of our Hyatt bearings."

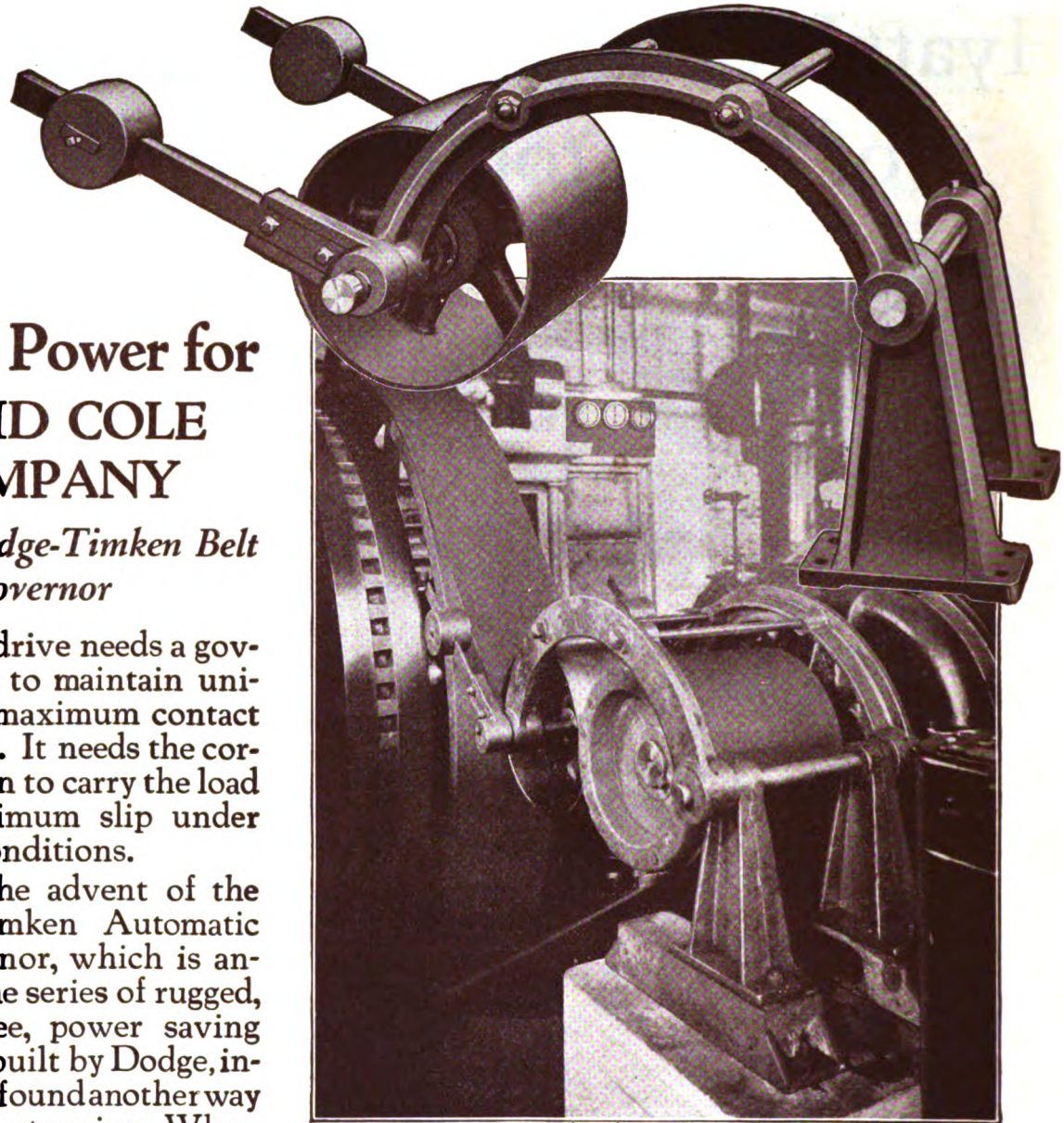
"—have been in use about 27 years."

"The Hyatt Line Shaft Bearings reduced the power needed from 22 HP to 16 HP. We expect to install Hyatt Roller Bearings all through our factory."

HYATT
ROLLER BEARINGS

USE GROUP DRIVE AND SAVE POWER

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Saving Power for DAVID COLE COMPANY

With a Dodge-Timken Belt Governor

A BELT drive needs a governor to maintain uniform and maximum contact on pulleys. It needs the correct tension to carry the load with minimum slip under varying conditions.

With the advent of the Dodge-Timken Automatic Belt governor, which is another of the series of rugged, trouble-free, power saving products, built by Dodge, industry has found another way to effect great savings. Wherever it is in use it is substantiating every claim for it.

Its application to all industry has been exceedingly successful. Above, is an illustration showing it in operation in the David Cole Co., Omaha, Neb. The Dodge-Timken Belt Governor can be applied to horizontal, angle or vertical drives. It is equipped with Timken Tapered Roller Bearings, which are designed for high-speeds, heavy loads, continous operation and severe service.

Our special bulletin, giving full particulars regarding this new Dodge-Timken development, will be sent on request.

Where Industry Is Dodge Serves

Fifteen District Sales offices located in Chicago, Milwaukee, Minneapolis, Cleveland, Cincinnati, Oneida, Boston, Philadelphia, New York, Newark, Atlanta, St. Louis, Houston, San Francisco and Portland cooperate with 500 leading mill supply and machinery dealers in making Dodge service immediately available to you.

DODGE TIMKEN

DODGE MANUFACTURING CORPORATION, Mishawaka, Indiana

Power Transmission—Material Handling—Special Machinery

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Don't fight line shaft friction with



OIL



or POWER

or LABOR



fight it with SKAYEF



SELF-ALIGNING BALL BEARING HANGERS

THE average Skayef Self-Aligning Ball Bearing Hanger installation pays for itself in less than two years' time. If you would like to secure facts concerning a typical Skayef installation, gathered by an unbiased group of research engineers in your own industry or one that is closely related to it, write today.

SKF

MARKED

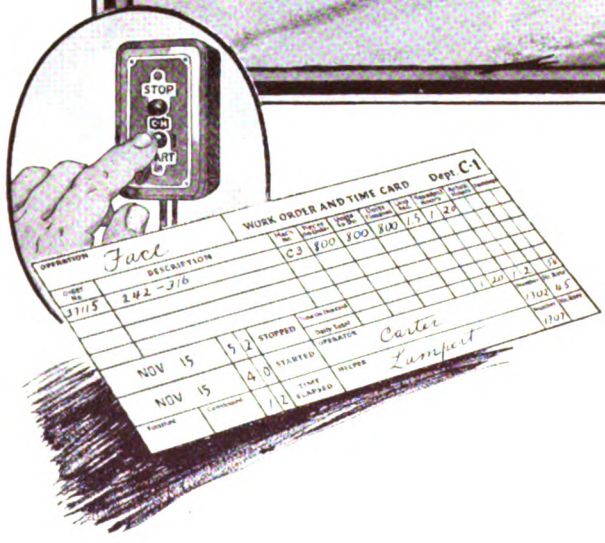
Self-Aligning HANGERS *Ball-Bearing*

1673

SKF INDUSTRIES, INCORPORATED ~ 165 BROADWAY ~ NEW YORK CITY

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The principal problem of industry today lies in the elimination of wasted time. Eliminate the confusion, the wasted steps of obsolete motor control! Modern control takes its savings out of labor cost, the major item of manufacturing expense.

The trend of industry is decidedly toward Cutler-Hammer Push Button Control. The button is placed right at the operator's hand—the controller itself in any safe, convenient location. Saves time, affords better control and provides greater safety—a logical step in advance.

CUTLER

Industrial Efficiency

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Somebody must discover this in YOUR plant!

MORE than ever before in the history of America's industries, the major problem today lies in the cost of labor.

It is not a problem confined to large plants. It is not a problem alone for the small manufacturer. Nor is it the problem of any certain industry or group of industries. It is the vital problem of *every* manufacturer under the competitive conditions that exist for all.

Economists agree that wages must be maintained for the prosperity America now enjoys. The improved standard of living which has resulted from higher wages has been responsible in the main for the greater sale of every manufactured product.

The success of your plant hinges on the return you are able to obtain from this increased investment in labor—it hinges on the elimination of wasted time in production.

Have you received your copy of "Industry's Electrical Progress?" It points the way to many worth while economies through the use of correct motor control. You will be interested. Write for a copy today.



Conditions today demand careful consideration of correct motor control

Many executives make the mistake of believing their plant at maximum efficiency when they can say it is completely *motorized.* True, electric power with its flexibility, its ease of control, has brought a new standard of operating economy.

But motors by themselves are only brute force. The savings in labor that result—these savings that add so materially to industrial profits—come through the proper application of motors. They come through the effectiveness of correct motor control.

Look now for the wasted time in your plant! Are you burdening your men with obsolete equipment? Unless someone has been in constant touch with the rapid progress made in motor control, your plant is almost certain to have lagged behind.

Engineers with more than thirty years experience to point out the savings possible

Many executives are making this check on their production efficiency by having the Cutler-Hammer engineers point out the equipment in their plant where modern motor control will save in labor costs.

Put the control of your motors at the hand of the operator where no time is lost. Eliminate the confusion, the wasted steps of obsolete equipment. Somebody must discover this in *your* plant. Why not call in these engineers today? They will counsel with your plant men or consulting engineers without charge—and the control equipment they recommend quickly pays for itself.

The CUTLER-HAMMER Mfg. Co.
Pioneer Manufacturers of Electric Control Apparatus
1265 St. Paul Ave.
MILWAUKEE, WIS.

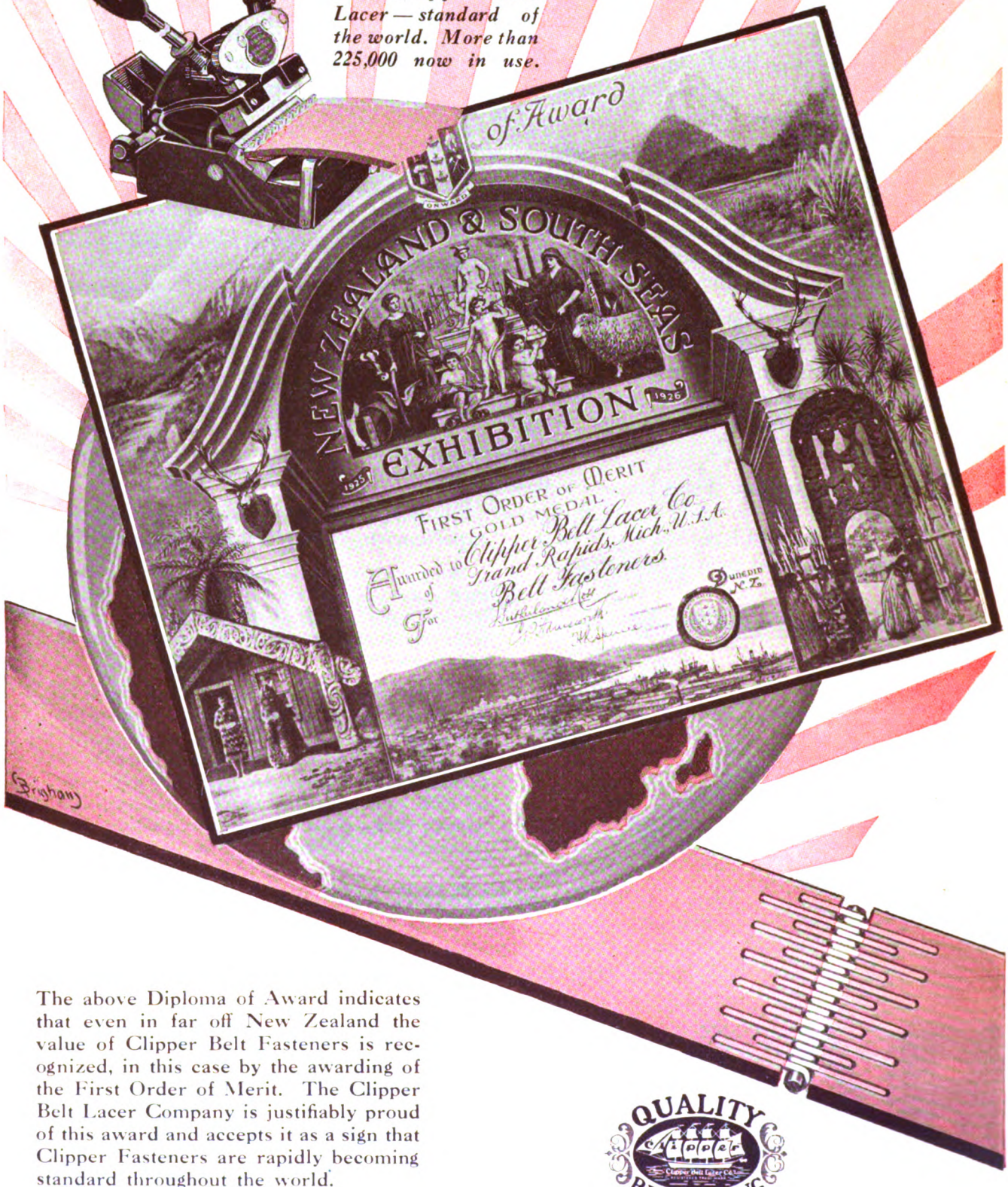
HAMMER

Depends on Electrical Control

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Clipper Knows

The Clipper Belt Lacer — standard of the world. More than 225,000 now in use.



The above Diploma of Award indicates that even in far off New Zealand the value of Clipper Belt Fasteners is recognized, in this case by the awarding of the First Order of Merit. The Clipper Belt Lacer Company is justifiably proud of this award and accepts it as a sign that Clipper Fasteners are rapidly becoming standard throughout the world.

QUALITY
Clipper
BELT LACING

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No Boundaries!

IT is not surprising that the Gold Medal Award of the New Zealand and South Seas Exhibition has been awarded to the Clipper Belt Lacer Company. The widespread acceptance of *Clipper Belt Fasteners* as standard belt connections, not only in North and South America but in Europe and Asia, should have a noticeable effect upon the decisions of practically all foreign countries.

Since one-third of the enormous daily production of *4,000,000 Clipper Belt Hooks* is exported to foreign lands it is evident that *Clipper* enjoys an international reputation.

WHY CLIPPER PRODUCTS ARE SO WIDELY USED

Clipper products are sold at a low margin of profit and at prices that meet foreign competition even in foreign countries.

Clipper Hooks are mechanically perfect and are made of the best fatigue-resisting steel.

Clipper Pins are the best we know how to make.

Clipper Hooks have a staggered double grip.

Clipper Belt Lacers are the most efficient lacers for use with *Clipper Hooks*. Material and workmanship fully guaranteed.

Standardize on Clipper Products

Clipper Belt Lacer Company

GRAND RAPIDS MICHIGAN



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Insist on



VENTURAFIN

Trade Mark

METHOD OF UNIT HEATING

THE revolutionary method of proved dependability that **forces** heat—as much as you want—where you want it—cheaper to buy—cheaper to install—cheaper to maintain—with five times the efficiency of ordinary heating methods.

AMERICAN BLOWER COMPANY, DETROIT, MICH.
BRANCH OFFICES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONT.

(575)

American Blower

"Sirocco" VENTILATING, HEATING, AIR CONDITIONING, DRYING, MECHANICAL DRAFT

MANUFACTURERS OF ALL TYPES OF AIR HANDLING EQUIPMENT SINCE 1881

✓ HEAT WITH UNIT HEATERS

Ask your heating contractor for prices—if he does not handle the Venturafin Method of Heating, write us for one who does.

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The Big Problem of Modern Management

NO one can read this issue of Industry Illustrated without realizing that the big task of management lies in the intelligent direction of power driven machinery.

Power, alone, is powerless. To be of any use to mankind it must exert its tremendous energy through machinery.

Power alone is powerless. Combined with improved machinery it forms the means of unlimited accomplishment. But the machine is essential.

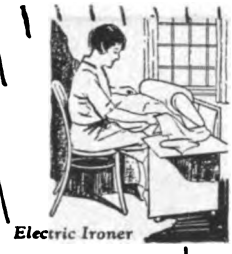
Horsepower, in American industry, is growing twice as fast as is manpower. And every bit of this additional power is being put to work through improved machinery. This proves the recognition, by management, of the profit making power of improved machinery.

This fact should also prove to management the importance of giving great attention to the quality and capabilities of the small tools and equipment which are essentially "hand" operated. Industry must continue to use files, hand taps, hacksaws, hammers, vises, etc. But to keep pace with the insistent demand for increased output, these indispensables must be chosen with care and used with knowledge.

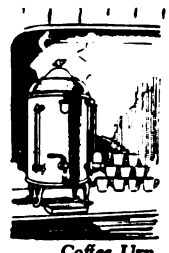
On the following pages will be found many valuable profit building possibilities in the form of improved machinery and equipment and small tools.

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Pipe Threader


Electric Ironer


Meat Grinder


Coffee Urn


Power Plane

50 Different Motors *for* 50 Special Jobs

In the 12 years that it has served industry with fractional horsepower motors, The Domestic Electric Company has developed half a hundred special motors for as many different applications.

Among them is not a single experiment; not a motor has been sold on the basis of what it *ought* to do rather than what it *will* do. Every model was specially designed to perform exactly the work it is now performing, and to serve better than any other type or modification of type could serve.

Instead of trying to adapt industries to a line of electric motors, we have engineered motors into industries—developing new motor applications, improving old applications, modifying and fitting existing types to the fields they were to serve.

The accompanying illustrations show a few of the many fields in which Domestic Electric fractional horsepower motors have become widely popular. In all these applications the universal motor drive is used, and in every case Domestic standards of design and manufacture have effected new economies of operation and raised the efficiency of motor-driven appliances.

This service deserves the consideration of any manufacturer who employs motor-driven production devices in his own manufacturing—drills, hammers, grinders, buffers, saws, etc.—or motors in the manufacture of appliances that his organization sells. A brief inquiry will place the time of a Domestic engineer at your disposal in your own plant without obligation to you.

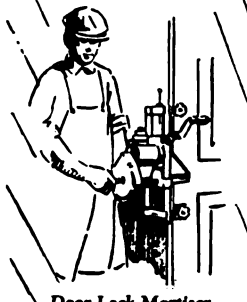
THE DOMESTIC ELECTRIC COMPANY
7209-25 ST. CLAIR AVE. CLEVELAND, OHIO
Manufacturers of fractional horsepower motors exclusively (80)

Domestic Electric Motors


Electric Ironer


Floor Polisher


Lawn Mower

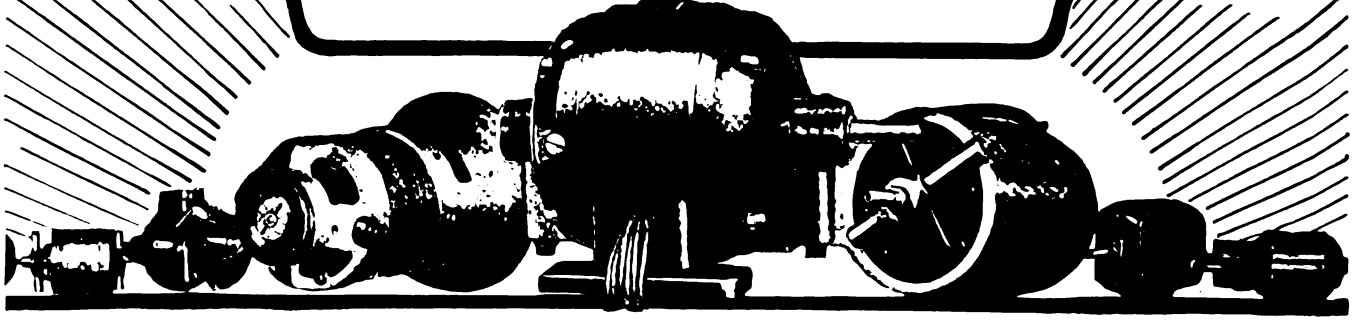

Door Lock Mortiser


Router or Shaper


Ventilating Fan


Siren


Sprayer



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Give the Men Good Tools- *for* Greater Production



POWER alone cannot be turned directly into production. It must be harnessed and directed by men into useful work.

That is where good tools and improved machinery have their influence, turning available power into the greatest amount of work in the most efficient manner. It is imperative, therefore, that management choose small tools and machinery with great care if more production is to be had.

The high quality of Brown & Sharpe Small Tools, Cutters and Machine Tools offers an unequalled aid to manufacturers in high production with precision.

The Brown & Sharpe No. 30 Catalog is a buying guide for quality equipment. You should have a copy for reference purposes. If your dealer cannot furnish a copy, write us direct. Send also for Catalog No. 138 which lists the complete line of Brown & Sharpe Products.

BROWN & SHARPE

BROWN & SHARPE MFG. CO. PROVIDENCE, R. I., U. S. A.

MANUFACTURERS *of* MODERN MACHINE TOOLS—CUTTERS *and* SMALL TOOLS

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keep ~ Production at its Best

EVERY Day

YOU CAN keep production at its peak EVERY day with the U. S. Heavy Duty 4 Ball Bearing Adjustable Speed Grinder. This is because the wheels can be held to a constant peripheral speed of 5,500 feet per minute regardless of the decrease in wheel diameter caused by wear.

Besides, this exclusive U. S. adjustable speed feature enables you to wear 24-inch wheels *down to 10 inches.* This alone makes a saving in wheel costs that soon pays for the grinder.

Many other features that keep production at its best are incorporated in this grinder—features that have kept the U.S.in the lead since the first electric grinder (a U. S.) was built a quarter century ago. Get all the details now.

WRITE FOR CATALOG "E"

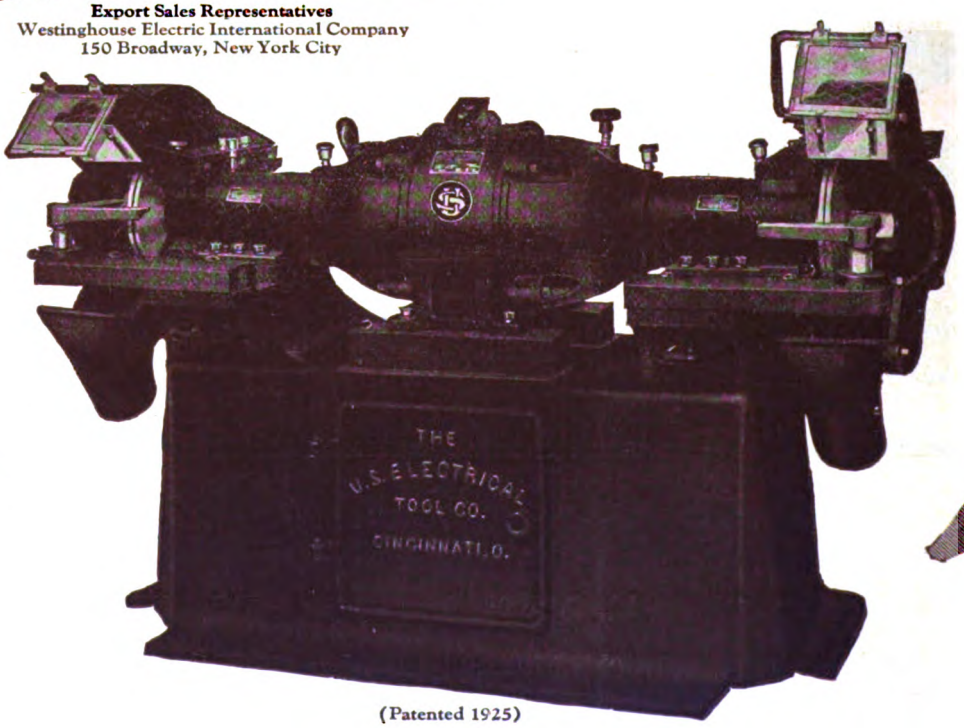
The United States Electrical Tool Co.

CINCINNATI, OHIO, U.S.A.

U.S. Portable Electric Drills Grinders–Polishers

OTHER U. S. features include powerful, continuous A. C. or D. C. motor, 40 degree centigrade rating, with momentary overload capacity of 100%—4 heavy duty SKF Ball Bearings (in dust-proof enclosures)—exhaust connections on wheel guards—unbreakable glass eye shields—positive shaft locking device for holding shaft while replacing wheels—remote control on A. C. grinders assuring motor protection under all conditions—vibrationless. ***Made for 110 and 220 volt D. C.—220, 440, and 550 volt, 2 or 3 phase A. C.—5 to 15 H. P.***

Export Sales Representatives
Westinghouse Electric International Company
150 Broadway, New York City





Made by Oldest Builders of Electric Drills and Grinders in the World

(Patented 1925)

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IN YOUR TOOL ROOM

Accuracy or inaccuracy in the tool room is multiplied a thousand fold in production.

Here is where precision tools have a value out of all proportion to their cost. Here your tolerance limits are set and maintained. The tool room, of all places, should be equipped with Dumore grinders—built to be used with all kinds of machine tools and to finish metal surfaces to exact dimensions.

Six styles, all vibrationless, cover all requirements for fine external and internal grinding, at prices ranging from $50 to $180.

Let us send you our new exchange offer and a Dumore Tap Drill Chart, free.

Mail the coupon.



Wisconsin Electric Company,
70 Sixteenth St., Racine, Wis.

Please send me, free of charge, one of your Tap Drill Charts. Catalogue of Dumore Grinders, and details of your new exchange offer.

NAME.....

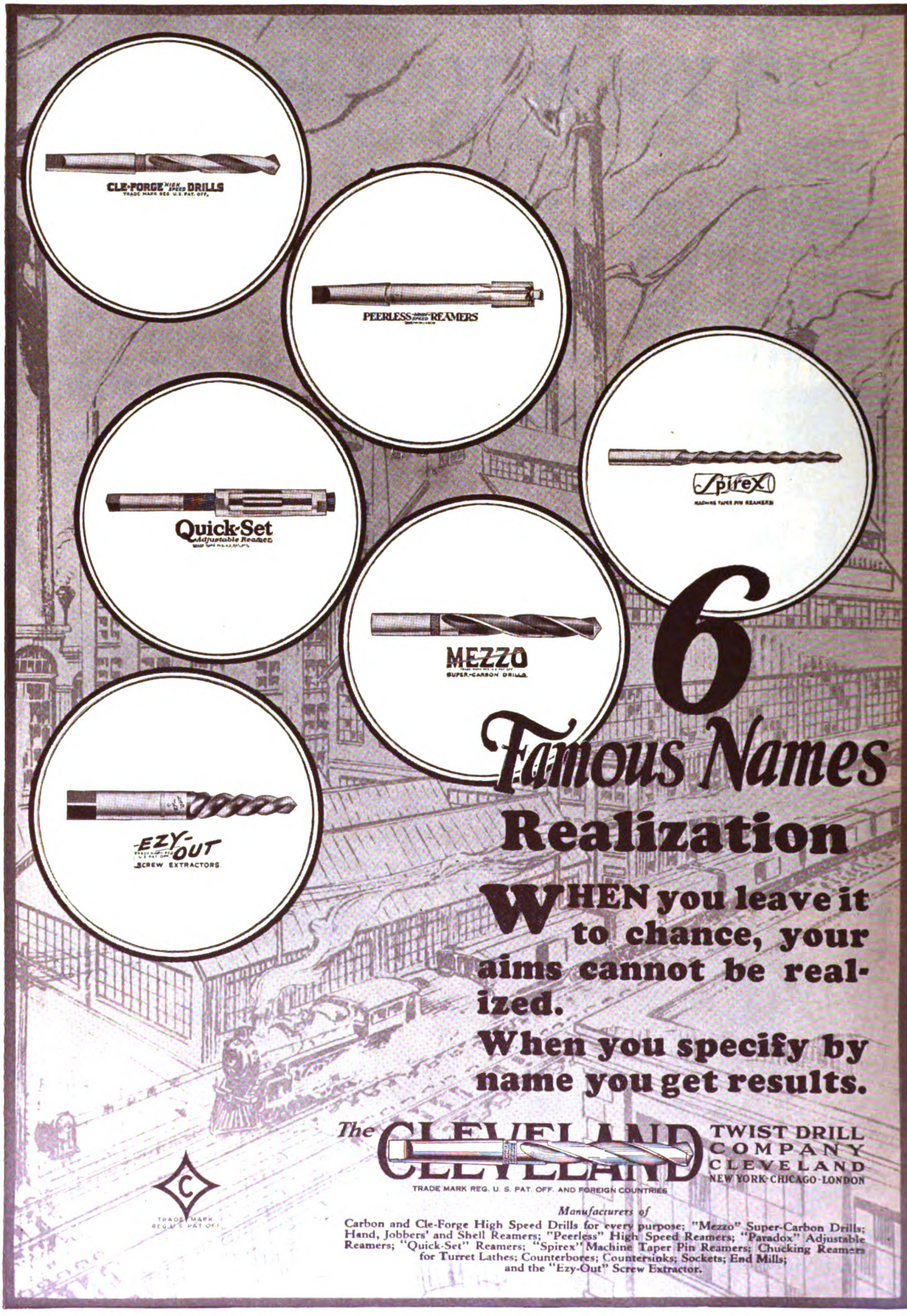
ADDRESS.....

City..... STATE.....

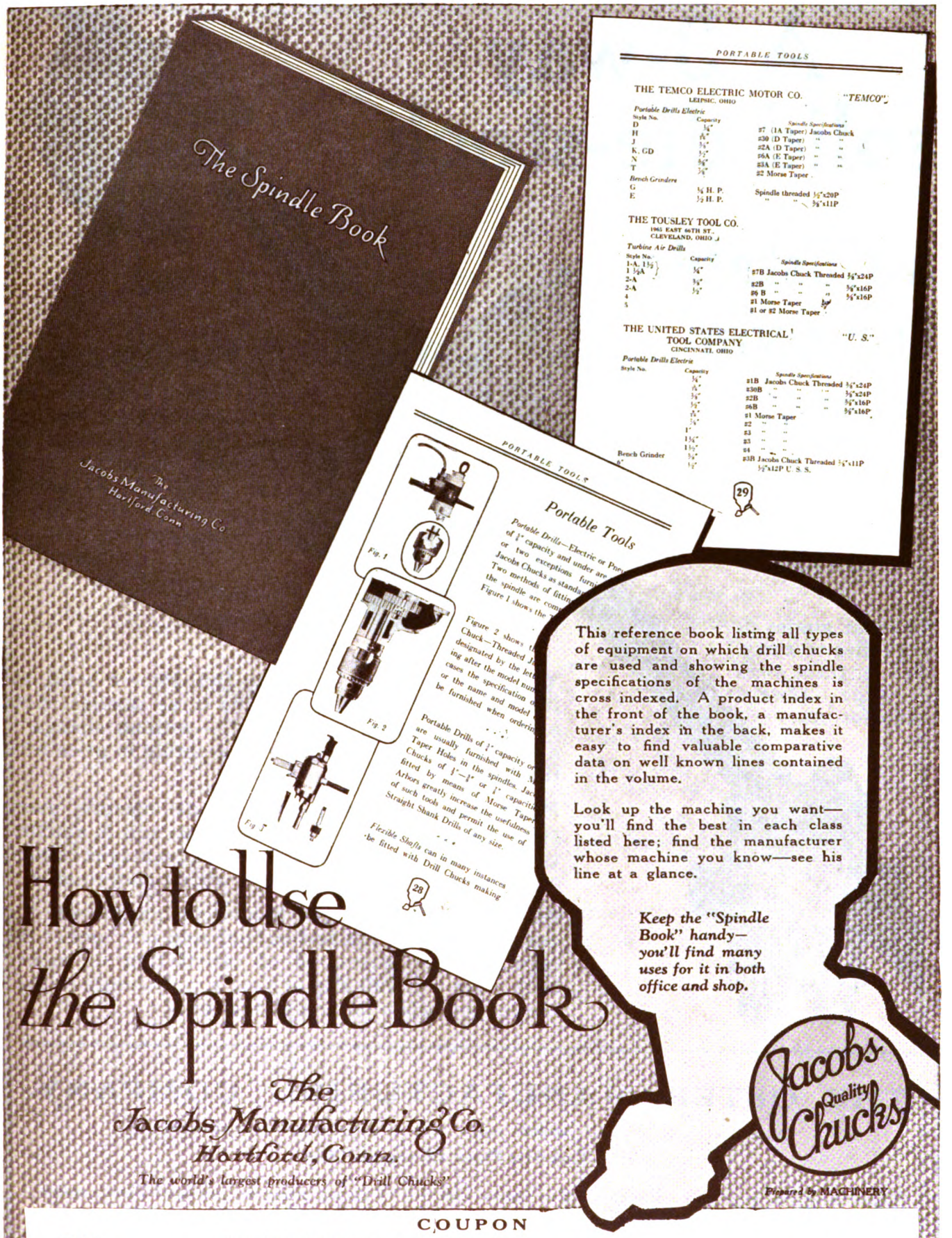
Wisconsin Electric Company, 70 Sixteenth St., Racine, Wis.

L. H. HAMILTON, Pres. **CHESTER H. BEACH, Vice-Pres.**

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How to Use the Spindle Book

This reference book listing all types of equipment on which drill chucks are used and showing the spindle specifications of the machines is cross indexed. A product index in the front of the book, a manufacturer's index in the back, makes it easy to find valuable comparative data on well known lines contained in the volume.

Look up the machine you want—you'll find the best in each class listed here; find the manufacturer whose machine you know—see his line at a glance.

Keep the "Spindle Book" handy—you'll find many uses for it in both office and shop.

The Jacobs Manufacturing Co.
Hartford, Conn.
The world's largest producers of "Drill Chucks"

Jacobs Quality Chucks

Prepared by MACHINERY

COUPON

Fill in
Cut Out
And Mail

THE JACOBS MFG. CO., Hartford, Conn.
Please send me a copy of your New Spindle Book.
Name .....
Street ..... City .....
Firm ..... Position .....

ILL-11-26

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A 3-way solid die-stock

adjustable for over and under size



No loose guides or extra dies to carry. Dies for three sizes of pipe always ready for use.

The OSTER BULL PUP

The handiest and most compact of any tool of its kind on the market. Combines all the advantages of the adjustable die stock with the "fool - proofness" of the solid die.

You'll be strong for the 3-way Bull Pup—a solid, adjustable die stock threading the three smallest sizes —3/8, 1/2 and 3/4 or 1/2, 3/4 and 1"—without change of dies or guides, and comparing favorably in price with the ordinary one-size die stock.

Made also in a handy 1-way model meeting every threading requirement at lesser cost, and in ratchet-type—the only tool combining the advantages of solid construction, adjustability and ratchet convenience.

All parts of all three models interchangeable with the one exception of the bodies, and sold only under the regular Oster guarantee of satisfaction or money back. See the Bull Pup at your supply house or mail the coupon below for complete details.

THE OSTER MANUFACTURING COMPANY

Manufacturers of the most complete line of pipe threading equipment in the world.

2103 East 61st Place, Cleveland, Ohio

Please send me your fully illustrated descriptive List No. 57 giving attractive prices and full explanation of these easier cutting pipe tools.

Name..... *Street*.....

City..... *State*.....

For products not advertised in this issue write Industry Illustrated

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Keeping Our 495,000,000 Workers on the Job

THERE are approximately nine million wage earners at work today in American industry.

There are approximately thirty-three million horsepower at work today in American industry.

These thirty-three million horsepower are equivalent, in energy, to four hundred and ninety-five million manpower.

All of this mechanical and electrical power is put to work through machinery of one kind or another.

And every bit of this machinery requires maintenance. The buildings that house it require maintenance. The equipment that transmits it requires maintenance. Otherwise the four hundred and ninety-five million "power" manpower would cease work, leaving us merely the pitifully small nine million human workers.

How to keep the four hundred and ninety-five million busy and contented is told on the following pages.

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THEY'RE FOR IT!

Out in the industrial centers—where the emergencies are many and conditions are out of the ordinary, dependability counts. You men haven't the time and money to make costly experiments, and what would be the economy in doing so when you can eliminate it by using what is needed to get satisfaction.

Our success in solving difficult paint problems is attested by many of the leading manufacturers and industrial concerns throughout the country. And it is being specified because they have tried it out and know it will give unfailing service, even under the toughest kind of conditions.

VALDURA ASPHALT PAINT

does one thing better than anything else. *It protects!* Made with a 99.5% pure Gilsonite Asphalt base—by men who have been at their work for years, it is only natural that this unfailing service has made countless friends.

We'd like to tell you just what some of your friends say about VALDURA, and incidentally, if you have a paint problem, give us the details and we'll tell you frankly what we think about it.



AMERICAN ASPHALT PAINT CO.

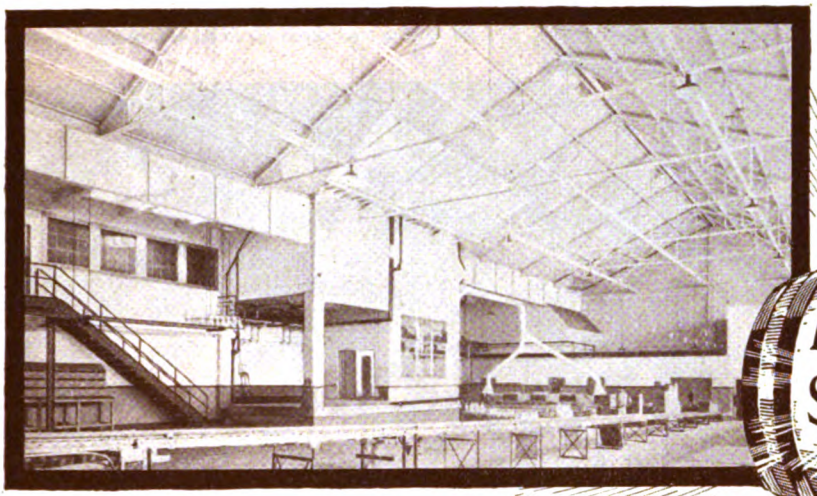
844 Rush Street **Chicago, Ill.**

Factories: Lincoln, N. J.

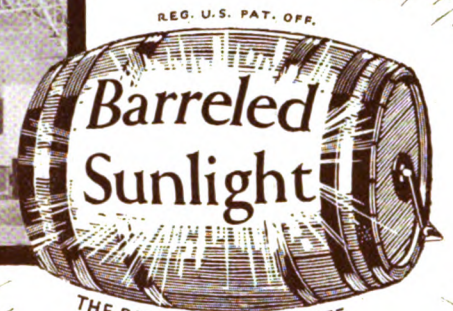
Warehouses: Oakland, Calif., Chicago, Ill.

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Clean, lustrous, lasting white paint



Thousands of industrial plants find the superior qualities of Barreled Sunlight an actual economy in interior painting.



at the lowest cost per sq. ft. of surface covered

A CHECK-UP among hundreds of industrial plants has shown that Barreled Sunlight does the finest possible job of interior painting—and does it *at an actual saving.*

The labor cost of application is less because Barreled Sunlight, containing no varnish, flows on freely with brush or spray—and covers remarkably.

Repainting costs are far lower, too. Once on the ceilings and walls, this paint is good for years of service. Its smooth surface *washes like tile*—and frequent washings will not wear it away.

Made by the exclusive Rice Process, Barreled Sunlight is guaranteed to remain white longer than any gloss paint or enamel, domestic or foreign, applied under the same conditions—also not to flake or scale if properly applied.

Plant lighting is always improved with Barreled Sunlight. Its lustrous surface reflects just the right quantity and *quality* of working light—free from glare.

Barreled Sunlight is sold in 55- and 30-gallon churn-equipped steel drums, and in cans from ½ pint to 5 gallons. Where more than one coat is required, use Barreled Sunlight Undercoat first.

Use the coupon to obtain illustrated booklet and panel painted with Barreled Sunlight.



Washable!

Ceilings and walls painted with Barreled Sunlight are easy to keep clean. Washing removes the dirt but not the paint!

U. S. GUTTA PERCHA PAINT CO.
Factory and Main Offices
5 Dudley Street, Providence, R.I.
New York—350 Madison Ave.
Chicago—659 Washington Blvd.
San Francisco—156 Eddy Street
Distributors in all principal cities

Barreled Sunlight

Reg. U.S.Pat. Off.

U. S. GUTTA PERCHA PAINT CO.
5 Dudley Street, Providence, R.I.

Please send us your booklet "More Light," and a panel painted with Barreled Sunlight.

Name.....

Street.....

City.....State.....

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AFTER

These unretouched photographs give a striking demonstration of the difference in operating efficiency effected by a seemingly small difference in the amount of light. Not powerful glare, but well diffused lighting—light without shadow pays dividends in manufacturing results.



BEFORE

21%
more work from the *same* machines

"In reference to the new system of lighting which we have installed in our plant on the advice of your lighting engineer, we are pleased to state that the actual results are much superior to anything we had expected to find. Like many other manufacturing plants we had made it a practice of hanging a drop light with a tin shade wherever we needed light. The results were, of course, far from satisfactory and we were much pleased to learn that your company is making a practice of supplying their customers with free lighting service.

"In our case the change from a spot of light at each machine to a system of general illumination throughout the plant has resulted in an increase in the output of our wire drawing machines of 21%.

"In addition our plant presents a more cheerful appearance, and our workers are more satisfied.

"Also want to express my appreciation of the service rendered by your representatives.

"Very truly yours,

(*Signed*) B. WILMSEN."

This letter received by the Philadelphia Electric Company last March, gives the experience of one of the many manufacturers who last year took advantage of the free engineering service offered by their light and power company.

You will find your local light and power company glad to send their engineers to help you to an economical solution of your lighting problems.

INDUSTRIAL LIGHTING COMMITTEE

NATIONAL ELECTRIC LIGHT ASSOCIATION
29 WEST 39TH STREET
NEW YORK

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VORCOLITE *Flat* White

Saves Half the Cost with Better Results

"BUT," customers ask us, "should we use a gloss white or a flat white for factory interior painting?"

The answer is, "We make both kinds, but for your own satisfaction we advise Vorcolite *flat* white."

Two research authorities on lighting, M. Luckiesh and E. W. Commery of the National Electric Lamp Co. laboratory, unite in a recommendation for flat whites, (Industrial Engineer, August, 1926). They find that flat white (1) reflects as much light, (2) diffuses it without glare or flicker, (3) is free from yellowing ingredients, (4) offers less adhesion for dirt, (5) is as easy to clean.

Add to these points the fact that Vorcolite saves the cost of one whole coat without sacrifice of quality. Gloss paint always needs an undercoat. Vorcolite, applied by the Vortex painting equipment (which we loan without cost) gives a complete job with one application as hundreds of nationally known companies have found.

Prepare to Vorcolite *your* factory interior by writing for details and estimate to

THE VORTEX MANUFACTURING CO.
1977 West 77th Street CLEVELAND, OHIO

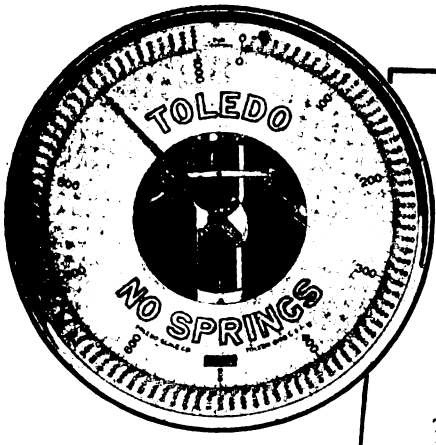




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How 52 Toledo Scales Contribute to the Efficiency and Precision of Packard Manufacture



1 By detecting errors in incoming shipments at the receiving room door. →

2 By reducing labor of counting screw machine production. →

3 By holding motor units to closely uniform weight. →

4 By testing power of motors during development. →

5 By holding paint and colors to a standard. →

6 By determining freight charges and postage. →

7 By the solving of many special problems. →

Automatic Scales for every purpose. Service Stations in 106 cities

How Toledo Automatic Scales are used in the Packard Plant

The Packard Motor Car Company has in operation fifty-two Toledo Scales of various designs.

In the Receiving Room there are Toledo Weighing and Counting Scales. Each incoming shipment is checked almost simultaneously for weight and count and compared with vendor's invoice. Many errors are corrected at this initial point to the ultimate advantage of both vendor and the Packard Motor Car Company.

In the Automatic Screw Machine Department is one Toledo Counting Scale, which with the assistance of one man accurately counts this department's entire production, which amounts to one-half million pieces a week. Before the installation of this equipment it required five men and four counting machines of various makes to handle this production.

The greatest degree of accuracy possible is exercised in the machining and inspection of motor parts. Special Toledo equipment in these departments assists in holding all important motor units to within one-eighth of an ounce in weight. This insures a perfect motor. Coil springs of all kinds are also tested on Toledo Scales and are held to a very close limit.

Some of the world's finest power plants have come from the Experimental Division of the Packard Motor Car Company. Their performance had been previously checked on Toledo Dynamometer Scales.

In the Body Division all colors and paint are mixed to Packard standard formulas and every cup full of material is carefully checked over Toledo Bench Scales.

The Post Office, Returned Goods and Service Shipping Departments are all equipped with Toledo Scales ranging in styles from the small Parcel Post Scale to the large 5-ton Dormant and the accuracy of the weights have never been questioned by the postal or express authorities.

With the advancement of the industry, many weighing and balancing problems have presented themselves and it has been found in most cases that the solution is acquired through the installation of Toledo Automatic Scales

In their marvelous manufacturing development, the Packard and other American automobile plants have utilized the most efficient means at their command, including Toledo Automatic Scales for weighing, counting and testing. In these operations, which are common to most industries, Toledo Scales provide accuracy, stop losses, and save time. What they accomplish in the Packard plant they will likewise accomplish in your plant. A survey by a Toledo man will cost you nothing. It may save you much. Write for particulars. Kindly address Industrial Sales Department, Section U.

Toledo Scale Company, Toledo, Ohio
Canadian Toledo Scale Co., Limited, Windsor, Ont.

TOLEDO SCALES

NO SPRINGS HONEST WEIGHT

For products not advertised in this issue write Industry Illustrated

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The Acid Test

Since the advertisement reproduced on the opposite page was released for publication, the Packard Motor Car Company has purchased 23 more Toledo Scales, increasing

from 52 to 75

--*nearly* 50%--the number of Toledo Automatic Scales contributing to the efficiency and precision of Packard manufacture.

Writing a testimonial letter is one way of expressing approval of an article used. Writing a check for more of the same article is the acid test of satisfaction.

There are Toledo Automatic Scales for all purposes in every industry. Let us investigate your problems.

Toledo Scale Company, Toledo, Ohio
Canadian Toledo Scale Co., Limited, Windsor, Ont.
Manufacturers of Automatic Scales for Every Purpose
Offices and Service Stations in 106 Cities in the United States and Canada

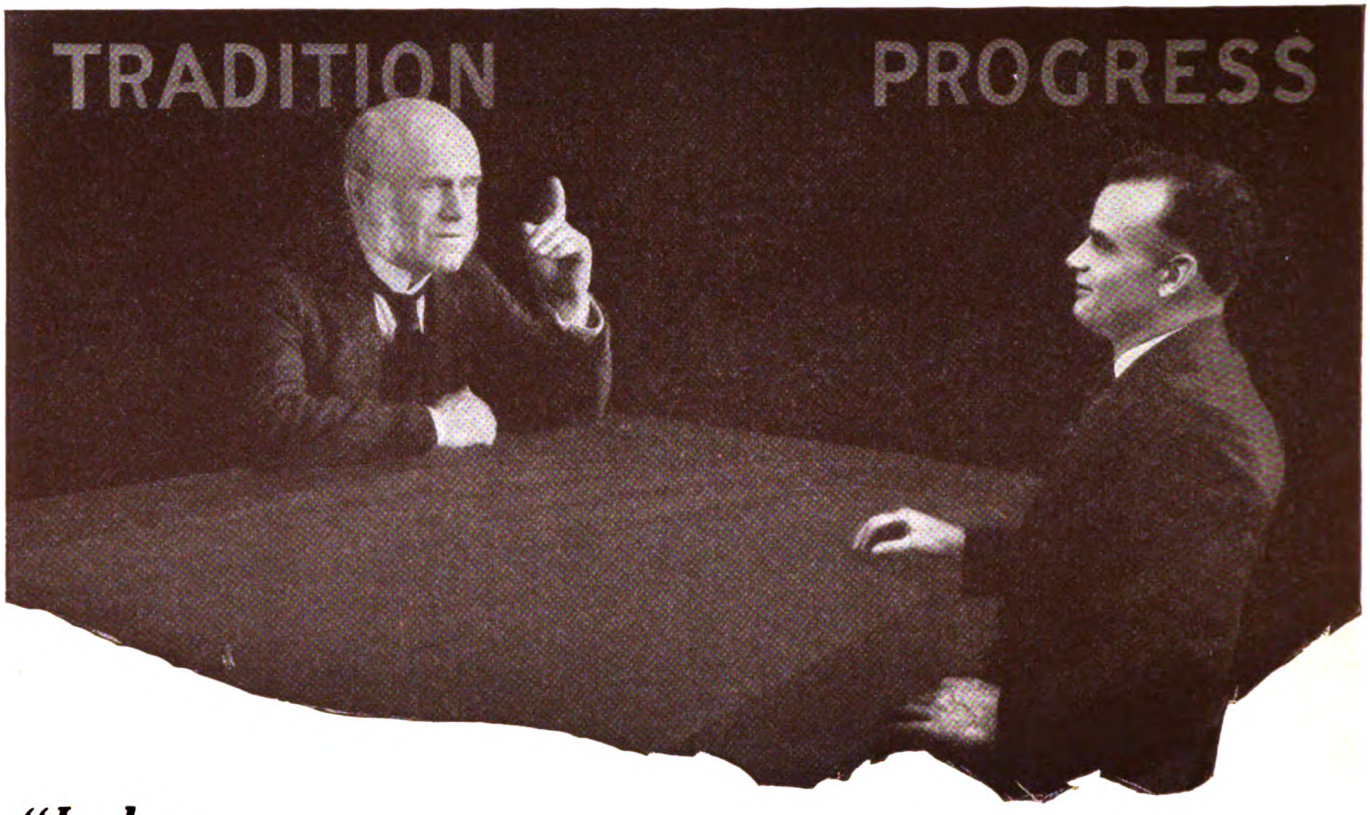
TOLEDO SCALES

NO SPRINGS HONEST WEIGHT

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Pop Doesn't Trust the Public



"Lad—

even if all you say is true about Stable-Arc welding bringing down the cost for making our machine bases—I can't take advantage of it—because the public won't accept welded steel as against cast iron—they don't know the facts.



	Cast-Iron Base	Welded Steel Base
Weight	184 lbs.	109 lbs.
Cost	$11.04	$5.45

"No, Pop—

neither do you or you wouldn't talk that way.

The public didn't know four-wheel brakes—but they didn't stick to two wheels once they were told.

The auto boys didn't wait for the public—they went to the public with "Here it is—BETTER."

Air-mail—oil burners—and a hundred other "BETTERS" are being accepted so fast that the older generation of business men gasp: "What's this world coming to?"

The answer being: "Yes, *it is* coming *to*."

The Lincoln Electric Co., Cleveland, Ohio

WC-1

"Stable Arc" LINCOLN WELDER

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"HALLOWELL" *ready-made* All-Steel Factory Equipment



Here you see a "Hallowell" all-steel work bench that needs no carpenter's costly time. It won't splinter. It can't burn. It's far ahead of any wooden bench for wearing qualities. All-steel benches come in various sizes to fit every factory need and they are always in stock so you can have them when you want them and in any number, too!

If you prefer wooden tops—"Hallowell" Steel Bench Legs are at your service. They save time and a lot of money. No bench can get wobbly when built on "Hallowell" Steel Legs.

Our all-steel Tables, Steel Bench Drawers, with or without locks, or Steel Tool Stands, mounted on casters might be just what you are looking for.

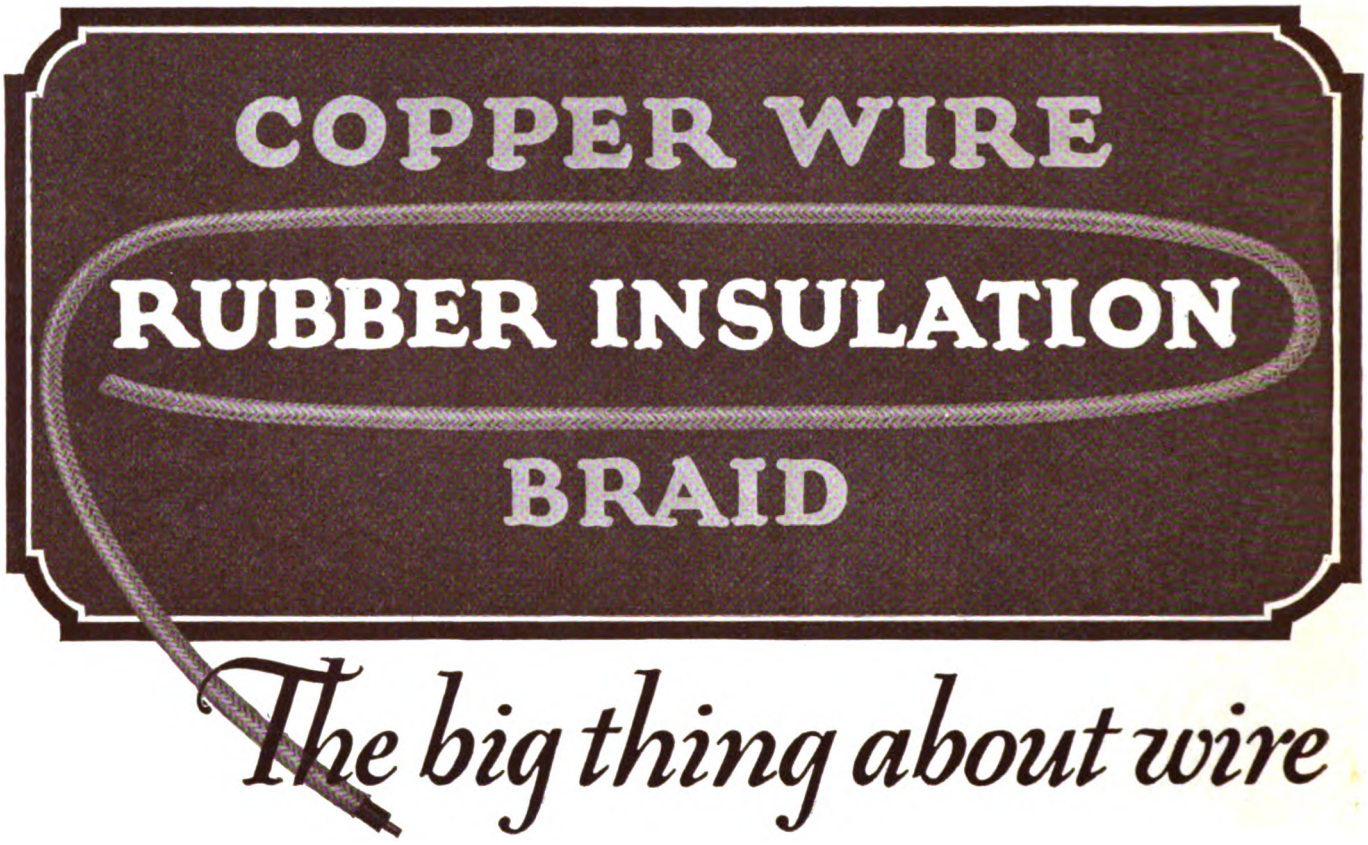
Write today for our special folder that gives complete description of these various items and illustrates our all-steel benches, too! At the same time, we'll be glad to send you our complete factory equipment catalog.

Standard Pressed Steel Co.

Box 8 **Jenkintown, Pa.**

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The big thing about wire

Rubber! That's the big thing about wire, for it is ***rubber insulation*** that plays the principal rôle in making a wire a sure and safe conductor for electric current.

Insulation is the place where "U. S." Paracore Wire demonstrates its superiority over wire that is just "wire." There can never be a great difference in copper or braid —but there IS a wide difference in the quality of rubber insulation.

The United States Rubber Company brings to the manufacture of "U. S." Paracore Wires and Cables all its great resources in growing and manufacturing rubber products—resources and facilities at the command of no other organization.

This outstanding leadership in rubber has given "U. S." Paracore supremacy in its field—by providing it with an insulation of unrivaled quality.

Experienced contractors know the vital importance of insulation—that's why they specify "U. S." Paracore.

United States Rubber Company

1790 Broadway, New York City

Branches in every industrial center

"U.S." PARACORE REG. U.S. PAT. OFF. **WIRES & CABLES**

UNITED STATES RUBBER COMPANY AND ASSOCIATED COMPANIES — US — RUBBER SYSTEM

Standards that Surpass

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Ultimately!

—*you'll choose this broom*

More than fifty years of effort to produce a better broom than any other have achieved this masterpiece!

The Lay Metal Case Broom is superior—in the quality of its materials; in its construction!

Here is a broom that is strong, resilient, perfectly balanced; a broom with extra wide sweeping tip that will hold its shape and serve its purpose down to the last stubs of straw!

Fibres are held without shed or spread in the vise-like grip of the metal casing.

Yet Lay Metal Case Brooms, despite their numerous advantages, are low in cost. There is a Lay Broom particularly suited for your use. Write for illustrated price list today!

BRANCHES:

New York City:
110 W. 34th St.

Cleveland:
9343 Gorman Ave.

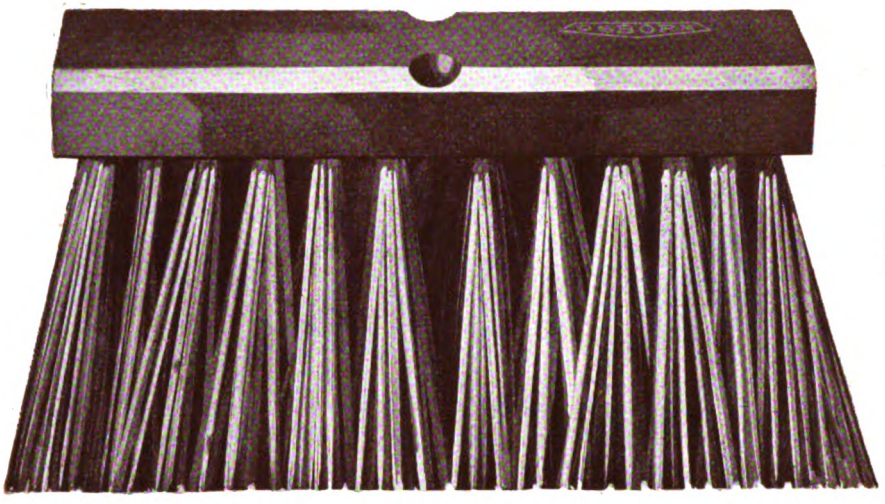
Chicago:
920 Medinah Bldg.

Milwaukee:
400 University Bldg.

THE JOSEPH LAY COMPANY
PORTLAND, INDIANA

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OSBORN



0277—Bamboo Push Broom Made of Split Bamboo. Length of Fibre 7". Block size 16" x 3½". A heavy duty push broom at a low price.

Osborn Push Brooms For Every Purpose

Osborn makes push brooms for every need—in mills, factories, railroad shops and yards, street cleaning, road building, or any other purpose.

For over 30 years, Osborn has made a close study of the best sweeping materials for each particular condition.

The brooms illustrated are the result of this experience and are known everywhere for their efficiency and surprising economy.

THE OSBORN MANUFACTURING COMPANY
INCORPORATED

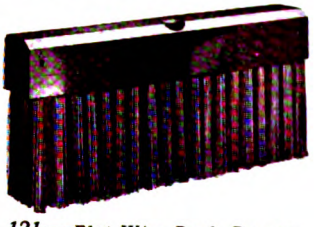
5401 Hamilton Ave. **Cleveland, Ohio**



500—Push Broom. Made of genuine African Bass—length of fibre 6". Size of block 16" x 3½"—sweep of broom 22½", large flare.



277— Rattan Push Broom. Made of select round reed. Size of block 16" x 3½". Length of fibre 6".



121— Flat Wire Push Broom. Made of tempered flat steel wire. Widely used in road construction. Block size 14" x 2⅜" —length of wire 5".

Osborn Brushes

A BETTER WEARING BRUSH FOR EVERY USE

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These 5 products will save you money

Leading industrial plants have used them for years to reduce their maintenance expense

1 Lapidolith protects your concrete floors against dusting and wearing. This original concrete floor hardener is described below.

2 Lignophol will keep your wood floors from drying out, splintering, or rotting. See the complete description below.

3 Cemcoat is a paint that will cut down your painting bills. It sticks to brick, wood, or concrete. It stays white long after other paints turn yellow, and may be washed again and again. Further details are below.

4 A treatment of Hydrocide Colorless will permanently waterproof the walls of your buildings. See full description below.

5 Stormtight will prolong the life of your roof and protect it against leaks. This rubber-like, adhesive liquid stops leaks instantly and permanently. A further description is given below.



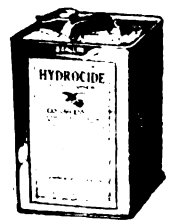
1 Lapidolith is the original concrete floor hardener. It will add years of wear to even an old concrete floor. It is a liquid, chemical compound that penetrates the porous cement, binds the loose particles together, and fills up the voids. It will make your concrete floors almost as hard as flint, and make concrete dust a thing of the past. Lapidolith is as easy to apply as water. Floors treated at night are ready for business in the morning.



2 Lignophol will add years of wear to old, worn-out wood floors. It is a preservative dressing that penetrates the wood fibres, and restores the natural gum and oils. It will give you smooth, hard, dustless wood floors.



3 When your next repainting job comes around try Cemcoat. The wearing qualities of this paint are remarkable. Even on brick, plaster, or concrete walls it will not crack or peel. It may be washed again and again. Because of its unusually heavy body it generally requires one less coat to a given surface than most paints. Cemcoat comes in white and colors for exteriors and interiors.



4 Hydrocide Colorless, applied to the exterior of a building, penetrates the brick or concrete and effectively keeps out all moisture. As it contains no paraffin it will not run in hot weather. It will permanently water-proof and damp-proof the walls of your buildings, and yet since it is invisible it does not detract from the natural beauty of the walls.



5 Stormtight is an adhesive, rubber-like liquid, ten times thicker than paint. It will prolong the life of your roof and protect it against leaks quickly and permanently. Stormtight quickly stops leaks that have already started. It is very easy to apply. It is not a temporary makeshift, but has saved the cost of new roofs again and again.

L. Sonneborn Sons, Inc.

114 Fifth Ave., New York City

Well known industrial plants all over the country have been using some or all of these products for years. The Ford Motor Co., Swift & Co., The Bethlehem Steel Co., and the Standard Oil Company of New York are representative of these concerns. These products have helped them reduce their maintenance costs. They can do the same for you. Send for more detailed information and a free demonstration sample. Use the coupon.

L. SONNEBORN SONS, INC. K-2
114 Fifth Avenue, New York City

Please send me, without any obligation, demonstration sample and literature on:—Lapidolith....; Lignophol....; Cemcoat....; Hydrocide Colorless....; Stormtight..... (Check those products that interest you)

Name.....

Street.....

City..... State.....

Company.....

Position.....

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SAVE
ON WINDOW CLEANING
By This Lowest-Cost Method

BY using one of the famous SUNBURST Formulas your unskilled labor can clean your glass like new—at a fraction of a cent per square foot. This is only practicable when using SUNBURST because it is easiest to apply. Use of SUNBURST insures the fullest utilization of daylight. There's a SUNBURST Formula to cover every window cleaning need. For general use we especially recommend SUNBURST Formula 345, effective on ordinary carbon deposit, rust, oil, or dust deposits. Let us send you a trial quantity. Prove it yourself on your own glass.

ECONOMIZE With This Chart

OUR Research Laboratory has covered every conceivable condition and has developed SUNBURST Liquid Formulas and Paste to fit each specific need. We have prepared a chart that shows you at a glance the ideal window cleaner formula for you to use. You will find this chart a valuable aid.

Sent to You Gratis

Use SUNBURST HI-SPEED WINDOW CLEANER

Results Guaranteed

We will send all responsible concerns a barrel, half or quarter barrel lot of any SUNBURST Liquid Formula or SUNBURST Paste on the following unqualified guarantee—use enough to satisfy yourself of its superiority. If it does not perfectly satisfy you return unused portion collect and we will cancel the entire invoice.

THE GERSON-STEWART CORP.
3541 E. 76th Street, Cleveland, O.
Specialists in Industrial Sanitation

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Put Your Supermen to Work

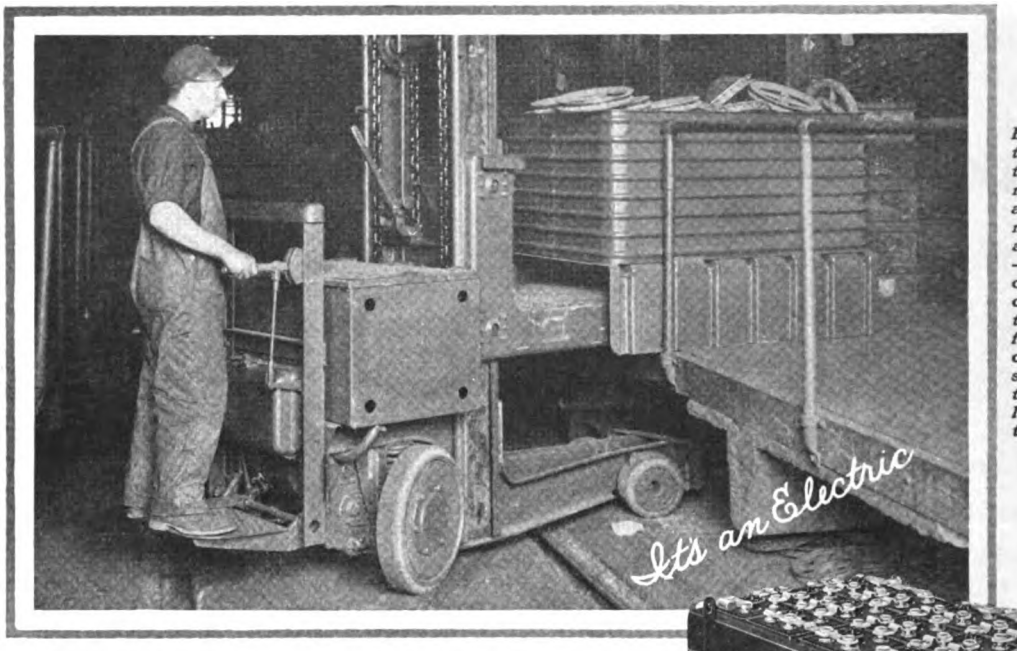
THE striking cartoon on page 12 of the editorial section of this issue shows a superman at work picking up ton weights.

This superman has the strength of 58 ordinary men. All day long he can keep up the task of lifting these ton weights at the rate of six every minute, or one every ten seconds—raising each one to a height of ten feet.

This superman is not merely imaginary. He stands back of every American wage earner, at his beck and call, in the form of three and three-quarter horsepower available, per worker. How foolish it is to have an ordinary man lift or carry anything in our industrial plants when these giants stand ready to do it infinitely cheaper and quicker.

How to put these supermen to work, profitably, is told in the following pages.

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Electric industrial trucks and tractors that move fast in the afternoon can make more trips around the plant—a factor that cuts handling costs. Many truck users have found that they can get good speed out of their trucks all day long. Read how they have done it.

Keeping your "electrics" moving fast *all day*



To keep down handling costs, it is important that they keep up a good speed during the afternoon

HUNDREDS of electric industrial truck and tractor users find that their machines keep moving fast right down to the end of the day's work. They maintain, to a marked degree, the pep and speed of the morning.

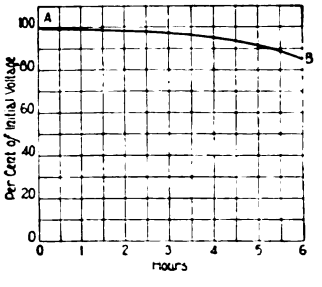
These trucks are equipped with Exide-Ironclad Batteries. Exide-Ironclads maintain a good rate of speed *all day long*. With one of them in the battery box, a truck can easily handle the required day's work and still get back to the charging panel at quitting time.

In addition to its sustained speed, the Exide-Ironclad has abundance of power. And it can deliver this power at many times the normal discharge rate when necessary. Steep ramps, rough surfaces, or extra-heavy loads bother this battery very little. It simply delivers power faster—and breezes ahead.

On the other hand, repairs play a very small part in the life of the Exide-Ironclad. It is built so rugged that it stands up under hard service with hardly ever a trip to the shop. This, plus the fact that it is economical on charge, means a large saving on maintenance, for the life of the Exide-Ironclad is unusually long.

If your trucks and tractors are not already equipped with Exide-Ironclads, it will be worth your while to send for our booklet, "Facts for consideration in selecting a Storage Battery," Form No. 2865, and learn all the advantages of this economical and efficient battery.

DISCHARGE OF EXIDE-IRONCLAD BATTERY AT NORMAL RATE



From this chart you can see for yourself how Exide-Ironclad Batteries maintain a high voltage—which means a high rate of speed—right up to quitting time.

Exide
IRONCLAD
BATTERIES

Member Service The Society of Electrical Development, Inc. Safety

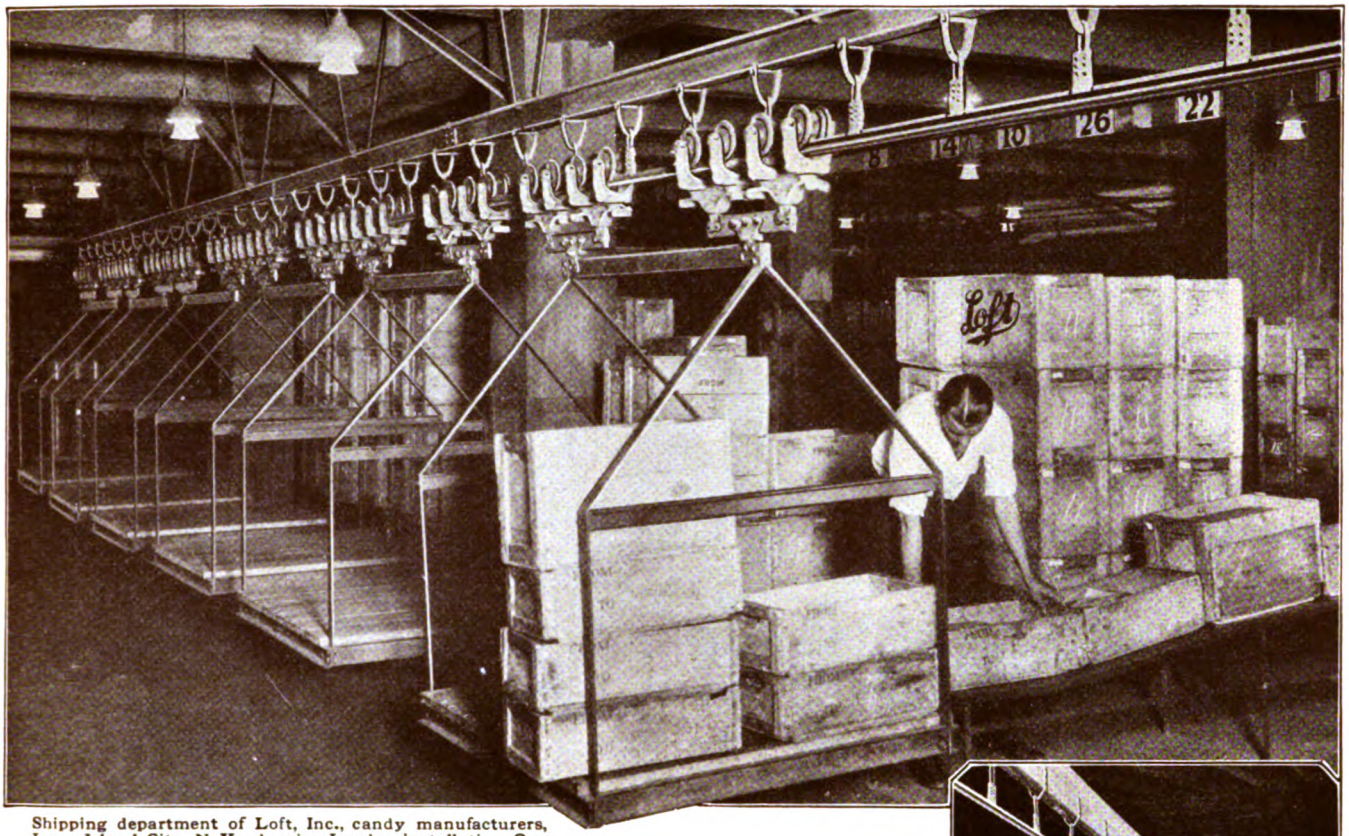
Move It Electrically

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia

Exide Batteries of Canada, Limited, 153 Dufferin Street, Toronto

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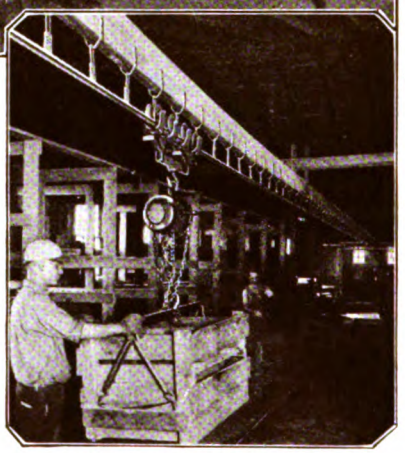
Shipping department of Loft, Inc., candy manufacturers, Long Island City, N. Y., showing Louden installation. One man easily pushes a fully loaded platform, one-ton capacity.

"Lowers Labor Cost 1/3

Helps us meet competition—makes dividends—and A CONTENTED ORGANIZATION!"

B. O. T. Mfg. Co., Trenton, N. J.

Not the least of the benefits of a Louden Monorail installation, is a contented organization—not only in factory control, but in factory labor. Louden users cite actual savings in payroll, time, floor space, wear on floors and protection of products, running into thousands of dollars. They also tell of its effect on the men—easier handling of loads, greater safety—better morale.



Crates of radiator cores carried by Louden Monorail from core storage to moulding floors. One man easily and safely handles large load of cores to any part of plant.—Central Radiator Corp., Lansdale, Pa.

This concern also uses Louden Monorail for handling ladles of hot iron, weighing from 600 lbs. to 800 lbs., from cupola to pouring floors, pouring direct into the flasks. Several thousand feet of Louden are profitably employed throughout the plant.

LOUDEN

OVERHEAD CARRYING EQUIPMENT

is adapted to practically any kind of work where loads have to be moved. Handles every carrying job up to 2000 lbs. with greater dispatch and economy. Moderate in cost. Can be installed by your own plant labor.

"Louden Equipment reduces breakage and saves us wages of 4 laborers, $100 a week or $5000 a year—300% on investment." Architectural Tile Co., Keyport, N. J. "Louden System reduces our labor cost on material handling 30%." American Chain Co., York, Pa. "We use two men where we used to use six. Louden Equipment saves us $10 a day, twice the cost of the installation each year." Southwest Veneer Co., Cotton Plant, Ark.

Without any obligation on your part, let us show what a Louden System would do for you. One of our engineers in your vicinity will gladly look over your plant and suggest where savings could be made in material handling costs, with Louden Monorail. Write us, today.

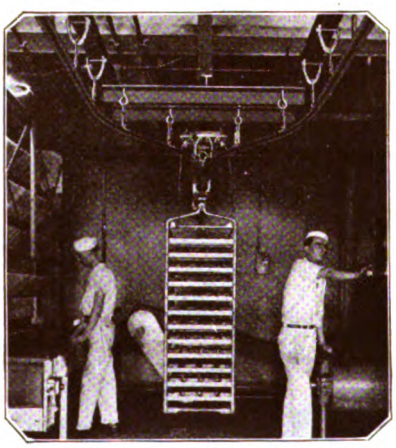
Send for Material Handling Book

It pictures many installations in various industries—from a few feet of track to many miles. Tells an interesting story of how other concerns have cut costs and saved money.

THE LOUDEN MACHINERY COMPANY

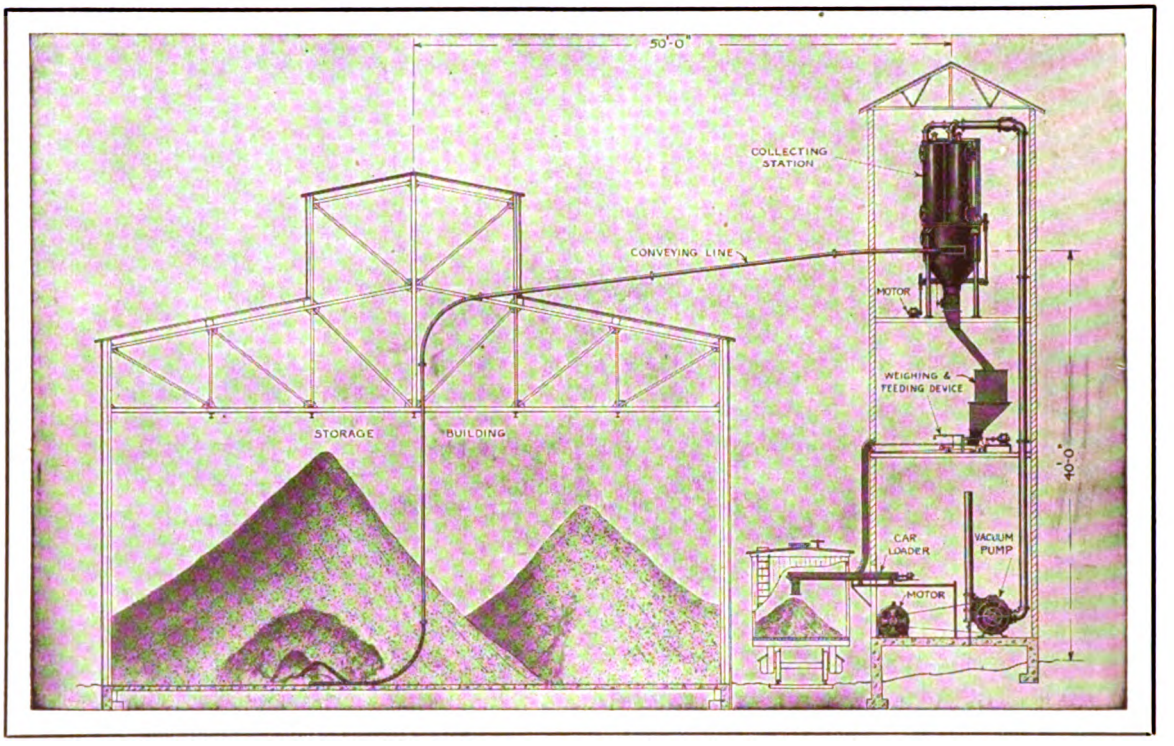
5003 West Avenue (*Established 1867*) Fairfield, Iowa

Branches in principal cities



Bread taken from pans and put into cooling rack. Empty pans returned by the Louden Overhead Monorail System to be refilled.—Mills Baking Co., Detroit, Mich.

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No shoveling gang required

when you use the Dracco system

And considering the enormous quantities of bulk material that many industries must handle—it is no wonder that the labor problem is one of tremendous cost.

Thousands of tons of lime, gypsum, sulphur, alum, cement, all sorts of metallic dust, heavy and fine chemicals and many others must be handled yearly. Many of them are obnoxious and poisonous.

Dracco will handle these materials without dust, confusion or waste. Your labor troubles cease for the problem becomes that of one man instead of an entire gang.

The Dracco System will successfully handle dry substance—from the finest dust (300 mesh) to materials of egg size and weighing as much as iron rivets.

Some
DRACCO Installations
Evans Lead Co.
Aluminum Co. of America
Grasselli Chemical Co.
Gold Dust Corporation
The Norton Company

The subject is set forth in a very interesting way in some of our pamphlets. Send for bulletins on some of our installations.

Dust Recovering & Conveying Co.

Harvard Avenue and East 116th Street

Cleveland, Ohio

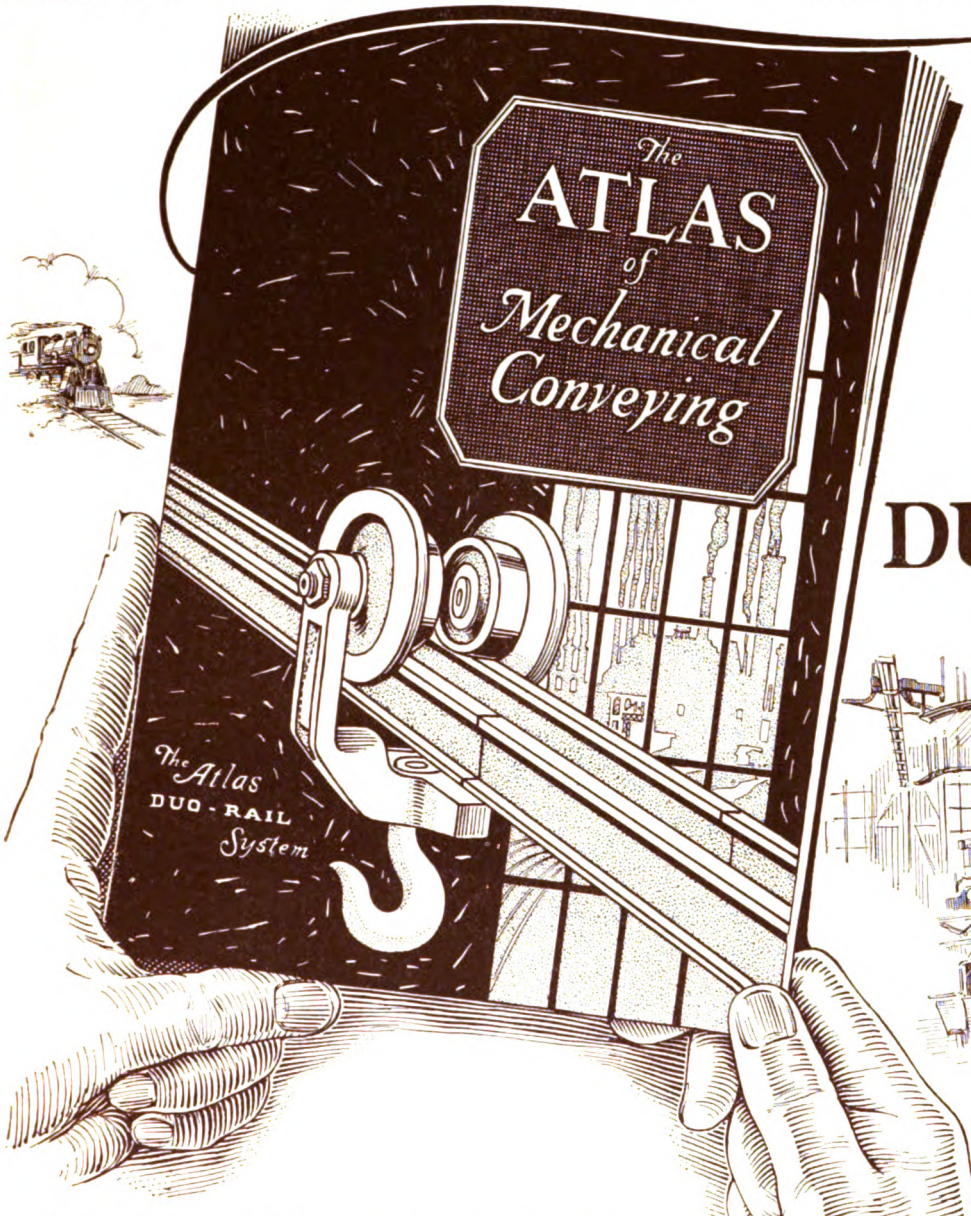
DRACCO DOES IT

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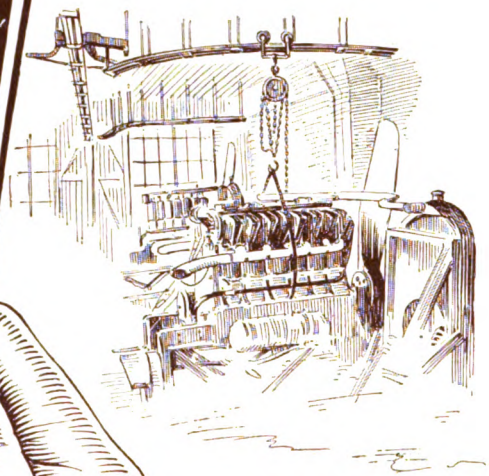
A New Method of Overhead Carrying-

This Book



shows how the swift —silent—smooth movement on rails has been applied to overhead track through the

DUO-RAIL SYSTEM



An application of the Atlas Duo-Rail.

The Atlas Duo-Rail System has been installed in hundreds of plants in practically every industry. The success of this system and the resultant economies effected have induced us to greatly enlarge the organization in order to give greater service to industry.

Under the new name—ATLAS-CHICAGO COMPANY—industrial executives can now avail themselves of this new and improved method of overhead conveying.

The operation of ATLAS DUO-RAIL SYSTEMS, their economy and how they can speed your handling and lower production costs, are all pictured and described in this new Atlas of Mechanical Conveying. Send the coupon for a copy. Dealers and distributors, write for information.

CUT OUT AND MAIL

THE ATLAS-CHICAGO COMPANY
740-744 W. Van Buren St.
Chicago, Ill.

Send me a copy of "The Atlas of Mechanical Handling"; also information about your trial offer.

Name .....

Name of Company .....

Position .....

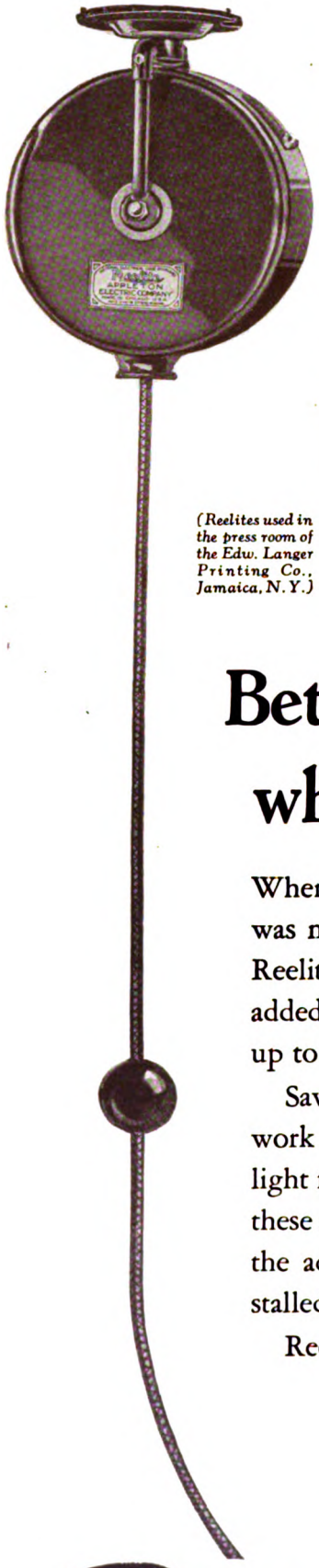
Address .....

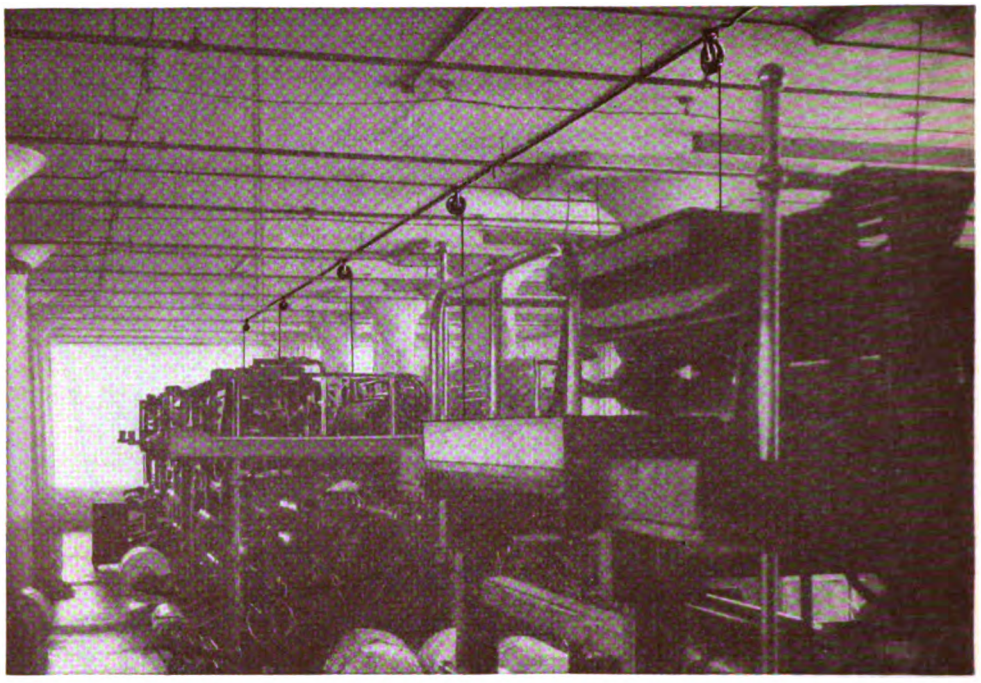
***The* ATLAS-CHICAGO COMPANY**

DIVISION OF CHICAGO ELECTRIC COMPANY

740-744 West Van Buren St. CHICAGO

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(Reelites used in the press room of the Edw. Langer Printing Co., Jamaica, N.Y.)

Better and speedier press-work when Reelites are on the job

When this printing-plant picture was made, there were only a few Reelites installed. New ones since added have now brought the total up to 35.

Savings on cord-renewals, better work in less time, handy trouble-light for repairs and adjustments—these are a few of the reasons why the additional equipment was installed.

Reelites pay—for Reelites last! They make electric cord last, too, by keeping it clean and dry, unkinked, out of the way when not in use, never under foot.

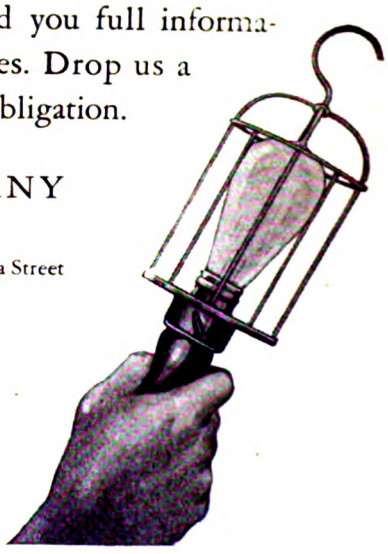
They'll save money for *your* plant if given the chance. They'll help you turn out more work and better work by bringing good light *down to the job* at all times.

Let us send you full information and prices. Drop us a line without obligation.

APPLETON ELECTRIC COMPANY

1716 *Wellington Avenue* · *Chicago, U. S. A.*

New York—150 Varick Street Los Angeles—340 Azusa Street



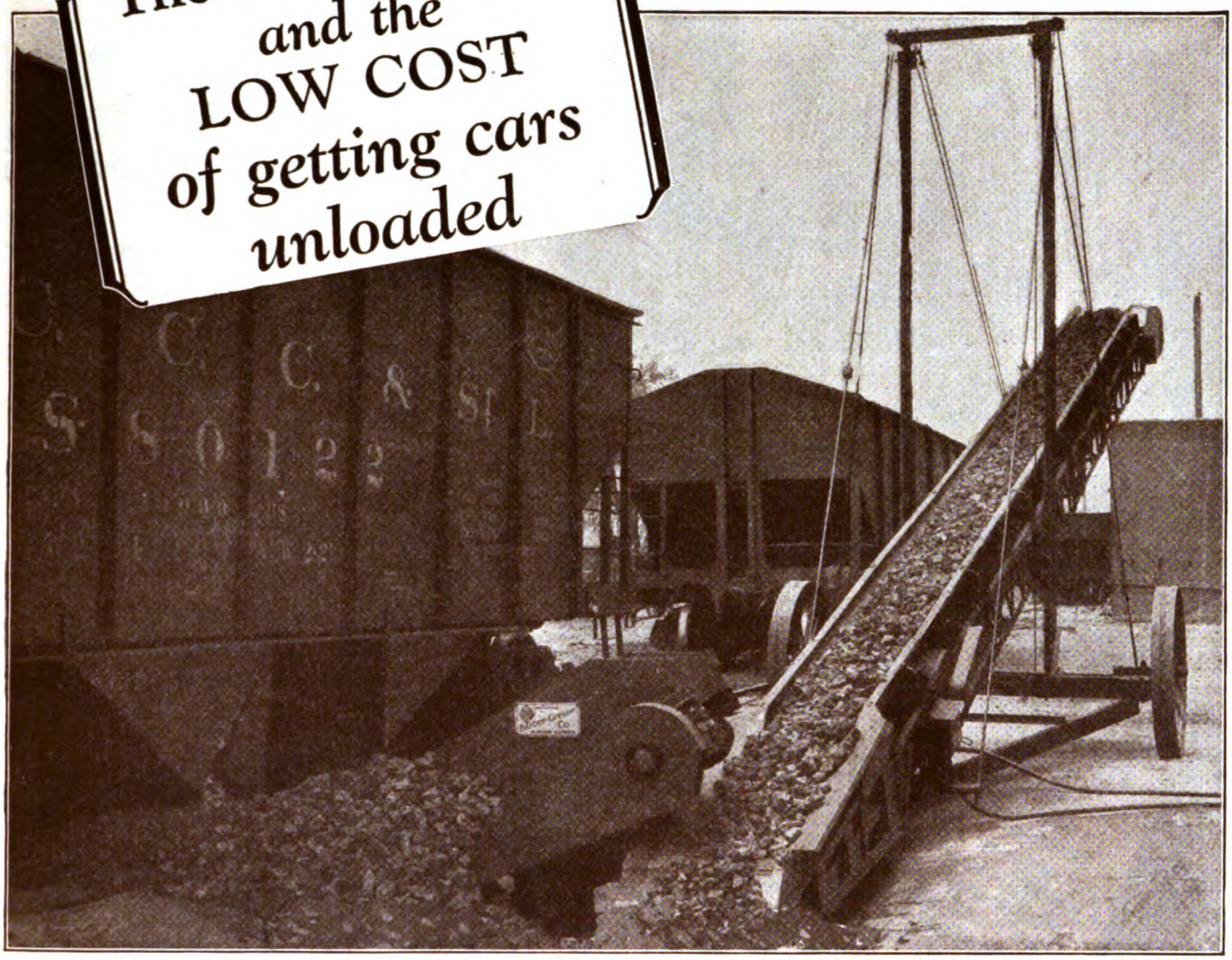
Reelite

The Handy Light on a Reel

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The HIGH COST and the LOW COST of getting cars unloaded



Out with the "Shovel Executive" and out with "High Overhead"

If you go into yard handling you will find that high coal and material handling costs are based upon either one of these two things:

The high cost of "shovel executives"
or
The cost of expensive equipment to replace them.

Barber-Greenes cut the cost of both.

They provide the versatility of hand labor—they provide more speed than most mechanical handling systems—and they are without the high costs of either method.

In price and operating cost Barber-Greenes are often one-half and one-fourth that of immovable equipment of the same tonnage capacity.

A single Barber-Greene "N" Conveyor will take care of the needs of the ordinary, everyday tonnage requirements.

It unloads directly from beneath hopper-bottomed gondolas, at a car-an-hour rate to stock pile or boiler-room. The only shovel help needed is a man or so to clean the car corners.

Chances for demurrage are reduced immeasurably. Car spotting is virtually eliminated. And you can see for yourself what is left of the shovel gang.

Alone, in series, or in conjunction with Barber-Greene Coal Feeders these conveyors form the basis for a permanent, flexible, coal handling system that can be added to or rearranged to meet any changing requirements.

They chase away your high-priced "shovel executives" and they cost comparatively little themselves. The coupon will find out for you what Barber-Greenes have done on a number of jobs—some of which must surely be like yours. Send it today.

A Barber-Greene "N" unloading coke with the help of a feeder



The "shovel executive" is often the highest priced executive on your payroll. He draws consequential wages for inconsequential work. Start the ball rolling to put him on work that earns his salt for you. This coupon will bring "Mr. Barber's Famous Scrapbook"—with its many and varied coal and material handling layouts. Send it today.

This coupon brings you the many low cost layouts in "Mr. Barber's Scrapbook." Send it today to

Barber-Greene Company,
500 W. Park Ave., Aurora, Ill.

Name_____

Address_____

City_____ State_____

Yearly tonnages_____

_____

BARBER-GREENE CO. — *Representatives in* *fifty cities* — **500 W. Park Ave., Aurora, Ill.**

BARBER GREENE

Portable Belt Conveyors **Self Feeding Bucket Loaders**

Coal Loaders, Permanent and Portable Belt Conveyors, Bucket Loaders, Coal Feeders

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C-M Ideas



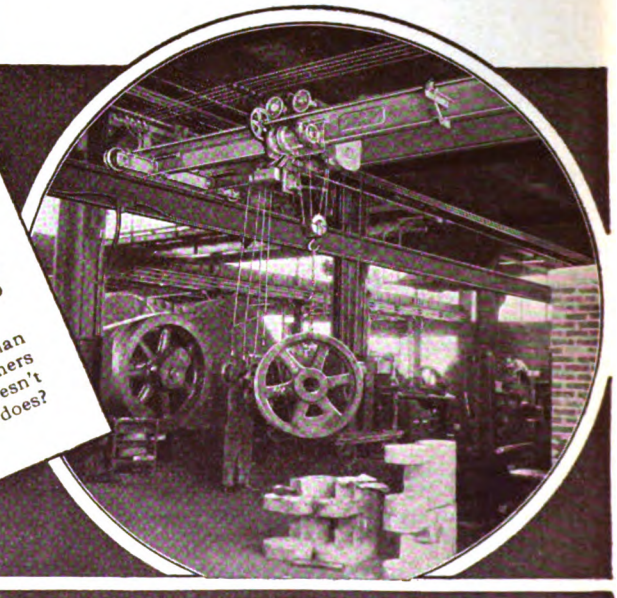
CHECK up on the concerns who have adopted "C-M" Ideas of material handling and you'll discover unmistakable signs of PROGRESSIVE MANAGEMENT.

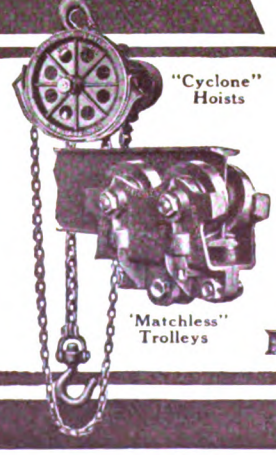
Illustrated on this page are typical examples of the practical and correct solution to problems of material handling. Your problems are different only in the sense that they require different combinations of "C-M" Overhead Material-Handling Equipment. "C-M" Ideas can determine the correct combination.

ABOVE is an example of a "C-M" Material-Handling Idea that has application to machine shops, foundries, warehouses, stock yards, and many other types of business. This complete Overhead Track System includes two and three-way switches, "Matchless" Trolleys and "Cyclone" Hoists. It is so arranged that all materials may be handled direct from two receiving rooms; to and from every machine; and direct to two shipping rooms. *There's no lost motion in this plant!*

YOU'LL notice in the view at the right that *only one man* is handling material. The 5 ton "C-M" Electric Hoist submerged between the beams of a "C-M" Traveling Crane have made it possible for this man to lift and convey heavy castings with no more effort than is required to pull his cap down on his head.

Do you get the "C-M" Idea back of this? One man doing the work of from two to ten or more. The others released for productive work. If that doesn't answer the labor problem, what does?





"Cyclone" Hoists

"Matchless" Trolleys

CHISHOLM-MOORE

OVERHEAD HOISTS CRANES TROLLEYS TRACK SYSTEMS

"C-M" is the trademark of a complete line of Overhead Material-Handling Equipment, backed by an organization ably qualified to correctly apply that equipment to every material-handling condition. "C-M" Engineering Service is gratis. The "C-M" policy is based on "*Facts* to show *YOU* a way to *MORE PROFIT*." Write for particulars.

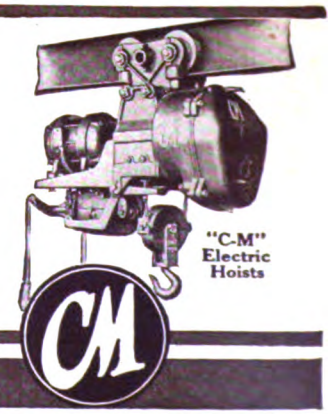
THE CHISHOLM-MOORE MFG. CO., Cleveland, Ohio

Branches: New York, Chicago, Pittsburgh

Representatives in All Territories for Immediate Service



"C-M" Cranes



"C-M" Electric Hoists

For products not advertised in this issue write Industry Illustrated

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Rex Progressive Assembly Conveyors—Maytag Company

There's Profit in Saving Backs

There's profit in saving backs, whether it is the backs of your workmen or the backs of the women of America on Wash Day. The Maytag Company of Newton, Iowa, has found it profitable to combine the two by progressive assembly of the Maytag Washer with the aid of a Rex Continuous Production Conveying System.

This interesting example of progressive assembly and parts transportation represents a method that is applicable to many industries. An issue of the Conveyor—our monthly bulletin describes this installation and its advantages—we will gladly send it free to anyone interested—Ask for the Maytag Issue.

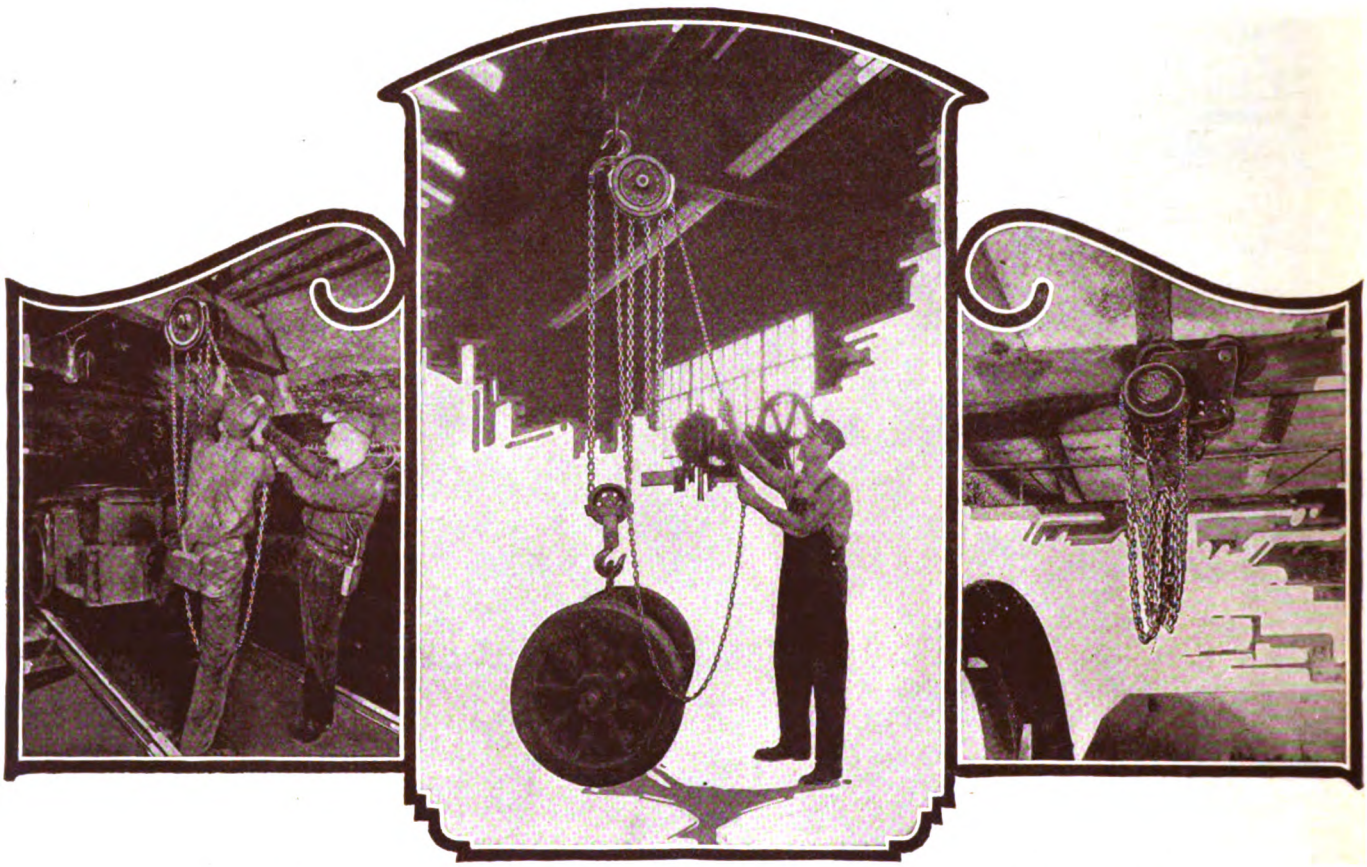
CHAIN BELT COMPANY, *711 Park Street,* MILWAUKEE, WISCONSIN

REX CONVEYING SYSTEMS

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TRADE **YALE** MARK



A Record Mine goes to YALE for *Chain Blocks*

The New Orient coal mine has standardized on Yale Chain Blocks. The illustrations above show a few of the many applications—one Yale Block used in hoisting the end of an eight ton locomotive, another in the shop handling heavy car wheels and a third ready for emergencies over the rotary dump.

There's never any question about the safety and reliability of Yale Chain Blocks.

Every Yale Chain Block is continually tested during the process of manufacture and given a final overload test before it leaves the factory.

The Yale Ball Bearing Spur Geared Chain Block is the latest outstanding Yale development. This block is the most efficient on the market—a test proven claim.

Yale hoisting equipment includes Yale Ball Bearing Spur Geared Chain Blocks, Yale Screw Geared Chain Blocks, Yale Differential Chain Blocks, Yale Ball Bearing Electric Hoists, Yale I-Beam Trolleys and Cranes, and Yale Electric Industrial Trucks, Tractors and Trailers.

Ask for the latest bulletins. Yale engineeers are ready at all times to cooperate in any material handling problem.

The Yale & Towne Mfg. Co., Stamford, Conn., U. S. A.

Canadian Branch at St. Catharines, Ont.

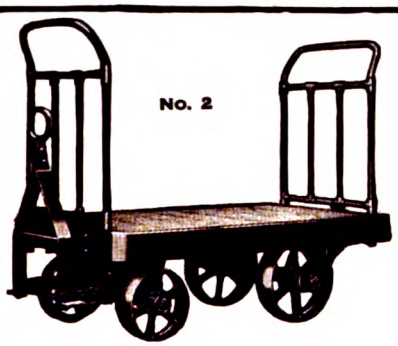
YALE MARKED IS YALE MADE

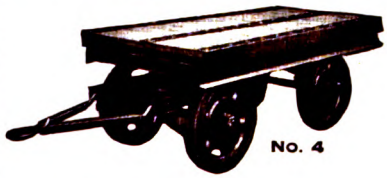
YALE **Hoisting and Conveying Systems**

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Mercury Tractors — *the motive power of the tractor-trailer system* — are offered in four different types and fifteen different models.
Ask for tractor Bulletin 106.

No. 1—The all purpose castor type industrial trailer. *Request Bulletin A-100.*

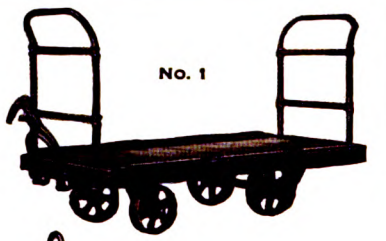
No. 2—This is a 4 ton capacity wagon-type steer. *Bulletin A-125 tells about it.*

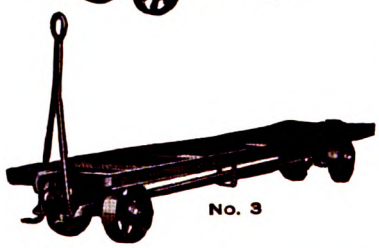
No. 3—A four-wheel steer trailer for long commodities. *Described by Bulletin A-120.*

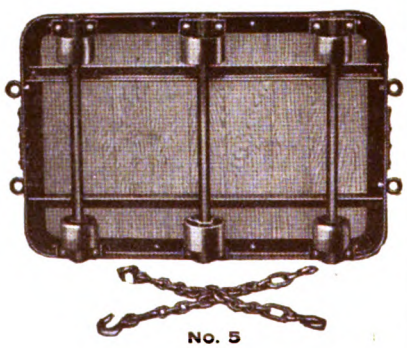
No. 4—Spring suspended — rubber tires — a minature highway trailer. *Complete specifications in Bulletin A-120.*

No. 5—A strong dolley for the hard-to-load shipments. *Ask for Bulletin A-120.*

No. 6—Dump body trailer for bulk material. *For description request Bulletin A-120.*



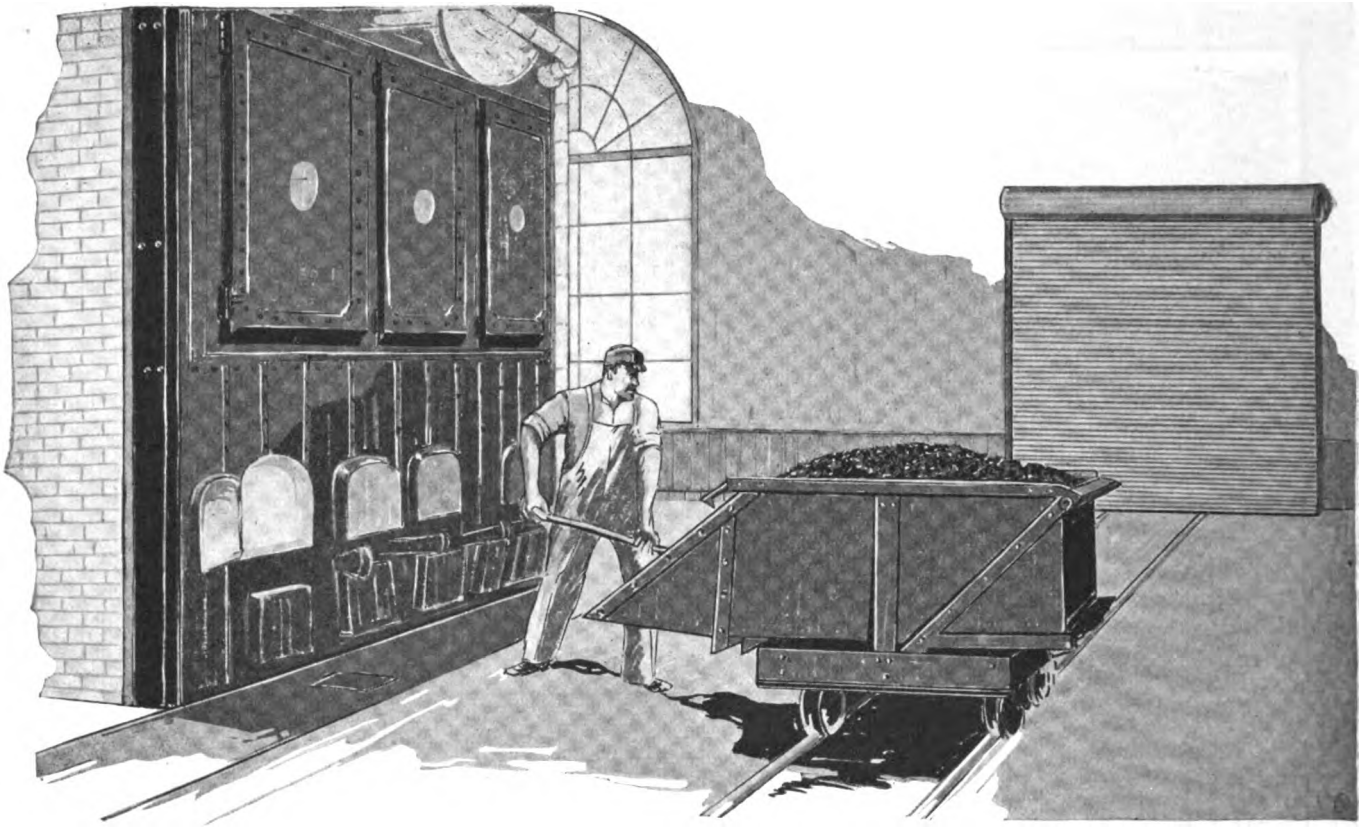




Mercury
Manufacturing Company

4112 So. Halsted St. Chicago

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Compare this with other Coal Handling Costs!

100 feet of track	@	$ .60 per ft.	$ 60.00
1 1-ton charging car			125.00
		Total cost	$185.00

This is the entire cost of the installation and it will handle the coal from storage piles to bins and directly to the boiler doors. Compare the low cost of Easton Cars and Track with other coal handling systems.

An Easton Railway Car installation for the power plant gives absolute measurement of coal consumed—a check on power costs and is an assurance of clean floors and better power plant operation.

We are prepared to make layouts of complete coal storage and boiler room railway installations. Write for the Easton Catalog describing the complete line of Easton Cars and Industrial Railway Equipment.

EASTON CAR & CONSTRUCTION CO.

11 Scarritt Arcade, KANSAS CITY, MO. Hilton St., EASTON, PA.

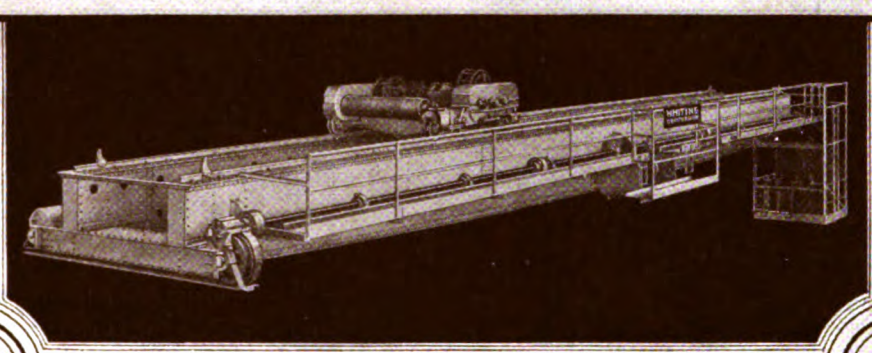
EASTON CARS

FOR EVERY INDUSTRIAL PURPOSE

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CONTINUING SUCCESS CAN ONLY BE BUILT ON QUALITY

WHITING



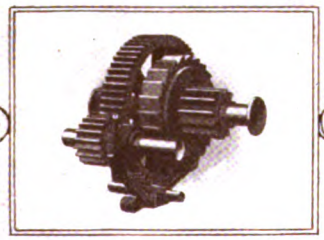
WHITING CRANES HAVE BEEN AN OUTSTANDING SUCCESS FOR 35 YEARS

In spite of keen competition for small crane business, Whiting has consistently refused to lower the quality of its crane construction. Bearings, gears, pinions, axles, wiring, brakes, and other details of a crane trolley cannot be cheapened below a certain standard without cutting the life and reliability of operation and increasing the maintenance cost in much greater proportion. Whiting designers have economized on all these features as far as good engineering practice permits. Whiting customers do not want cheaper construction because they know that in the last analysis it is not cheaper—but much more expensive.

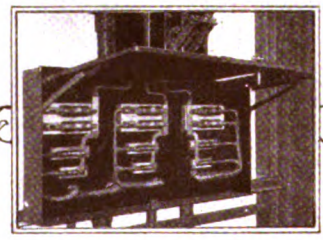
The Whiting record during the past 35 years is ample proof that Whiting Cranes have uniformly high quality and that industrial executives appreciate this one quality policy.

CRANE CATALOGUE NUMBER 200 ON REQUEST

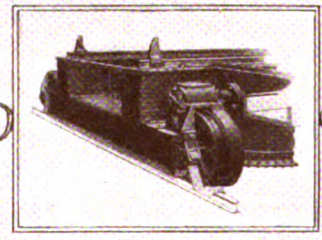
WHITING CORPORATION
HARVEY, ILL. (*Chicago Suburb*)



Automatic Mechanical Brake—operates in oil bath.



All enclosed "safety first" Switchboard.

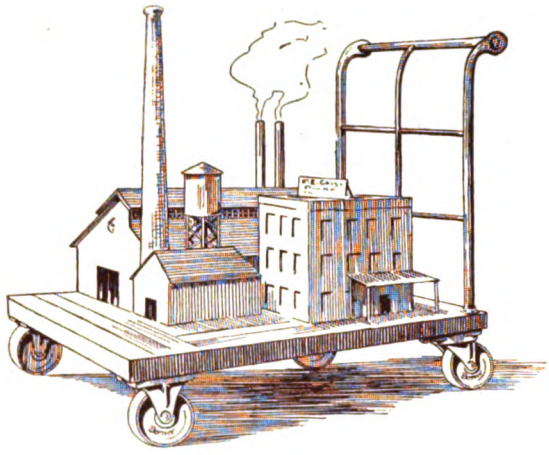


M. C. B. type End Truck.

I.I.11-Gray

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Bond



The Modern Plant Runs On Wheels

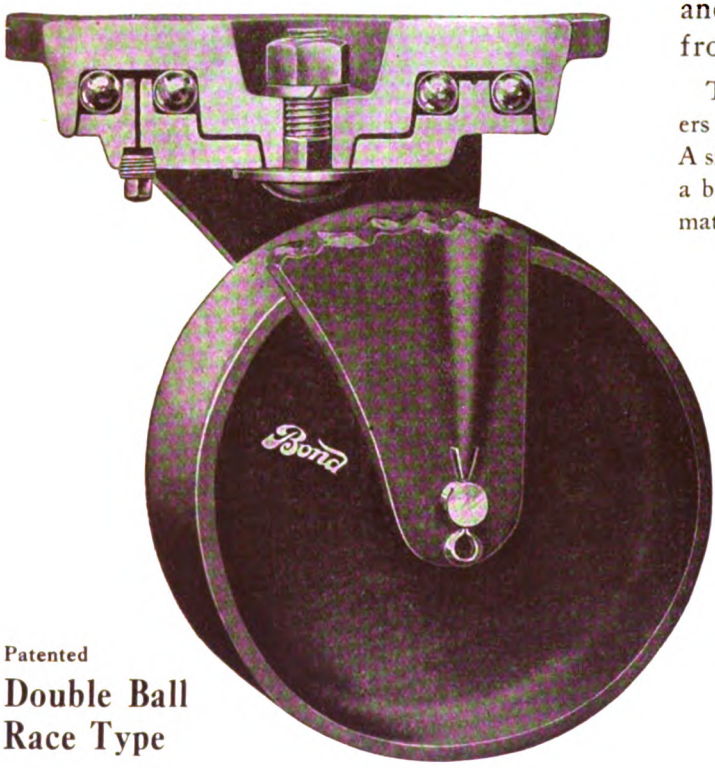
The up-to-date industrial plant is literally **a plant on wheels.** For trucks equipped with caster wheels are the basis of transportation throughout. They keep materials and work in process moving steadily from one operation to the next.

The importance of having dependable casters under your trucks cannot be overestimated. A single balky caster can cause annoying delays; a broken caster can hold up the movement of materials and involve a heavy loss.

Bond Anti-Friction Swivel Truck Casters are built for **Dependability.** By their scientific construction, all strain is removed from the Kingpin and carried by the sturdy ball races.

Bond Casters will stand heavy loads and sudden shocks that would mean disaster to ordinary casters. They swivel freely and easily in any direction, even when fully loaded.

The Bond Line of Truck Casters offers a type scientifically designed for every kind of industrial service.



Patented
Double Ball Race Type

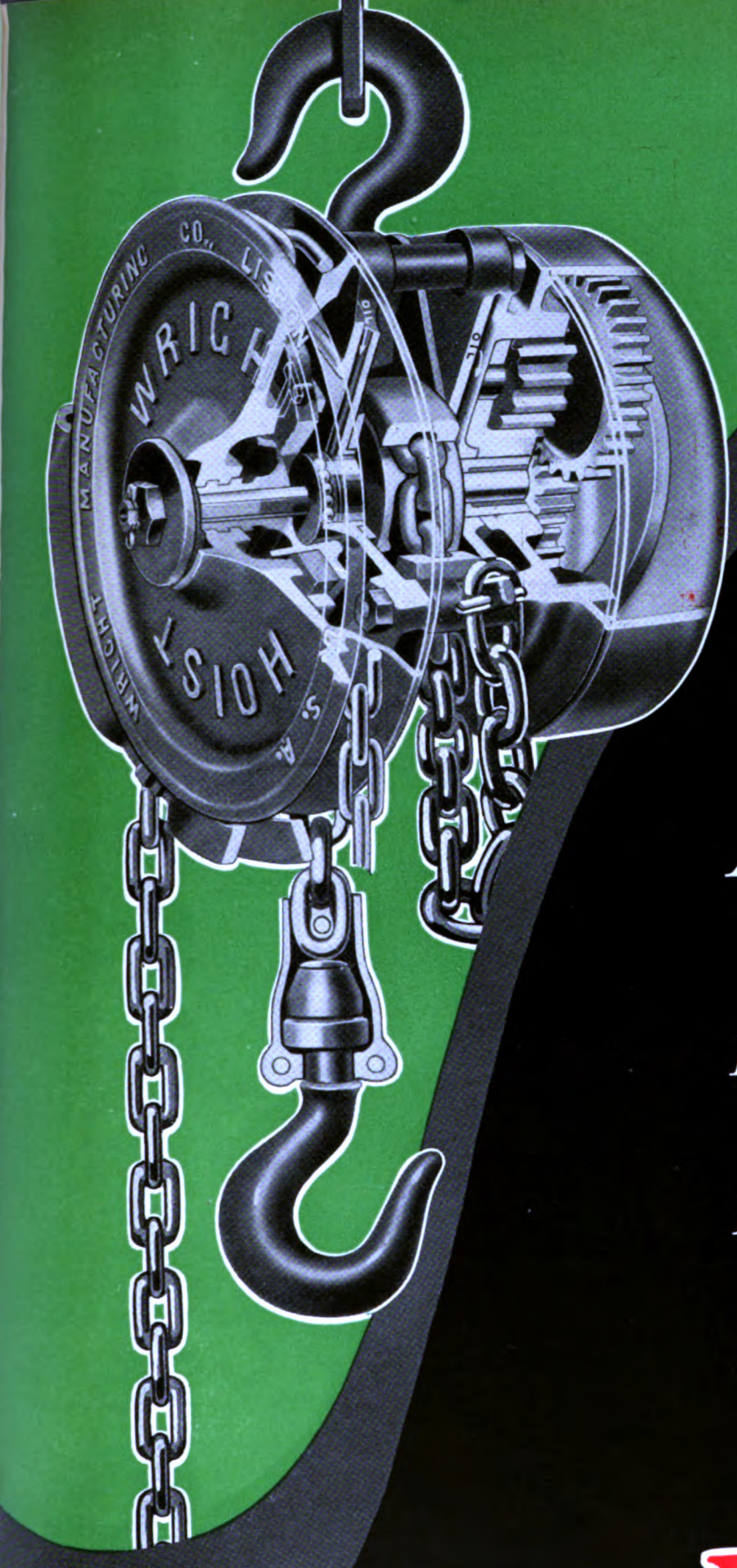
Send for illustrated catalog—You'll find it helpful

BOND FOUNDRY AND MACHINE COMPANY

Manufacturers of Truck Casters, Commercial Roller Bearings and Power Transmitting Machinery

Manheim, Lancaster Co., Penna. New York Office: 256 Broadway

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A Super Chain Hoist

A Mechanical Colossus

Perfect in construction, absolutely dependable in action, husky in service, and extremely easy in operation.

Exclusive Features?

Yes, for years, but like all super tools it has been imitated, copied—

But Still It Leads

On the other side of this page are a few of its Super Points Plus—reasons why you should specify, use, demand—

WRIGHT

HIGH SPEED

HOISTS

AND THE BEST JOBBERS CAN SUP

STAFF

21 Points Plus of Hoist Superiority found in the WRIGHT

1 TIMKEN TAPERED ROLLER BEARINGS
Eight to each trolley.

2 STEEL SIDE PLATES
Bumpers protect wheel flanges and treads.

3 CHILLED TREAD WHEELS
Absolute roundness insures ease in handling load.

4 STEEL EQUALIZING PIN
Permits placing trolley on I-Beam at any point and insures equal distribution of the load on the four Wheels.

5 STEEL HANGER PLATE
May be eliminated and hook hung on equalizing pin to save headroom.

6 STEEL HOOK—DROP FORGED—PROOF TESTED
The strongest part of the hoist This hook never opens to drop the hoist and load.

7 STEEL DROP FORGED CROSS HEAD

8 SAFETY LOAD CHAIN GUARD
Completely shrouds the upper half of load wheel, holding six links of load chain in wheel at all times.

9 STEEL LOAD WHEEL
Special analysis electric steel casting, annealed.

10 OIL TUBES
To insure positive and easy lubrication at vital points.

11 MAIN DRIVING SPINDLE AND PINION
Upset forging S.A.E. steel 1035 —heat treated.

12 BRONZE BUSHED LOAD SHEAVE

13 BALL BEARING DRIVING SPINDLE
Where speed is greatest. Not subjected to heavy and shock loads. Eliminates wear on this part.

14 STEEL SUSPENSION PLATES
An extra precaution to care for heavy overloads.

15 NON FOULING HAND CHAIN GUIDE
(Malleable Iron)

16 GEAR COVER—EXTRA HEAVY
Pressed from 1/8" plate. Insures permanency.

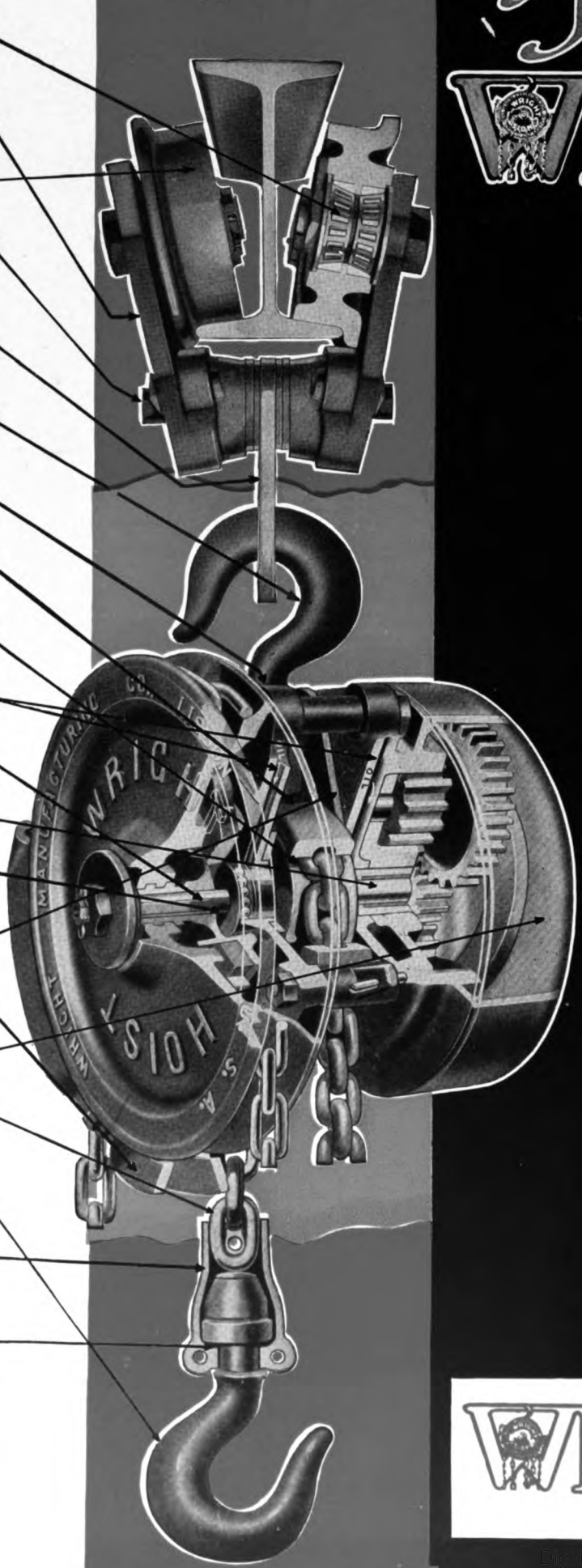
17 STEEL CHAIN—ELECTRIC WELDED
Special heat treated and proof tested. An elastic limit 4½ times rated capacity, and breaking strength 6½ times rated capacity

18 STEEL HOOK—DROP FORGED —PROOF TESTED
Never opens to drop the load.

19 DETACHABLE STEEL COUPLING—DROP FORGED
Completely enclosed Ball Bearing. Easily detachable to renew chain. Load is *not* held on connecting bolts but by the forgings.

20 BALL THRUST BEARING ON BOTTOM SWIVEL HOOK
Permits easy swiveling of load. Insures load chain hanging straight and feeding perfectly straight into load sheave pockets. This insures longer life to chain and wheel the greatest point of friction and wear.

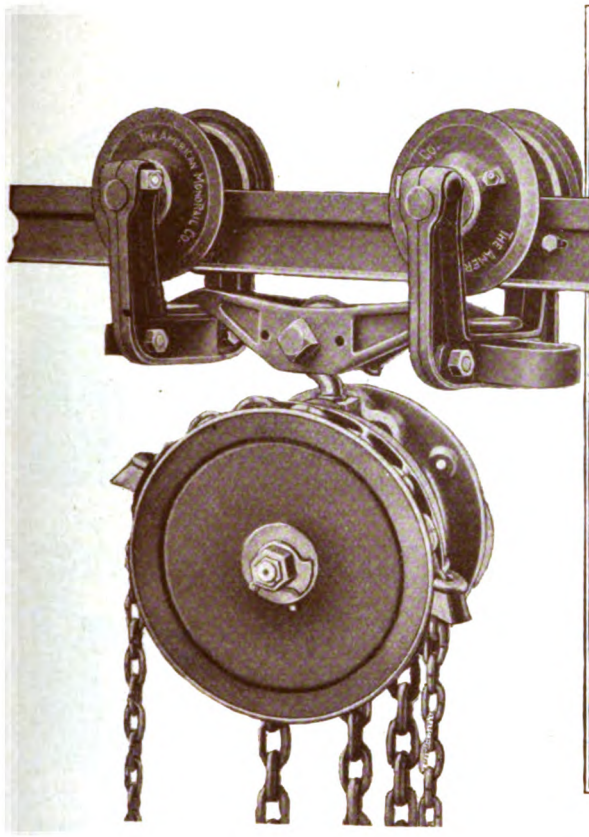
21 OIL CUPS SPRING COVER IN ALL OIL HOLES

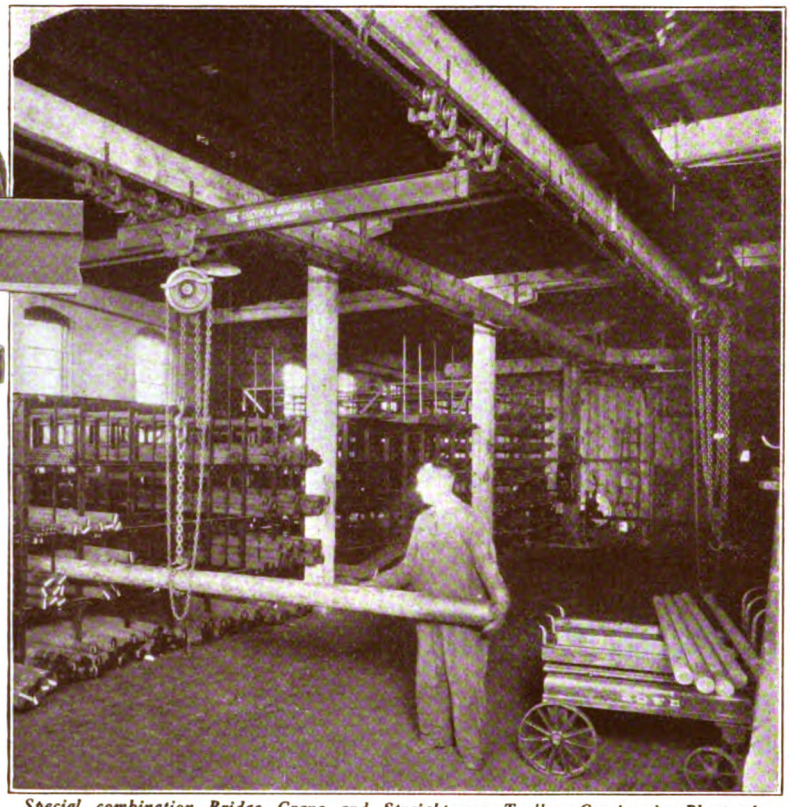


Ask Us About Them

WRIGHT
MANUFACTURING COMPANY
DAYTON, OHIO.

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Special combination Bridge Crane and Straightaway Trolley Carrier in Plant of Super Steels, Inc., Cleveland, Ohio

New Values in MONORAIL *Handling Systems*

SUPERIOR POINTS

1. *NEW RAIL DESIGN.* Two special twin sections bolted together, back to back, forming a solid MonoRail Unit. Eliminates splices, bolted hangers, trolley interference and provides increased strength. No other system provides such advantages.
2. *BOLTS AND NUTS AUTOMATICALLY LOCK.* Special design machine screw bolts clamp sections together and when nuts are drawn tight both bolt and nut are automatically *LOCKED.* Positively cannot work loose. No other system has this feature.
3. *HANGERS.* One piece, drop forged. No bolts. Clamped inside instead of outside of rail. No interference between trolley wheels and hangers. Assembled with MonoRail before shipment. Adapted direct strap or adjustable bolt suspension. Fewer parts and less handling on job. No other system has such features.
4. *NO SPLICE CLAMPS.* Twin MonoRail sections are assembled with overlapping ends, securely bolted, breaks staggered opposite side of rail; eliminates weak, rough joints, prevents deflection and provides smooth runway. No other system has this feature.
5. *NEW TYPE SAFETY SWITCH.* Fewer working parts all bolted to solid steel mounting plates. Every nut locked. Open rail guards attached to switch tongue. Absolutely cannot fail to guard open rail. Operation easy, quick and always in perfect alignment. No other system has such a switch.
6. *TROLLEY.* Entirely drop forged except special adaptable steel load bar. Ball bearing wheels. Forged load hooks, eyes, clevis or bolt. Strong, safe.

NEW improvements and values represented in the design and manufacture of American MonoRail have won instant favor and approval at the hands of plant executives and engineers.

FORGINGS AND STEEL

Railroad steel monorail. Forged supporting hangers. Forged trolley frames. Forged trolley wheels on high duty ball bearings. Steel load bars. Steel mounting plates for switches. No splicing clamps. Overlapping rail ends bolted solid. MonoRail shipped with hangers assembled. Easy to bend and form on the job.

SAFETY, STRENGTH, LOW COST

These features offer unusual value in safety and strength, smooth and easy operation and lower installed ready-to-use costs.

COMPLETE MONORAIL EQUIPMENT

Tracks, Trolleys, Switches, Cranes, Hoists, Elevators, Turntables and Special Equipment for Special Applications.

LAYOUT SERVICE

A highly trained field organization is ready to render immediate and complete advisory and layout service without expense or obligation.

Suitable for every kind of material handling. Capacities 10 lbs. to 4,000 lbs. Write for bulletins.

The American MonoRail Company

West 67th & Pear Ave.,
Cleveland, Ohio

AMERICAN SYSTEM MONORAIL

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10 TON

Move Heavier Loads

Without Building Changes

YOU don't need to put in special equipment or remodel your present building to handle more materials or larger and heavier loads. Use an Elwell-Parker Tructor! These electric trucks have capacities of from 2 to 10 tons. All they need is a floor, runway or road to travel over. A Tructor can be used for conveying, stacking, piling, cross-handling, yard-handling—most any job where materials must be moved quickly and economically.

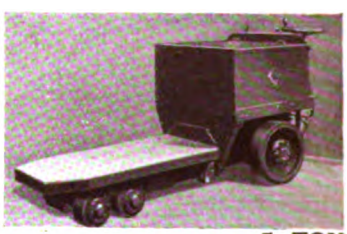
A Real Pace-Maker

In fact a Tructor speeds up the work so remarkably that in many plants it is called a "Pace-Maker for Production." It will keep high-speed, expensive tools and special machinery up to capacity. It will keep production going through smoothly. It will release men for other work. In fact a Tructor will make tremendous savings in your handling costs.

Electric Lift Tructor

Pictured here are five sizes of one style of truck—the Lift Tructor—with capacities from two to ten tons. One concern uses 30 of the 10-Ton Tructors, which have been largely responsible for saving at the rate of over $400,000.00 per annum. Many plants use 10 to 30 of the 2-Ton and the 3-Ton units. Then there is the low bed two-tonner to carry hand lift truck skids.

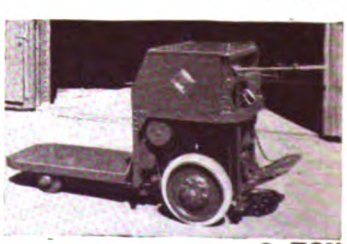
Tell us what your individual problem is and we shall be glad to have our engineers suggest ways of handling your work easier, quicker and more economically. We have 20 years' experience in building electric mobile transporting and storing equipment. Surely, with such a background we can help you lower your costs. Write us.



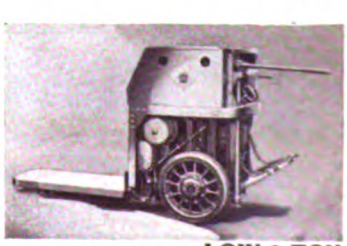
5 TON



3 TON



2 TON



LOW 2 TON

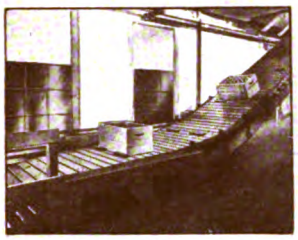
THE ELWELL-PARKER ELECTRIC COMPANY
"Pioneer Builders of Tructors"
CLEVELAND, OHIO
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TRUCTORS
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A panorama of cost-cutting opportunities



Platform Conveyor handling cased bottles



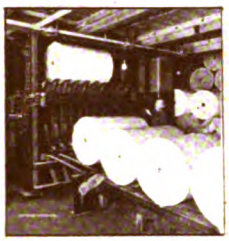
Chain Conveyor for motor assembly



Chain Conveyor for automobile assembly



Battery Assembly Conveyor



Tray Elevator Handling ½ ton paper rolls



Slat Warehouse Conveyor



Barrel Elevator handling oil barrels



Slat Conveyor handling automobile parts



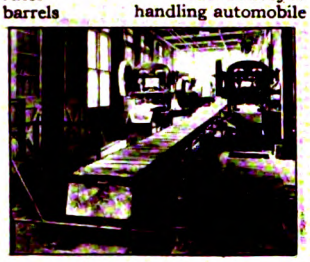
Barrel Elevator handling oil barrels



Platform Conveyor handling bales



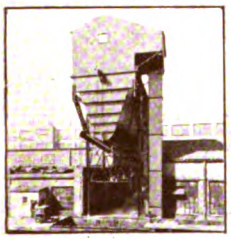
Apron Conveyor handling battery parts



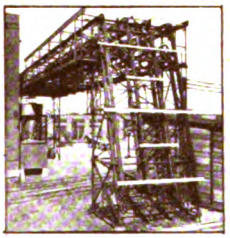
Apron Conveyor for handling battery grids



Platform Conveyor handling heavy automobile parts



Coal-handling Bucket Elevator and Bunker



Lumber Conveyor



Elevating and Lowering Machine for paper rolls



Elevator for handling boxes, bags, barrels



Sand Elevator



Belt Conveyor in cement mill

A few of many installations of G-W Material Handling Equipment, indicating the many forms in which this equipment is made and the wide range of the materials it handles.

Your request for our engineering advisory service or for a copy of our comprehensive, fully illustrated Material Handling Catalog No. 98 would be welcomed.

GIFFORD-WOOD CO., *Main Office*: 16 Hill St., Hudson, N. Y.
New York: 50 Church Street — Chicago: 565 W. Washington Street
Boston: 222 State Street — Pittsburgh: Peoples Bank Bldg.
San Francisco: 1274 Folsom Street



Apron Conveyor handling scrap metal

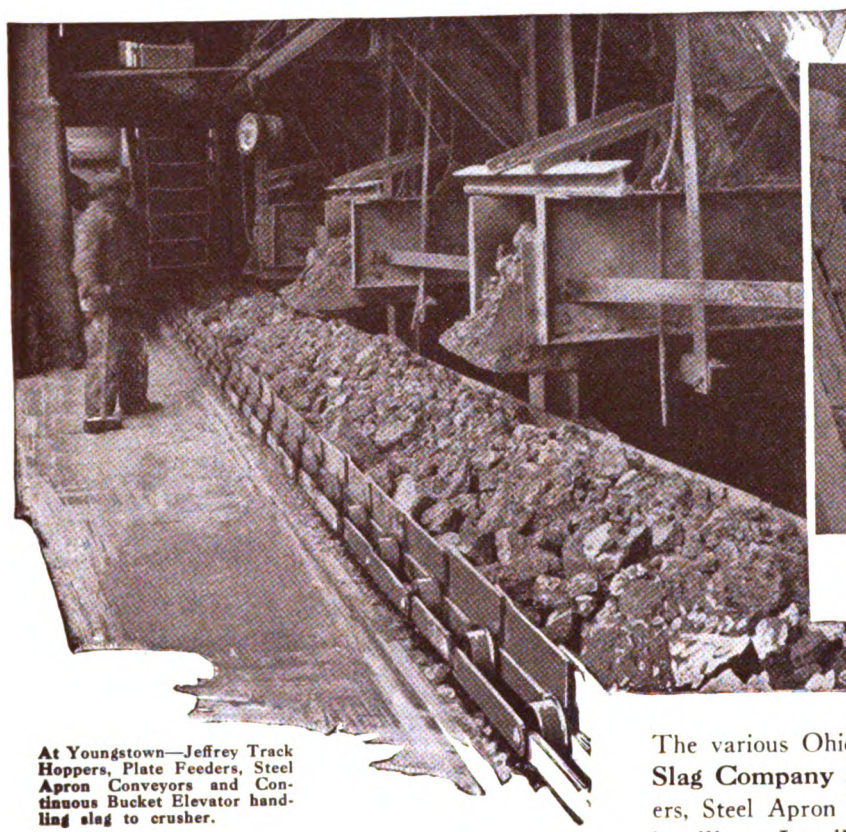
Gifford-Wood

BUILT STRONGER LASTS LONGER

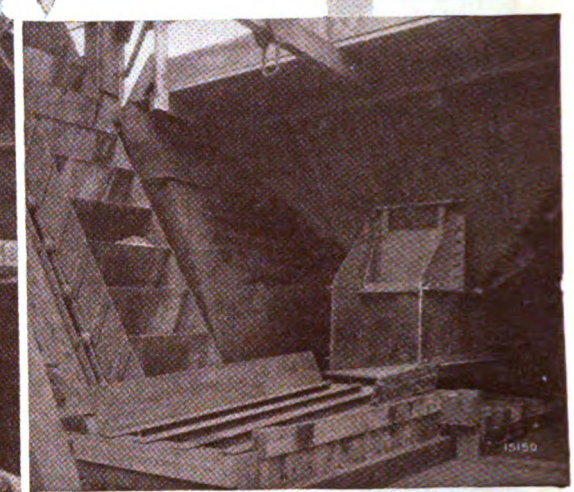
MATERIAL HANDLING EQUIPMENT

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These Standard Slag Company Plants served by Jeffrey



At Youngstown—Jeffrey Track Hoppers, Plate Feeders, Steel Apron Conveyors and Continuous Bucket Elevator handling slag to crusher.



At Canton—Jeffrey Continuous Bucket Elevator receiving slag direct from Jeffrey Track Hopper and Plate Feeder.

Youngstown
Canton
Dover
Bellaire
Jackson
Leetonia
Lowellville
W. Middlesex

The various Ohio and Pennsylvania plants of the **Standard Slag Company** are extensive users of Jeffrey Hoppers, Feeders, Steel Apron and Belt Conveyors, and Elevators for slag handling. Installations at the Youngstown and Canton plants (shown here) are typical examples of Jeffrey Equipment meeting hard service requirements.

Proof of the satisfactory way in which Jeffrey Screening, Washing, Elevating, and Conveying Equipment is handling Sand, Gravel, Crushed Stone, Slag and other similar materials, is found in its *continued* selection by leading plants similar to the one mentioned here.

Plan to lower your handling cost with Jeffrey Equipment.

The Jeffrey Manufacturing Company

946-99 North Fourth St., Columbus, Ohio

New York	Scranton, Pa.	Chicago	Salt Lake City
Buffalo	Boston	Detroit	Los Angeles
Rochester, N.Y.	Cincinnati	Milwaukee	Birmingham
Philadelphia	Cleveland	St. Louis	Charlotte, N.C.
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JEFFREY
MATERIAL HANDLING EQUIPMENT

JEFFREY PRODUCTS
Elevators—Conveyors
Portable Loaders
Coal and Ashes Handling Equipment
Skip Hoists
Chains and Attachments
Sprocket Wheels—Gears
Crushers—Pulverizers
Sand and Gravel Handling, Washing and Screening Equipment
Locomotives
Coal Mine Equipment
Tipple Equipment
Ventilation Fans

For products not advertised in this issue write Industry Illustrated

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A Big Improvement on the Old Hand Truck!

HANDLING loads of six or seven thousand pounds all day, their broad, flat wheels working equally well in yard or shop, a battery of eight Baker elevating trucks are regularly doing three times the work at half the cost of hand trucking in one of the larger forge plants. May we show you how Baker machines can help you correspondingly?

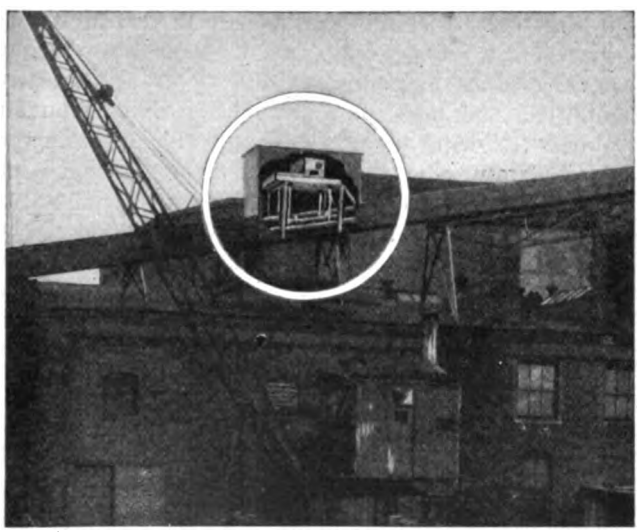
THE BAKER-RAULANG CO., Cleveland, O.

ELECTRIC TRACTORS AND TRUCKS

TRADE-MARK REG. U.S. PAT. OFF.

Baker





Weigh as You Convey and Eliminate Losses

What check have you on materials handled on conveyors? Your bills of lading are not always correct. The chance for error is always present.

Conveyors equipped with Merrick Weightometers are assured of an accurate check on all conveyor handled materials—99% accuracy guaranteed—ore, sand, stone, gravel, coal, coke, finished cement, etc. The weighing is done while the materials move along and the weights recorded. It is ideal for checking receipts, shipments and interplant movements.

Write for the "Merrick Catalog." It explains how it works.

MERRICK SCALE MFG. CO.

180 Autumn St. Passaic, N. J.

SOS help!

Are you saving your belts and machinery?

IT is an awful thing for you to neglect your own pocketbook, particularly when you may be losing large amounts of money in losses due to belt slip and belt deterioration. Cling-Surface is more than a belt treatment, more than a preserver of practically every type of belt in use. It stops slipping, it prevents hot-boxes, it reduces costly shutdowns to a minimum.

Send us an "SOS" in the form of this coupon. You will want to thank us and continue to do business with us if you do so.

Cling-Surface — preserver of belts—has been made for thirty years by the only company whose sole product is belt treatment. It is used in every country of importance in the world. It saves belts and machinery. It increases transmission efficiency and prevents all loss due to slipping.



CLING-SURFACE COMPANY

PRESERVES BELTS—ELIMINATES BELT SLIP

FREE 60 Day Return Privilege COUPON

Conditions in our plant are about as checked:

☐ cold ☐ hot
☐ damp ☐ dry
☐ dusty ☐ clean

F.O.B. nearest Warehouse.

Cling-Surface Co., 1056 Niagara St., Buffalo, N. Y.

Here is my "SOS" for a tin of the size checked. If satisfactory, I shall pay in 60 days. Otherwise, no pay.

( ) 3 gal. tin @ $3.40 gal.
( ) 6 gal. tin @ $3.25 gal.

Company .....Attention.....

Address II-11-26

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"43"

Makes Buying Easy — and Economical!

There *is* a good rule to buy by. You can say it two ways in three words:—(1) Concentrate your purchases; (2) Medart Catalog Forty-three.

Medart Catalog 43 is *primarily* a buying guide and *incidentally* a catalog. Between its covers you will find concentrated instructions for concentrated buying of "Everything in Line Shafting Equipment"—the safe, quick, convenient, easy, economical method of buying power transmission machinery so as to save time, freight and (last but not least) money! It is also an Engineering Hand Book, but it is so simply written that you don't have to be an engineer to use it in your daily work.

Remember the name and the number:—"Medart—43." Send for copies today. This guide is useful to superintendents, purchasing agents, owners, managers, master mechanics, as well as designers and draftsmen who plan power transmission installations; likewise to dealers and salesmen of power transmission machinery.

THE MEDART COMPANY
(Formerly Medart Patent Pulley Co.)
General Offices and Works, St. Louis, U. S. A.
Offices in Chicago, Philadelphia, Pittsburgh, New York and Seattle
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Manufacturers of Power Transmitting and Kindred Machinery

MEDART
Everything in Line Shafting Equipment

Scientific Ventilation and Industrial Efficiency

The Results and Conclusions Derived from a Series of Tests

By Uthai Vincent Wilcox

THAT tired, all-gone feeling, and that dragged out sensation can be cured more easily by scientific ventilation than by drinking Dr. Quack's patent medicine. Furthermore, air of the right temperature, with the right amount of water content or humidity, will increase the efficiency of employees who work indoors.

A series of tests on government workers carried out by the Bureau of Mines and the United States Public Health Service demonstrated that ventilation means much as regards healthful working conditions. The tests also showed that the individual in good health, not too much over-weight, or too much under-weight could more easily endure the hot days of summer-time.

More than one hundred tests were carried on in chambers where the air could be controlled as to its humidity and its temperature. The more nearly normal the weight of the worker the better the result of the tests. These workers when subjected to high temperatures lost weight but reached a normal degree of efficiency sooner than the workers who were thin and lost but little weight but experienced a greater degree of exhaustion from which it took them longer to recover.

It was found that the human body at rest in still air cannot endure for any long period a temperature higher than 90 degrees Fahrenheit with 100 per cent. relative humidity. The tests showed that the exhaustion and weakness following subjection of human beings to a very high temperature and humidity for a short period is not so severe as subjection to a moderately high temperature and humidity for a longer period. The pulse rate rather than the rise in body temperature, apparently determines the extent of discomfort, the subjects becoming very uncomfortable after the pulse rate exceeded 135 pulsations per minute, and complaining of very distressing symptoms when the pulse rate exceeded 160 per minute.

Rested in Well Ventilated Rooms

A testimonial to the effect of properly ventilated rooms on the efficiency of workers was the use of such a chamber for the recuperation of those subjected to the tests. It was found that rest for two hours in such rooms placed the body in a high state of efficiency, and acted as a preliminary conditioning.

Neither very thin workers were used nor very stout ones, but the results, the physicians stated, were applicable to larger ranges of weight. The individuals ranged from 99 pounds to 145 pounds. Under identical conditions those between 99 and 120 pounds lost less weight than those from 140 to 145 pounds, but their feeling of distress was greater and they made a slower recovery. Those who entered the chamber in a happy mood and jokingly soon became restless and irritable, complaining of headache and palpitation of the heart. They experienced urgent thirst, heaviness in the chest, and their

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Seven Management Duties of Our Foremen

1. Take an active part in effecting cost reduction
2. Learn to manufacture with minimum of stores
3. See that material formulae are adhered to regularly
4. Maintain accurate check on material quantities
5. Make daily man-hour and production report
6. Maintain physical orderliness in material stores
7. Study the more important quantitative and financial facts of their departments

— FACTORY

"Control of material is the starting point in control of finances."—Geo. Marion Brown, President Certain-teed Products Corp., in "Factory."

4 out of 7

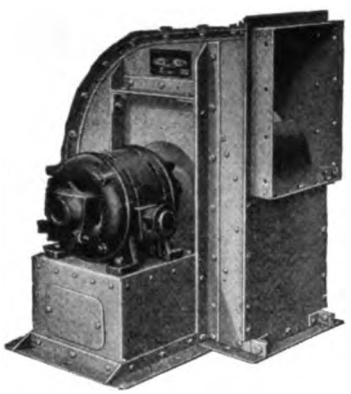


When a Durand engineer comes into your organization to make a material control survey, you are assured of an industrially intelligent recommendation, based on your storage requirements — bins for heavy materials in quantity, racks for bulky packages, shelves for lighter storage, and box inserts with adjustable dividers for lesser quantities of small articles.

Allowance is made for Durand Steel Shelving advantages — reduction of inventory through better stock control, increased storage capacity, decreased floor space, easy and rapid adjustability to meet changing storage needs and interchangeability of parts for rearrangement to accommodate stock increases and decreases, as well as additional items.

We will gladly send an attractive catalog and full information on the construction, application and economies of Durand Steel Shelving for material control — WRITE US.

DURAND STEEL LOCKER CO. INC.
1539 FIRST NATIONAL BANK BLDG.
CHICAGO, ILL.



TYPE ME FAN

Certified Performance Guaranteed Ratings

It will pay you well to look over the certified performance sheets of the New Type ME Fan — tested by competent, disinterested, outside engineers in their own laboratories.

Unsurpassed in mechanical efficiency and performance by any fan of its type now on the market, the ME Fan commends itself to the discriminating buyer.

Let us submit the evidence.

Write for Catalog No. 100— a 32 page book on air moving

Fans
Unit Heaters
Air Washers
Blowers
Furnaces

NEW YORK BLOWER COMPANY

General Offices
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Chicago

Adjustable ranges:
17-23"
21-27"
25-31"
28-34"

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chair



For 9 **years** Royal Seats of Production have incorporated not only posture and health principles, but have essential common sense working comfort, without which posture alone cannot increase production.

Adjustable chairs with broad seats and properly fitting backs reduce fatigue, diverting lost energy to greater output.

Over a thousand of the largest factories have proven that a Royal Adjustable Factory Chair costs less than a tired worker.

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Largest Manufacturers of Industrial Chairs and Stools
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Like LENOX WOLVES
They Ripped and Slashed
and Tore Their Way

No brainier, more courageous, more daring group of men have ever been assembled than that fearless little clan MacFarlane,—established by the old Earl of Lenox along the Western shores of Loch Lomond.

Bred among the rocks and forests and reared in that turbulent Borderland where the Highlands and Lowlands meet, they had to be strong, courageous and resourceful to live.

In battle they were terrors! They were hailed by the same name as the savage bands of wolves among which they had grown up —Lenox's Wolves. And they were well named, for they like Lenox Wolves ripped and slashed and tore their way.

Modern "Wolves of Lenox" are Lenox Band Saws, which like their worthy namesakes are noted for their sturdy strength, their uniformity of performance and the precision with which they cut through the toughest metal.

Remember to ask for Lenox Band Saws.

"The Tools in the Plaid Box"

American Saw & Mfg., Co.
Springfield, Mass.

LENOX  BAND SAWS

eyes became inflamed. It became an effort to speak. Dizziness and confusion followed. Weakness and a dragged out feeling continued for some time after leaving the warm rooms, depending upon whether under-weight or of normal weight. A metallic taste in the mouth was noticeable and persisted for two or three hours after the experiment.

These various symptoms, according to the physicians conducting the health experiments, should be of value to employing foremen and managers and worth noting for the benefit of workers complaining of them during summer days.

The longest test period was three and one-half hours and the shortest was twenty-five minutes. In one test the temperature was 112 degrees with a 100 per cent. relative humidity. A man weighing 140 pounds lost over three pounds in forty-eight minutes. Another man in the same test weighing but 99 pounds lost but one and one-third pounds but suffered more and for a longer period than the man of nearer normal weight.

Ice water was given to these workers who had tried to carry on in high temperatures such as would be found during summer periods. Two of the men drank a quart of ice water in less than fifteen minutes. The result upset theories as to cramps sometimes said to follow. These men regained a large portion of their lost weight and suffered no ill effects and were able to reach a higher degree of efficiency than those who took no ice water at all.

Not All Can Stand High Temperatures

Office managers and efficiency experts would note the fact that not all workers could stand with equal fortitude high temperatures. Where the pulse rate was 149 beats to the minute, the fatigue and weakness that followed lasted longer than when the pulse rate went to 162 beats for only a short period.

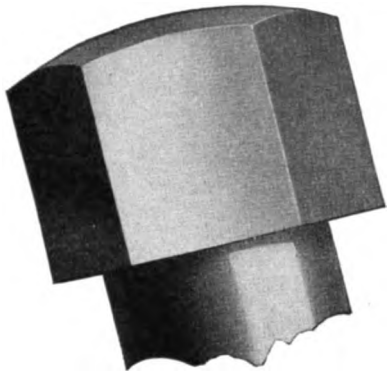
The rise in blood pressure was noted as having to do with the efficiency of the workers and was different in individual cases. As in the pulse counts that for some would reach 160 and for others 180 in the same length of time, the blood pressure would vary. At 30 per cent. relative humidity the distress due to blood pressure began around 120 degrees Fahrenheit, at 60 per cent. around 104 degrees and 100 per cent. around 92 degrees. The sensations complained of were first a slight palpitation of the heart, which increased in severity until a feeling of dizziness and "floating in the air" sensations followed. followed by numbness and soreness of the face, and nausea.

It was noticed that when high temperatures were provided the sweat from trying to carry on work would reach the eyes and cause inflammation. This would reduce the efficiency of the worker in the use of his eyes. Sweat bands applied during the experiments made it possible for the eyes to function at their normal efficiency regardless of the temperature.

The value of these experiments lay in understanding what workers could stand and proving how scientific ventilation would bring a higher degree of efficiency among workers and less danger of accidents and poor work and days lost due to poor health. Where atmospheric conditions could not wholly be controlled there was shown the need of cold drinking water, rest periods for under-weight employees, health examinations for discovering weakness of the heart and respiratory organs.

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Cap Screw Heads that are consistently perfect



"If it's upset— it must be heat-treated"

A broad statement to make—but one that any user of Ferry Heat-Treated Cap Screws will admit.

The heads of Ferry Cap Screws are clean cut, smooth, and true.

Made so by the famous Ferry patented die compression principle of forming heads and the careful machining of them.

When in need of Cap Screws, ask for Ferry Cap Screws and get the best at no additional cost over ordinary screws.

THE FERRY CAP & SET SCREW CO.
2151 Scranton Road Cleveland, Ohio

FERRY
PROCESS SCREWS

RUSH ORDERS

Disrupt Production Schedules

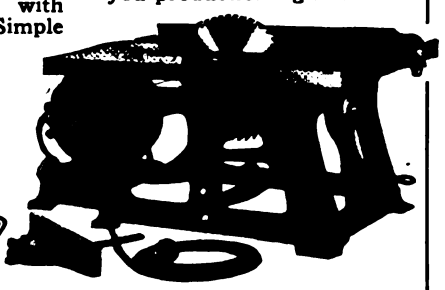


Portable Bench Machines will handle many of these Rush Orders and your large machines remain on scheduled work.

H&A Bench Machines are built for Production Work. Many plants are saving money by using them on regular production operations. It will pay you to consider them.

Send us a description of your work and we will give you production figures.

Sturdily built with plenty of power. Simple in operation. Cost very little for current. Sold on a guarantee of satisfaction. Hundreds in use. Your dealer sells them.



Portable Electric H&A Bench Machines

Ask for our new catalog showing our complete line of Bench Woodworking Machines. It is free.

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for Accuracy and Precision

Skilled workers who take exceptional pride in their work and who know what good files are, almost invariably choose Grobet Swiss Files.

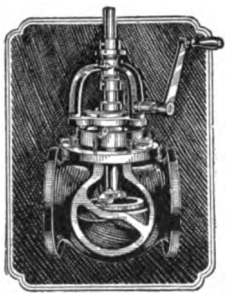
Then and then only can they be assured of accuracy and precision on filing jobs.

Ask for the genuine Swiss file—Grobet File—on your next order.

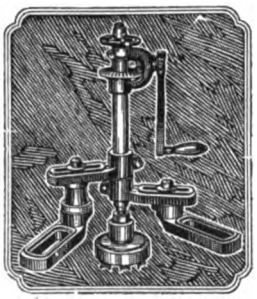
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GROBET FILE CORP. OF AMERICA
3 Park Place, New York

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Dexter
Globe Valve
Reseating Machine



Dexter
Pump Valve
Reseating Machine

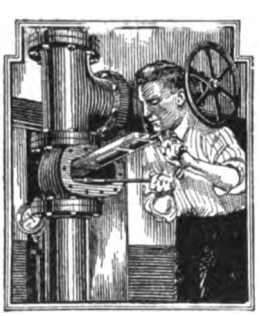
Here's an Easy Way to Cut Down Expenses

Valve replacements and repairs represent one of the largest maintenance expense items in your plant—unless you're equipped with a Dexter Valve Reseating Outfit.

The Dexter Outfit cuts this expense 90% or more and eliminates leakage losses by keeping every valve steam or fluid tight without taking it out of the line.

Tell us the number and sizes of globe valves, gate valves and reciprocating pumps in your plant and we'll show you in dollars and cents what you can save annually with the proper Dexter outfit.

Let us send you Catalog 23 containing complete information and prices.



Dexter
Gate Valve
Reseating Machine

THE LEAVITT MACHINE CO.

27 East River Street, Orange, Mass., U. S. A.

Canadian Agency: Darling Bros., Ltd., 120 Prince St., Montreal

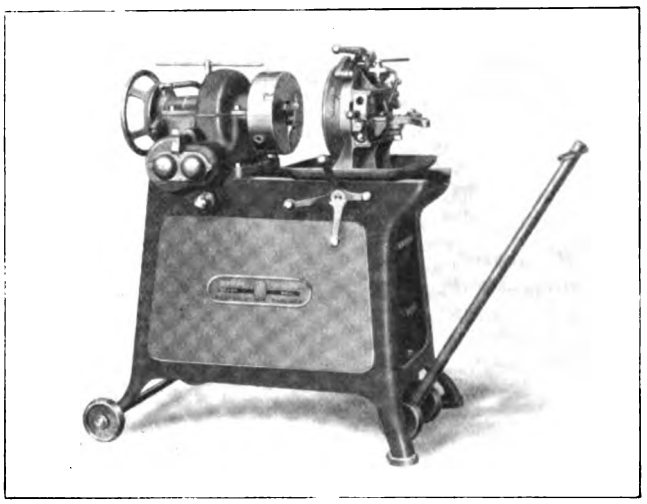
British Agency: Cromil Engineering Co., E. Floor, Milburn House, Newcastle-on-Tyne

309

Valve Reseating Dexter Machines

A New Pipe-Threading Machine

HALL-WILL, INCORPORATED, of Erie, Pa., have recently placed on the market the Red-E-Hall Portable Electric Pipe Machine, with a capacity of from ¼" to 2" pipe and ½" to 1½" bolts. The machine can also be used as a power unit, using universal shaft, to drive hand stocks up to 12". Designed as a portable machine, it is said to be readily convertible to a stationary machine; the change being effected in a few minutes' time.

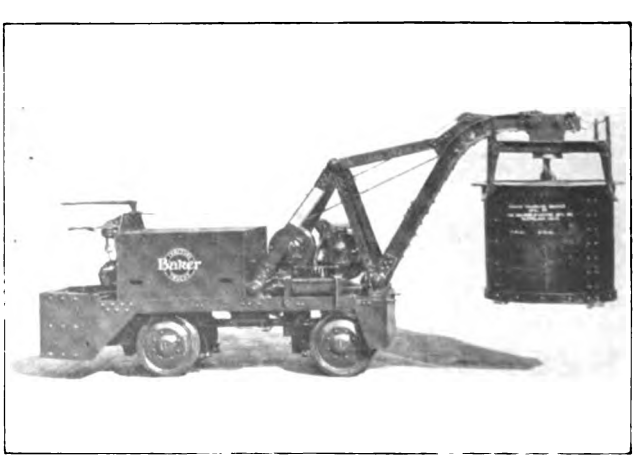


The following specifications are supplied by the manufacturers:

Speeds—19, 34, and 69 r.p.m. of spindle.
Carriage travel—11".
Shortest length of pipe cut off—7".
Shortest length threaded—Close Nipples.
Diameter of hole in spindle—2⅞".
Diameter of hole in head—3".
Motor—1 horsepower, reversible, A. C. or D. C. Any phase or frequency.
Motor speed—1750 r.p.m.
Floor space—30" x 26".
Height over-all—43".
Height floor to center of spindle—35¾".
Weight—net 450 lbs.

An Electric Cupola Charger

THE accompanying photograph shows a crane type of electric truck recently designed by the Baker-Raulang Company, Cleveland, Ohio, for cupola charging.



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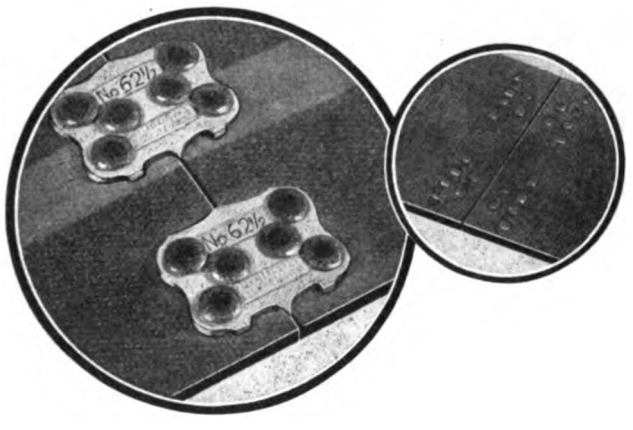
"Red Shield" High Speed Drills

STAND SEVERE SERVICE

THE STANDARD TOOL CO.

CLEVELAND

New York: 94 Reade St. Chicago: 552 W. Washington Blvd.
Fredk. Pollard & Co., Ltd., London and Leicester, England
Paris, France—Burton Fils Copenhagen, Denmark—Niensted & Co.



THE NEW BELT FASTENER

"Standard" Self-Aligning
Stronger—More Serviceable—Longer Life

Users of belt fasteners and belt manufacturers who realize how difficult it is to properly apply belt fasteners will appreciate the following features in Standard Self Aligning.

Self Aligned Plates. The strain is equally distributed on each fastener.

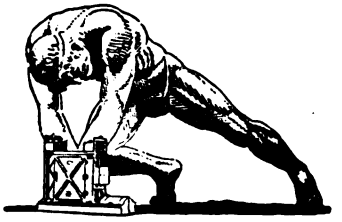
Rivets are self aligned lengthwise of the belt; the right way. The plates are rust proof and will give longer service than other plates.

Their construction guarantees a strong, durable, and expert job in a jiffy, and you don't throw them away every time you take up a belt.

Send for samples to compare with what you are now using.

THE BOURNE-FULLER CO.
Upson Works
Unionville, Conn., U. S. A.
Also manufacturers of Standard Malleable and Steel Fasteners
Upson Bolts—Nuts—Rivets and "Climax" Wire Rope Clips

Specify a Schick



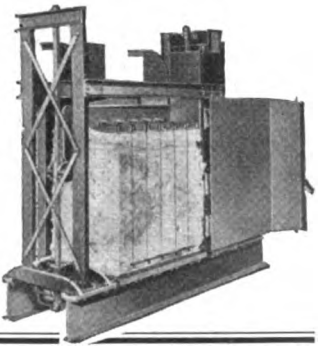
for difficult baling operations

No baling operation is too difficult for a Schick—the "Samson of Balers." Anything from waste paper to metal scrap is quickly, easily and economically baled in one of these balers. Eight sizes provide a baler for every baling requirement. Hand-balers made made in capacities of 125 to 375 lbs., power balers 250 to 1500 lbs. Schick balers are all-steel, fire-proof and positive in operation. Depend on a Schick baler for every baling operation.

DAVENPORT MFG. CO.

Davenport, Iowa
Dept. R

Write for catalog and prices



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Oakite methods protect industry

against waste in cleaning!

PRODUCTION executives in many industries have found either through necessity born of competition, or inquisitiveness resulting from a keen desire to improve production processes, that cleaning operations frequently hide unsuspected wastes.

In bringing these to light they have been aided by Oakite service men, and through the use of Oakite Materials and Methods effected startling savings in time, money or labor, or other worth-while accomplishments.

Cleaning operations, because they so materially affect those subsequent to them, offer one of the most promising fields for cost reduction.

If you are not sure your cleaning operations are being performed as economically, speedily and thoroughly as you think they should be, ask to have one of our service men call.

Take advantage of his wide experience in cleaning. He has helped others—find out what he can do for you. Write us today. No obligation.

Ask for Oakite Booklets bearing on your work



Oakite Service Men, cleaning specialists, are located at

Albany, Allentown, Pa., *Atlanta, Ga., Baltimore, *Boston, Bridgeport, *Brooklyn, Buffalo, Camden, Charlotte, N. C., *Chicago, *Cincinnati, *Cleveland, *Columbus, O., *Dallas, *Davenport, *Dayton, *Denver, *Des Moines, *Detroit, Erie, Flint, Mich., Fresno, Cal., *Grand Rapids, Harrisburg, Hartford, *Indianapolis, Jacksonville, Fla., *Kansas City, Los Angeles, Louisville, Ky., *Milwaukee, *Minneapolis, *Montreal, Newark, Newburgh, N. Y., New Haven, *New York, *Omaha, Neb., *Oakland, Cal., Philadelphia, *Pittsburgh, Portland, Me., *Portland, Ore., Providence, Reading, *Rochester, Rockford, Rock Island, *San Francisco, *Seattle, South Bend, Ind., *St. Louis, Springfield, Ill., Syracuse, *Toledo, *Toronto, *Tulsa, Okla., Utica, *Vancouver, B. C., Williamsport, Pa., Worcester.

**Stocks of Oakite Materials are carried in these cities.*

OAKITE

TRADE MARK REG U.S. PAT. OFF.

Industrial Cleaning Materials and Methods

OAKITE IS MANUFACTURED BY OAKITE PRODUCTS, INC.

formerly OAKLEY CHEMICAL CO. 40A THAMES ST., NEW YORK, N.Y.

This machine operates in connection with Chisholm & Moore one-ton charging buckets and makes use of the Morgan patented bucket yoke.

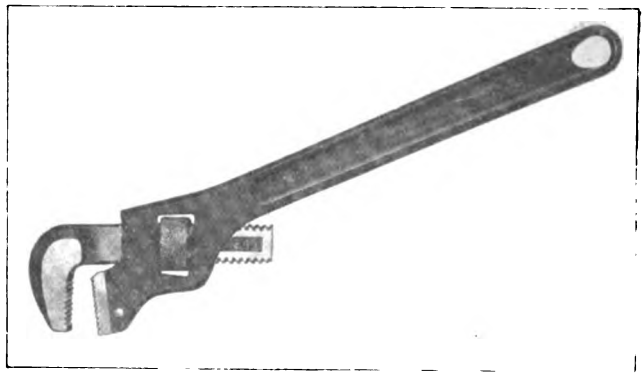
The truck itself is assembled principally of standard Baker parts; that is, the axles, controller, automatic switch, hoist, hoist controller, limit switch, etc., are all inter-standardized with all other models of Baker trucks and tractors. The motors receive power from a 48-volt storage battery contained in the large steel box near the driver's end of the truck.

The Morgan charging bucket is circular in shape with a conical bottom. In operation the bucket is loaded and picked up by means of an eye fastened to the center of the bottom. When it is raised the four dogs on the yoke engage with the angle iron ring around the top of the bucket. To discharge the bucket it is only necessary to reverse the power on the hoist. This lowers the bottom while the shell is held up by the yoke. Because of the conical shape of the bottom the charge is spread evenly around the cupola. To place the bucket back on the floor the bottom is raised until it engages the shell and raises the ring clear of the dogs. The dogs are then held clear of the ring by means of the chain leading back to the operator's position while the bucket is being lowered. The upward travel of the hoist is protected with an automatic safety switch which cuts off the power when the bucket has been raised so that the ring is one inch above the dogs.

The boom is strengthened with a steel plate on the side toward the fire. This keeps the heat away from the cable and also away from the hoist and other truck operating parts. The cable is a special steel center rope well suited for this purpose.

A New Adjustable Pipe Wrench

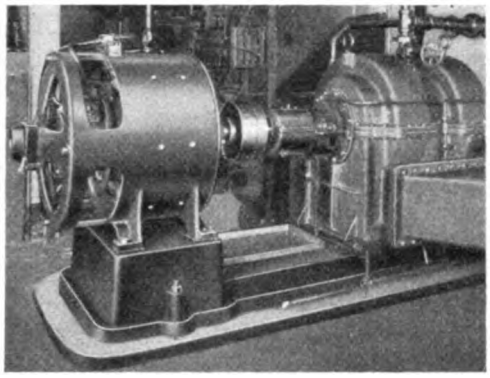
THE Lawson Manufacturing Co., Cleveland, Ohio, has placed on the market a 24-inch pipe wrench. This wrench is made entirely of drop forged steel. The movable jaw housing is forged solid with the handle, a design which is claimed to give strength and accessibility with less assembled parts. The one coil spring used in



this wrench holds the jaws open so the wrench can be put on a pipe using but one hand. The action of this spring tends to disengage the upper jaw from the pipe instead of holding it against it. This action results in a more positive release when moving the handle back to secure a new hold, and longer life of teeth.

The design is similar and an addition to other wrenches made by this company in sizes ranging from 8 to 18 inches.

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Diehl 90 horsepower motor driving condenser circulator pump

DIEHL MOTORS

It is important when installing a pump that it be the best possible to secure for the purpose and it is equally as important that the motor secured to drive the pump be of the same value. Diehl motors because of their sturdy construction and high electrical efficiency are the ideal motors for operating pumps. Diehl motors give a sure, steady, dependable flow of power that will keep not only pumps, but all kinds of general and special machinery in service. Diehl engineers will help you with your motor problems.

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BUILDERS OF FANS AND MOTORS SINCE 1888



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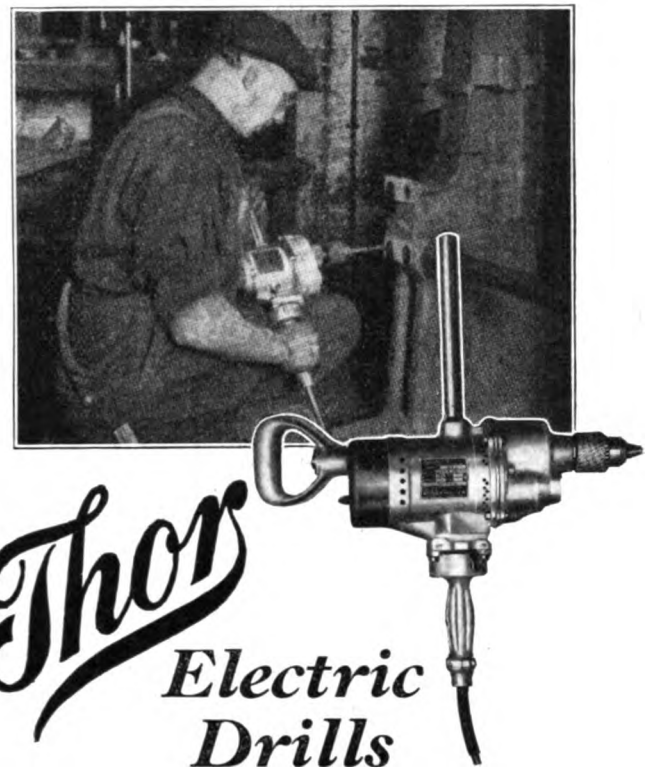
where and when needed

Let us make a survey of your lighting needs—write today for booklets, or a representative's service, or both.

The economy of an American System as compared with a flood light system is found in the fact that the light is placed exactly where needed, and it is used only when needed.

No flood lighting of great areas with the resultant shadows on the tools just where light is most needed—but light accurately placed which guarantees greater and better production.

American Fixture Company
230 West Water Street **Milwaukee, Wis.**



Thor Electric Drills

Cut Drilling Costs 90%

Try a Thor Electric Drill on any job and see the difference. It will drill holes faster. It is easier to handle and every one is built for endurance. That is why so many plants are standardizing on Thor Drills for production and maintenance jobs.

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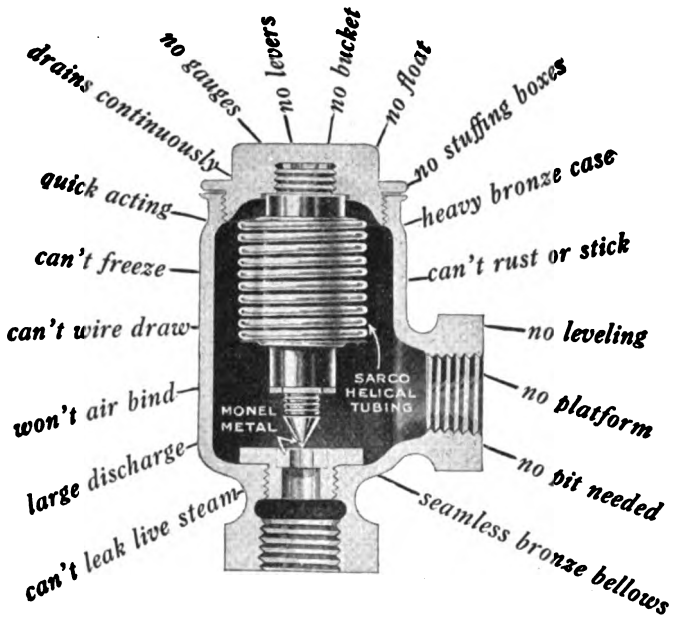
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Why pay **three** times the price of a Sarco Steam Trap for a big trap, when the Sarco does the same work and has the many advantages above mentioned?

The Sarco is self-adjusting for all pressures from 0 to 100 lbs.

Without Risk Try a SARCO STEAM TRAP

Tens of thousands of Sarco Steam Traps have been in use for years and years and are still giving entire satisfaction. We are so sure that a Sarco will do your work perfectly and save you many dollars in installation cost and upkeep that we will gladly send one on 30 days' free trial. Then if you are willing to part with it, simply send it back and the trial will not cost you one cent. Mail the coupon before you forget it.

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FREE TRIAL COUPON

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Please send the following on 30 days' free trial.
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An Appropriate Banquet Table

THE Stephens-Adamson Mfg. Co., not long ago, celebrated with an anniversary dinner the twenty-fifth year of activity in the production of labor-saving materials handling machinery. In attendance were not only the executives from the two plants—the home plant at Aurora, Illinois, and the branch plant at Los Angeles, California—but also district managers and sales engineers from Boston, New York, Huntington, Pittsburgh, Detroit, St. Louis, Chicago, and Los Angeles.

The novel banquet table arrangement shown here was entirely appropriate to the occasion as the banquet board was equipped with a complete S-A belt conveyor. The conveyor extended down through the center of the table for its entire length of sixty-seven feet. The belt was eighteen inches wide, carried on ball bearing carriers,



and operated at a speed of approximately thirty feet per minute, and was reversible. The conveyor operated with marked smoothness and to such an extent that a glass of water could be transported from one end to the other without spilling.

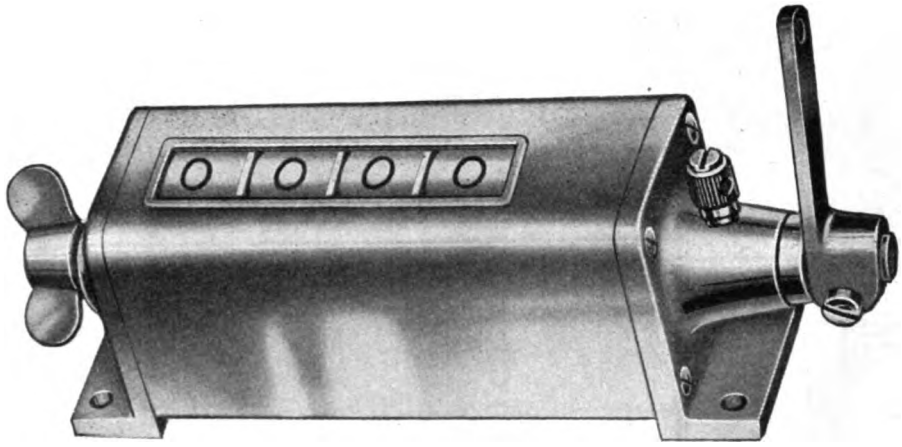
The various courses of the dinner were served on the belt conveyor, being placed on the slow-moving belt in the serving pantry adjacent to the dining hall. As the courses progressed they were taken from the belt by the guests, who found cards bearing their names neatly attached to each plate. At the termination of each course the conveyor was reversed, and the belt carried the dishes back to the kitchen.

This dinner was elaborately prepared and served without the presence of waiters or waitresses in the dining hall. While this sort of equipment might never become a commercial possibility, there were those in attendance who expressed the thought that such a labor saving device would not be beyond the realm of practicability.

A New Line of Pointer Gages

THE Hays Corporation, of Michigan City, Indiana, have recently brought out a new line of Pointer Gages for Draft, Pressure and Differentials. The type V is illustrated here. The unit shown has three scales, but can be obtained with any desired number. The more

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Veeder

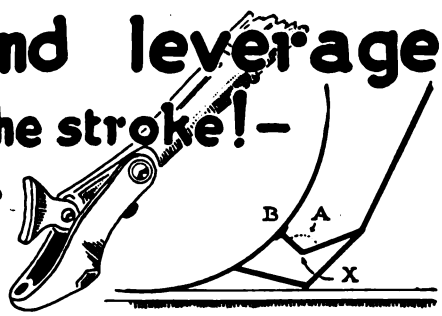
Set-Back Counter

Registers reciprocating movements of the lever, as required in counting the product of punch presses. Sets back to zero from any figure by turning knob once 'round. Price, with four figure-wheels, as illustrated, $11.50 (subject to discount). *Cut full size.*

This dial records the product of the worker—but more especially his *diligence*. It indicates either industrious work or the evident *need* of it. Putting the facts where they're seen by all, you can count on the extra effort required to show a high production at any machine. Veeder Counters fit *all* machines and help all work-situations. Like to see a book-full of the Counters?

THE VEEDER MFG. CO., 31 Sargeant Street HARTFORD, CONN.

compound leverage all thru the stroke!— real toggle action



At no time can the angle at A reach a right angle. This gives a "toggle-joint" leverage *from the very start* of each stroke of the New Badger. This leverage increases hugely as the stroke nears completion, until angle A reaches 180 degrees. The force applied at elbow X (already multiplied because of the purchase obtained thru the long handle) is stepped up to an irresistible force on the wheel at B thru this principle. That's why the New Badger works so easily.

Buy them from your Jobber.

THE ADVANCE CAR MOVER COMPANY
930 E. John St., Appleton, Wisconsin

NEW BADGER
SLIP PROOF CAR MOVERS



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WITT FACTS

You are interested in low costs. A Witt Can gives long service. That replacement cost is "cut to the bone."

Ruggedly constructed, the Witt Oily-Waste Can is solving in industrial plants the inflammable material problem, for in the handling of oily waste and other inflammable materials, it affords you positive protection against loss by fire. The Witt Oily-Waste Can carries a guarantee tag wired to the handle, guaranteeing it to outlast 3 to 5 of the ordinary type.

Win High Industrial Awards

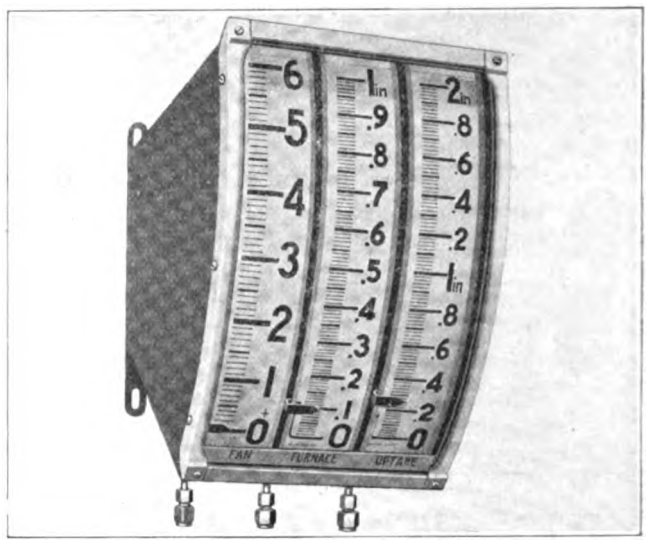
Witt Oily-Waste Cans have been tested and approved by the Underwriters' Laboratories, Inc., and the Associated Factory Mutual Fire Insurance Companies, the finest testimonials that such industrial equipment can win.

See your local dealer for more detailed information—he will gladly show you why you need Witt Cans in your plant.

THE WITT CORNICE COMPANY
2117 Winchell Avenue
Cincinnati, Ohio

Manufacturers of

WITT
CORRUGATED
CANS and PAILS



familiar type, designated as Type F, can be had with one or two pointers.

The manufacturers point out that these gages are new in principle and design, employing no liquids, tanks, gears, sectors, or magnets; and requiring no leveling. The point is also stressed that, with these features, the new line of gages provides extreme accuracy with readability even at 50 to 100 feet distance.

An Arc-Welded Gas Pipe Line

A NUMBER of advantages are claimed for the method of making joints in a pipe line by electric arc welding. The Consumers' Power Company recently made approximately seven miles of 6-inch pipe by this method for transporting gas at 60 pounds pressure.

The joints on the pipe were arc welded with the General Electric WD type of welding equipment, using electrodes ⅛-inch and 5/32-inch in diameter and using



125 and 150 amperes respectively. Each joint was hammered under pressure to test for defects. The pipe wall is 5/16 inch thick and each joint was beveled at 30° for welding. Expansion joints were placed every 1,500 feet and the pipe lengths were 40 feet long.

The pipe was welded on the surface of the ground and then rolled into the ditch, which was varied in depth from two to six feet. Each welded joint required 20 minutes to make, and 19 joints were made by each welder in nine hours.

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Why Leading Manufacturers Choose Union Machines—



Two Machines in One! Union Combination 6" Jointer and Saw Bench

Because Union Machines are as accurate and long wearing as the costliest machine built—They will do all the average work of small plants, and the majority of the work of large plants cheaper and better.

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Union Machines will do more work in shorter time with less men.

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¼ H. P. Motor



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and
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1/10 to 2 H. P.

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of 15 to 48% Shown in this Book



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It shows how Powers Control in many of America's leading firms has reduced fuel consumption 15 to 48 per cent; and how the output of workers can be increased, and the quality of their work improved; and other profitable advantages. *For limited distribution only—*

—among plant owners, chief engineers and other executives interested in eliminating waste and increasing the profits of their company.

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I shall be glad to receive a copy of your book SHOP and OFFICE TEMPERATURES.

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"Gimme a Prentiss"

Men know what they want for a vise and don't hesitate to say so—that's the reason you hear "Gimme a Prentiss" so often.

It's no wonder men are asking for 'em. The Prentiss is a vise that won't go back on any man—and they know it; it's a sticker in any tight place. Good hard work never fazes a Prentiss either—it's built to withstand years of real service.

And men knowing these things naturally insist on a Prentiss.

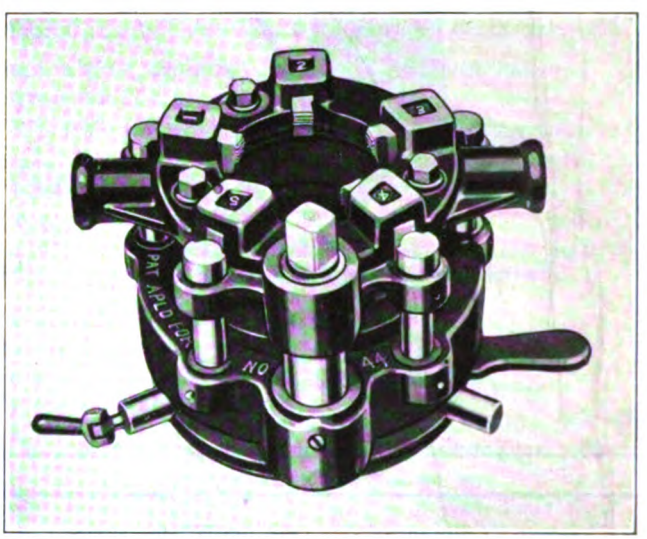
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VISE CO.
CHENEY HAMMERS

A New Die Stock for the Larger Sizes of Pipe

A NEW pipe threader for the larger sizes, known as No. 44 Receder, has just been placed on the market by the Oster Manufacturing Company of Cleveland, Ohio.

The tool is claimed to get its easy cutting qualities from its narrow dies, which are ground with an extra long lead and sharp rake. To further increase the ease of cutting, the tool is geared and is furnished with a ratchet handle so that one man can cut 4" pipe without hard work.

The following points are stressed by the manufacturer: "A massive leader screw protected by a patented chip shield starts the dies on the pipe and pulls them along,



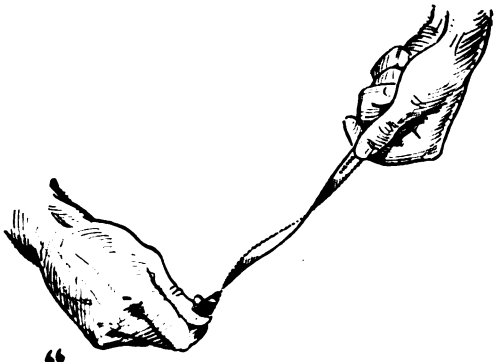
producing the proper pitch and taper. The leader screw, which is of great importance to a tool of this type, is kept free from dirt and chips by the patented shield. Thus the leader screw is not subjected to any undue wear caused by chips and its life is materially lengthened."

A simple rotary movement of the die head adjusts the dies to cut either deep or shallow threads.

A lever-operated, self-centering chuck takes the place of, and eliminates the bother of, changing pipe bushings for each size of pipe. The chuck is said to insure a straight, true thread on all sizes from 2½ to 4", the range of the tool.

The threading of short nipples is possible, as the bore of the stock is large enough to accommodate even a 4" coupling.

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"A Sample of Hacksaw PERFECTION"

In producing a hacksaw blade that has this unusual flexibility combined with the cutting qualities that have long been recognized is nearing the state of hacksaw perfection.

We feel that the users of Victor blades have the advantage of the last word in hack saw development.

Let us send you free samples of this Wonder Blade

VICTOR SAW WORKS, Inc.
MIDDLETOWN, N. Y.



versatile—

For emergency use, for taking up slack, for new installations—big husky fasteners, tiny ones. If your mill supply house does not stock Bristol's, write direct. The Bristol Co., Waterbury, Conn. Ask for Folder CE-719, too.

BRISTOL'S STEEL BELT LACING
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PATENTED

"American" Pressed Steel Shaft Hangers are light, rigid, efficient and adjustable. Their strong tubular design adds to the good appearance of any shop.

TO USE pressed steel in place of bulkier and weaker materials is modern, efficient common sense. It meets the needs of the age.

An example of signal success in this field is the Edward G. Budd Manufacturing Company. The full extent of this success is attested by the hundreds of thousands of motor cars with "bodies by Budd" and the two huge factories working day and night to meet the increasing public demand for the protection of All-Steel construction and Full-Vision motor car bodies.

It is only natural that a concern so versed in the advantages of pressed steel should equip its plants with "American" Steel Split Pulleys.

These efficient, power transmission units, "American" Pulleys, are saving power in thousands of factories in every country where industry thrives. They combine great strength with light weight, imposing no excess load on the line shaft. A source of protection to production schedules, this and other important power- and labor-saving features are fully described in special explanatory literature. Write for it.

The American Pulley Company

Manufacturers of Steel Split Transmission Pulleys, Pressed Steel Shaft Hangers, Pressed Steel Hand Trucks and Pressed Steel Parts.

4200 Wissahickon Avenue Philadelphia, Pa.

For nearest distributor carrying stock, see MacRae's Blue Book.

AMERICAN
PRESSED STEEL HANGERS — PATENTED
STEEL SPLIT PULLEYS — PATENTED

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"Mastering Power Production"

A Most Unusual Book

By Walter N. Polakov

455 pages—138 illustrations **Red cloth—$5 postpaid**

"Mastering Power Production" shows what can be done in the way of reduced costs, more efficient operation, expanded production and better human relations—in the power plant and throughout the factory—BY TELLING HOW IT HAS BEEN DONE in the author's own extended personal experience.

No other book has ever been written that analyzes and attacks the whole problem of production by power-driven machinery from so many angles—all of them bearing directly on the conditions now confronting industry.

It treats in a unique, thoroughly readable, intensely practical manner the engineering, managerial and economic fundamentals underlying the better uses which can be made in every plant of existing equipment, materials and personnel, and as such will be interesting and useful to every engineer, manager, economist and student of human relations.

CONTENTS

Introduction—The Descent of the Principle of Production for Use.

1. The Power Industry as an Economic Factor.
2. The Location of Plants.
3. The Equipment of Plants.
4. Mastering Materials.
5. Mastering Maintenance.
6. Mastering Labor Problems—Conditions.
7. Mastering Labor Problems—Compensation.
8. Mastering Processes.
9. Mastering Records.
10. The Analysis of Expenses.
11. Power as a Commodity.

Index.

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1. **In a public Utility Plant the operating expenses were actually reduced one-third.**
2. **An electric railway cut its operating expense per kilowatt from over three-quarters of a cent to less than half a cent.**
3. **Many manufacturing concerns have reduced their power bill to one-half of its former figure.**
4. **Applications of its methods in manufacturing concerns of national reputation have resulted in savings amounting to several millions annually.**

And Hundreds of other "HOWS"—Big and Little

The Author

has served the New Haven Railroad as superintendent of power; the Board of Estimates and Apportionments of the City of New York as expert engineer for municipal plants; and, during the war, the United States Shipping Board Emergency Fleet as power expert. In the public utility field he established a record for economical operation, both on electric railways and in central stations, his pioneer work for the Penn Central Light and Power Company particularly receiving much attention.

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Simply fill in the coupon and mail it at once. This book will be forwarded at once. If you decide to keep it, you may remit $5 within 30 days. Get the coupon off in TODAY'S mail.

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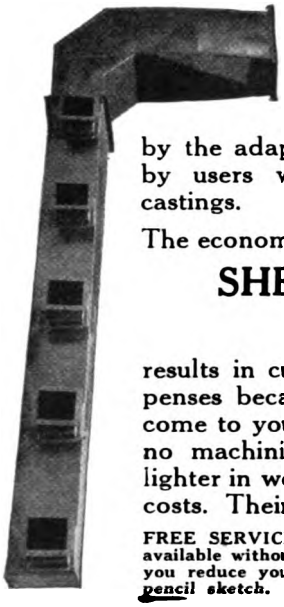
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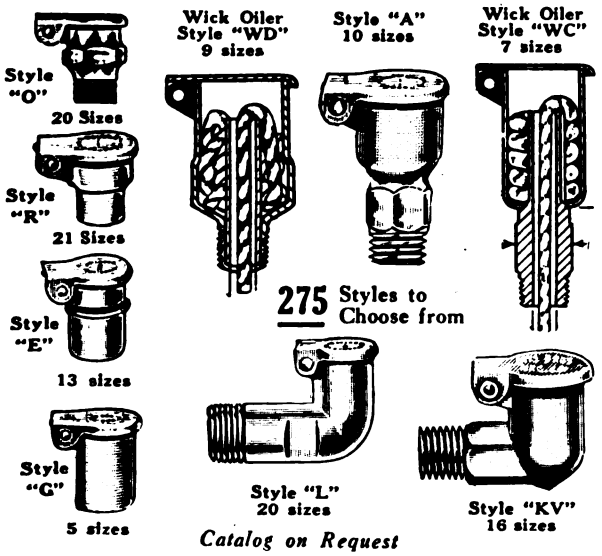
See Data A.S.M.E. Condensed Catalogue of Mechanical Equipment. Also Hendricks' Sweets Engineering, and Thomas Catalogues.

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For transporting and storage of packages, parts, raw material, trimmings, etc. Durable, easy to handle and cheaper in the long run. Write for catalog of the

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BEARINGS. Transmission and Line Shaft

Economies possible thru the use of Anti-Friction bearings on trucks and other machinery are described on page 5 by the Timken Roller Bearing Co.

An Average Power Saving of 15 per cent. is shown on page 69 by Hyatt Roller Bearing Co.

An Oilless Bearing is described on page 67 by the Arguto Oilless Bearing Co.

Anti-Friction Bearings, that permit higher speed at the lowest friction loss. See page 55. The New Departure Mfg. Co.

ELECTRICAL EQUIPMENT. (Motors, Generators, Buffers, Polishers, Grinders, etc.)

Complete Details can be obtained on a Motor that gives long service. See page 137. Master Electric Company.

Bulletins Describing a Ball Bearing Motor are offered by The Valley Electric Co. See page 145.

21% more work with the same machine, thru the use of better lighting arrangements. See page 88. National Elec. Light Association.

Tap Drill Chart Cards useful for designers and builders of machinery are being issued by Wisconsin Electric Co. See page 81.

Information on a Drop Cord System that saves its cost many times in lamp renewals. See page 104. Appleton Electric Co.

Catalog "E" very interestingly describes an adjustable speed grinder that saves its cost in one year. See page 80. The U. S. Electrical Tool Co.

Descriptive Bulletins on Motors for practically every purpose are offered by Diehl Manufacturing Company. See page 127.

Information on high quality rubber insulation for copper wire. See page 94. United States Rubber Co.

"Industry's Electrical Progress" is a story of savings through modern motor control of machinery and equipment, and can be obtained from The Cutler-Hammer Mfg. Co. See page 72-73.

A 10-day free trial on Thor Electric Drills that cut drilling costs 90%. See page 127. Independent Pneumatic Tool Co.

Information on lower cost welding for machine bases. See page 92. The Lincoln Electric Co.

Motors Built for Specific Production Requirements. See page 78. The Domestic Electric Company.

Information on Lighting Fixtures, adjustable for any operation, is given in the catalog offered by the American Fixture Co. See page 127.

Descriptive Bulletin explains the complete line of motors from one-quarter to forty HP, single and polyphase. Manufactured by the Valley Elec. Co. Page 145.

MAINTENANCE

Information on Scientifically prepared Coatings for all industrial purposes can be obtained from The Goheen Corporation. See Inside Back Cover.

A New Chart and a Folder which aid in the selection of the exact liquid window cleaner for every purpose are offered by The Gerson-Stewart Corp. Mfrs. See page 98.

Brushes for every industrial purposes. Also brooms. See page 96. The Osborn Mfg. Co.

Metal Case Brooms for industrial use. For illustrated booklet and price list see Joseph Lay Co. advertisement on page 95.

Catalog No. 23 contains information on valve reseating machines, useful in any power plant and factory. The Leavitt Machine Co., page 124.

An Oily Waste Can that outwears 3 to 5 of the ordinary kind is described on page 130 by The Witt Cornice Company.

A Painting Method that makes the painting of industrial plants an economical and low cost labor saving method. See page 89. The Vortex Manufacturing Co.

Descriptive Bulletins on Metal Coating that can be applied right over wet, rusty, oily and hot surfaces. For information see page 141. The Nitrose Company.

Catalog No. 100 is a 32-page book on air moving. See page 121. New York Blower Company.

Blowers for Heating, Ventilating and Mechanical Draft. For information see page 76. American Blower Company.

An Interesting Booklet and Sample of a Waterproof, Acid, Alkali and Brine resisting Paint. American Asphalt Paint Co. See page 86.

Coatings that Cut Down Upkeep on Roofs, Floors and Walls, Choice of samples offered by L. Sonneborn Sons, Inc. See page 97.

An Illustrated Booklet, "More Light" on the use of factory paint is offered by the U. S. Gutta Percha Paint Co. See page 87.

A Trial Offer on Factory Chairs, that eliminate fatigue. See page 121. Royal Metal Mfg. Co.

MATERIALS HANDLING EQUIPMENT

Four Different Types and Fifteen Different Models of Tractors are described in Bulletin 106. Other bulletins are offered: A100 showing all purpose Industrial Trailers. A125 and A120 also give complete descriptions of their line of trailers for every industrial requirement. See page 109. Mercury Manufacturing Company.

Crane Catalog No. 200 contains information on cranes that have a record for reliability during the past 35 years. See page 111. Whiting Corporation.

Equipment that Minimizes the Handling of Products. The Powell Pressed Steel Co. Page 145.

Factory Certified Wire Rope for use as a conveyor cable. See page 4. Williamsport Wire Rope Co.

Various combinations of overhead conveying systems are shown on page 106 by The Chisholm-Moore Mfg. Co.

"The Atlas of Mechanical Handling" is a book containing information on overhead carrying systems which applies

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Four Wheel Brakes ~ On the Vise!

A turn of the bolt—the base is locked! As quick and positive as four wheel brakes in an emergency. Nor is that all. You will find this type of locking feature on the Parker Vise only—an exclusive patented feature which gives the Parker Swivel base a big advantage over all others. Here's how it works. When the bolt is turned down the wedge is pulled up, expanding the split ring with a positive grip around the whole 360° of the base. The vise is locked as solidly as if it was made with a stationary base.

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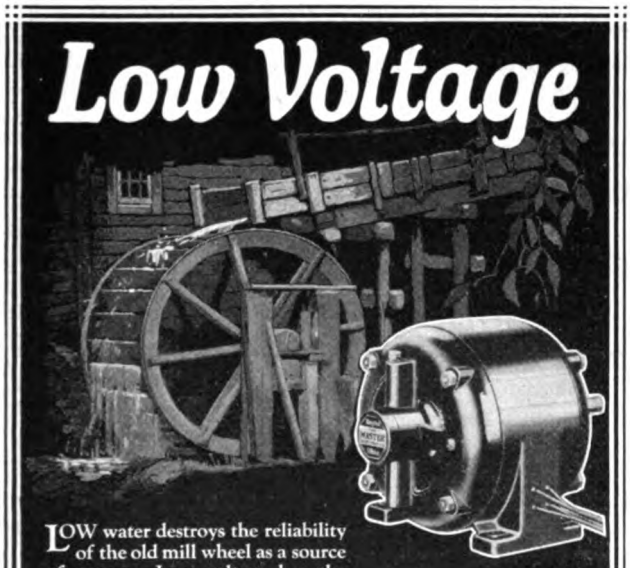

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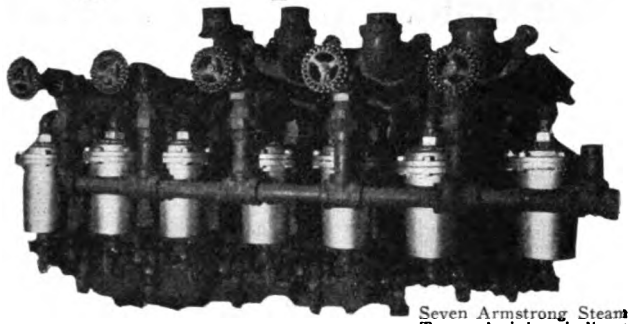
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Seven Armstrong Steam Traps draining indirect fan dryers at the Joliet Wall Paper mills, Joliet, Illinois.

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Steam pressure.....(Do not neglect to state maximum)

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THE NATIONAL, STATE AND LOCAL TUBERCULOSIS ASSOCIATIONS OF THE UNITED STATES

the railroad principle of two rails. See page 103. The Atlas-Chicago Co.

A sixty-eight page "Book of Illustrated Economies," giving figures and actual photographic illustrations and a sixty page, "Floor Operated Hoist Catalog" are offered by the Shepard Electric Crane & Hoist Co. Back Cover.

Catalog Showing Trucks, Barrels, Boxes and Trays for transporting and storage of packages, parts, raw material, trimmings, etc. See page 135. Rogers Fiber Co.

Information on Equipment that Lowers Handling Costs in the yard or plant is shown on page 105 by Barber-Green Co.

A Booklet "Facts for Consideration in Selecting a Storage Battery" is offered by the Electric Storage Battery Co. See page 100.

Industrial Tractors, Trucks and Cranes that save enough on handling costs to charge off the purchase price in six months. See page 119. The Baker-Raulang Co.

Additional revenues from Proper Material Handling Equipment are described in a catalog offered by Truscon Steel Company. See page 3.

A Thirty Day Trial Offer on a Portable Crane that is known as the handiest tool in the shop. For information see page 149. Canton Foundry and Machine Co.

The "Merrick Catalog" shows how bulk materials can be weighed while conveyor handled. The Merrick-Scale Co. See page 119.

An Overhead Monorail System that can be applied to every industry is shown on page 101 by The Louden Machinery Company.

Bulletins describing the Pneumatic Conveying of granular, injurious, dusty materials can be obtained from the Dust Recovering and Conveying Co. See page 102.

New Value in MONORAIL handling Systems, is described on page 115 by The American MonoRail Co.

"Snapshots of Sensible Savings" is a book describing various uses of a Tier-Lift Truck. See page 140. Lakewood Engineering Co.

Catalogs that give valuable information on low cost methods of handling coal and ashes—also describing a complete line of power transmission machinery—as well as silent chain drives, can be obtained from the Link Belt Co. See pages 68-150.

Catalogs No. 12 and 19C describe the complete line of Lansing Trucks and trailers. See page 149. Lansing-Company.

Latest bulletins on overhead conveying equipment. See page 108. The Yale and Towne Mfg. Co.

An illustrated catalog showing how the modern plant runs on wheels. See page 112. Bond Foundry and Machine Company.

Any Type of Truck or Caster can be equipped with the new Floor Saving Wood Wheels made by the Metzgar Company, Inc. See page 141. Booklet offered.

A Handy Tool for Moving the Heaviest of Railroad Cars. For information see page 129. The Advance Car Mover Company.

A Complete Engineering Service that solves elevating conveying crushing and screening problems is offered by The Jeffrey Manufacturing Co. See page 118.

The monthly bulletin, "The Conveyor," describes continuous Production Conveying Systems. For a copy, see page 107. Chain Belt Co.

Fifty Years of Conveyor Service, the record of the Logan Company. Page 1.

A low cost coal handling system, is described on page 110 by Easton Car and Construction Co.

A chain hoist with 21 points of superiority. See pages 113-114. Wright Mfg. Company.

Catalog No. 98 on Material Handling Equipment is offered by Gifford-Wood Co. See page 117.

A New Track Unloader that fits right on to the coal car is described on page 139 by the Chicago Automatic Conveyor Company.

A "Pace-Maker for Production" is the name given to the new Electric Lift Tructor built by The Elwell-Parker Electric Company. See page 116.

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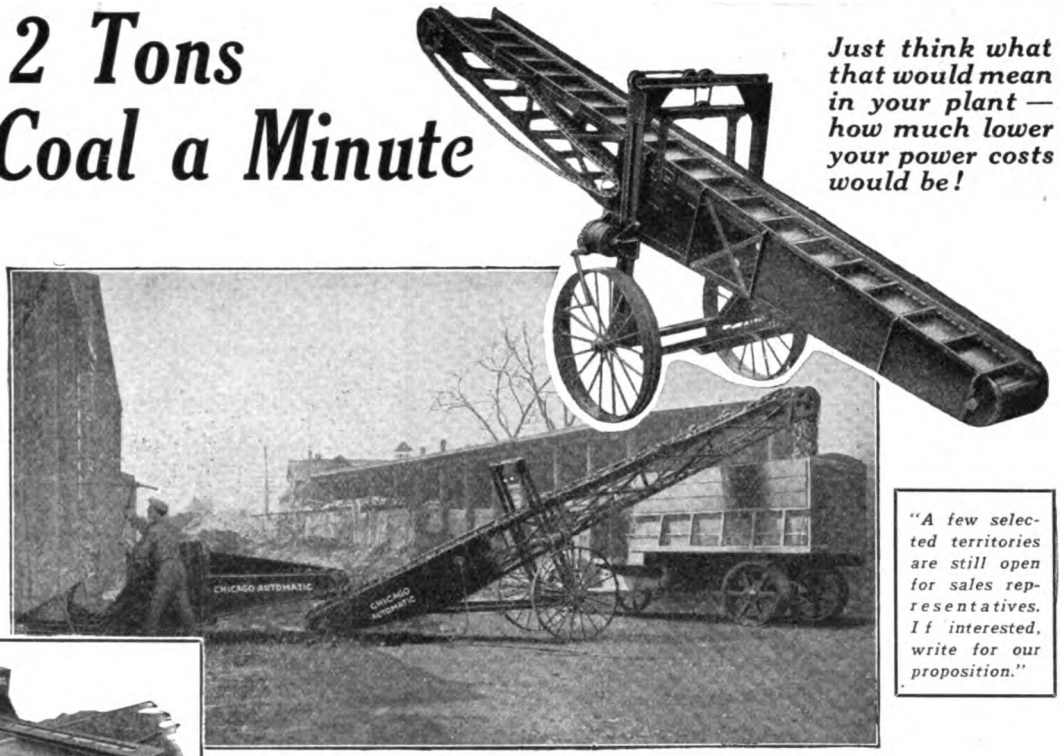
Unloads 2 Tons of Coal a Minute

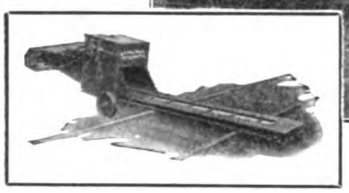
Just think what that would mean in your plant — how much lower your power costs would be!

That is why you need the new Chicago Automatic Model T. V. Truck Unloader. No shoveling—unloads a whole car of coal in an hour—no pits necessary. Only three inches high on the rail — goes under any car.

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Statement of the Ownership, Management, Circulation, etc., Required by the Act of Congress of August 24, 1912

of INDUSTRY ILLUSTRATED, published monthly, at New York, N. Y., for October 1, 1926.

State of New York } ss.
County of New York }

Before me, a Notary Public in and for the State and county aforesaid, personally appeared John H. Van Deventer, who, having been duly sworn according to law, deposes and says that he is the Editor of the INDUSTRY ILLUSTRATED and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:
Publisher, The Engineering Magazine Co., 120 West 32nd Street, New York, N. Y.
Editor: John H. Van Deventer, 120 West 32nd Street, New York, N. Y.
Managing Editor: None.
Business Manager: Harvey Conover, 120 West 32nd Street, New York, N. Y.

2. That the owner is: The Engineering Magazine Co., 120 West 32nd Street, New York, N. Y.; John R. Dunlap, 120 West 32nd Street, New York, N. Y.; J. R. Dunlap, Jr., 120 West 32nd Street, New York, N. Y.; John H. Van Deventer, 120 West 32nd Street, New York, N. Y.; Harvey Conover, 120 West 32nd Street, New York, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

JOHN H. VAN DEVENTER, Editor.

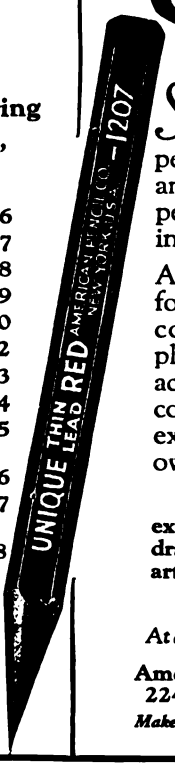
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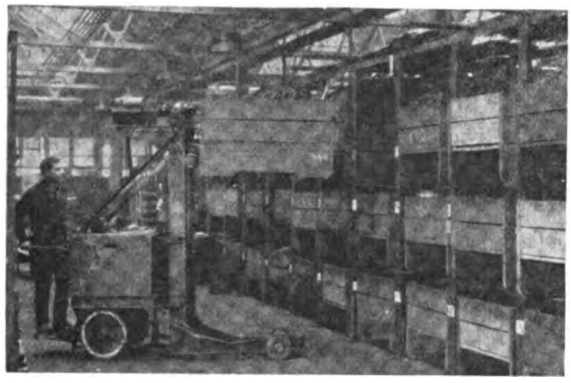
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POWER PLANT EQUIPMENT AND AUXILIARIES

A Steam Trap on a 90 Day Trial also catalog. Offered by the Armstrong Machine Wks. See page 137.

Catalog Describing a Boiler Feed Water Regulator can be obtained from the Chaplin-Fulton Mfg. Co. See page 141.

Very Interesting Bulletins on Boiler Room Economies are offered by the Wickes Boiler Co. See page 147.

Bulletins on Jennings Heating Pumps, containing valuable information on heating system installations. Nash Engineering Co. on page 6.

Free Trial Offer of a Steam Trap that spells fuel economy can be obtained from the Sarco Co., Inc. Also write for booklet R. 268. See page 128.

"Shop and Office Temperatures" is the name of catalog which shows power savings of 15 to 48 per cent in many of America's leading firms. For a copy, see page 131. The Powers Regulator Co.

Bulletin No. 320 describes the line of steam and vapor specialties manufactured by Illinois Engineering Co. Page 59.

A bulletin is offered showing a complete line of valves by the Fairbanks Co. See page 60.

Catalog No. 730 describes mechanical draft apparatus that results in more horse power per pound of coal. See page 61. Buffalo Forge Co.

Catalog and Price Lists on Steam Unions that prevent loss of steam, can be obtained from the E. M. Dart Mfg. Company. See page 60.

A 3-way solid die-stock adjustable for over and under size. See page 84. The Oster Manufacturing Co.

Metal-cutting saws for every purpose. For catalog and prices, see page 54. Simonds Saw & Steel Co.

Band Saws Noted for their strength, precision and uniformity. See page 122. American Saw & Mfg. Co.

TOOLS. Shop Tools, Saws, Files, Chucks, etc.

Catalog H describes Swiss Files that are noted for their accuracy and precision. For a copy, see page 123. Grobet File Corp. of America.

Bulletins describing quick operating and wide opening lever vises. See page 149. Edw. Purvis & Son.

Information on Portable and Bench Type Woodworking Machines is offered by Gallmeyer & Livingston Co., page 131.

Catalog No. 30 on Small Tools and Catalog No. 138 on the complete line of machine tools can be obtained from Brown & Sharpe Mfg. Co. See page 79.

A new catalog showing complete line of bench wood-working machines. See 123. Heston & Anderson.

Sample Blades are Offered by Victor Saw Works. See page 133.

Cap Screws heads that are consistently perfect. See page 123. The Ferry Cap & Set Screw Co.

High Speed Drills with forty-five years experience behind them. See page 125. The Standard Tool Company.

Catalog 57B describes a vise with seven distinct and exclusive features of construction. See page 137. The Charles Parker Company.

Special Analysis Steel can be obtained from Ludlum Steel Co. Page 129.

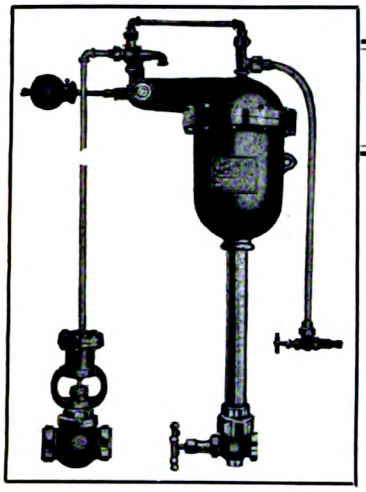
High Speed Drills for high speed production. See page 82. The Cleveland Twist Drill Co.

Chrome Vanadium Wrench Kits for Millwrights, Loom-fixers and other Shop Mechanics. See Bonney Forge and Tool Works. Inside Front Cover.

A Description of a Vise built to stand plenty of rough stuff. See page 132 Prentiss Vise Co.

The Spindle Book, now ready, shows a complete list and information about different classes of machines and their

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Real boiler efficiency is never attained through hand feeding. A fluctuating water level is wasteful of fuel.

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will put your boilers on an efficient basis. A constant water level means increased steam production, real fuel economy, less boiler strain, and safety.

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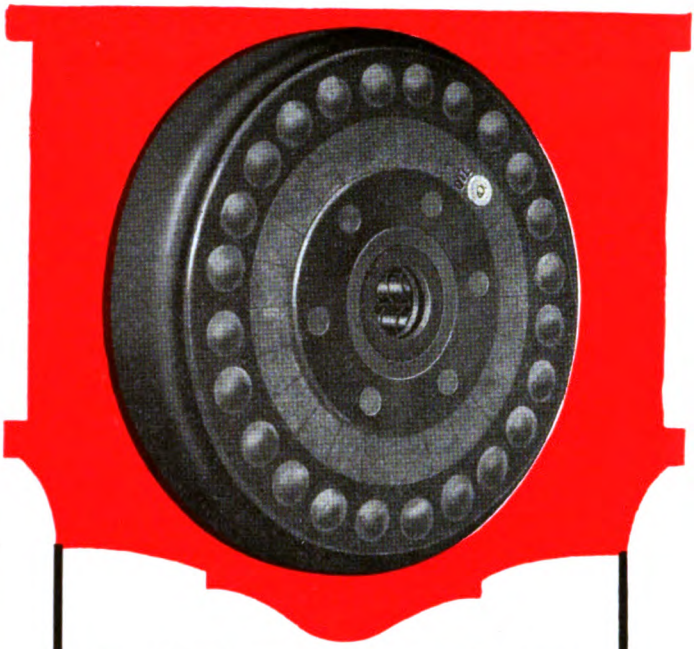
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Nitrose conquers corrosion. This thick, black, glossy coating endures. Forces of deterioration meet their equal in Nitrose Metal Coating. Use Nitrose where corrosion has been hardest to fight.

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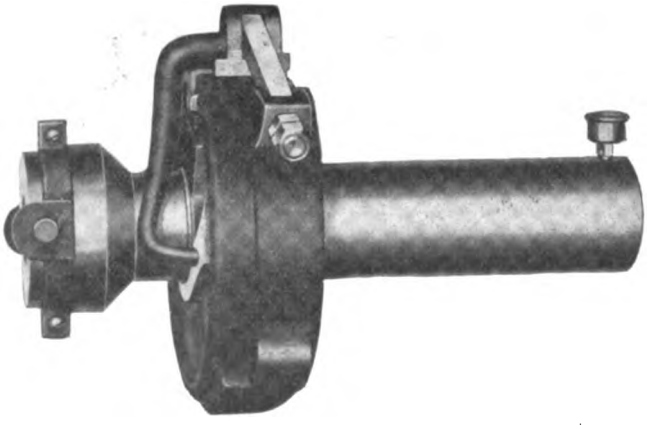
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The Clutch that controls the Steam Shovel, Hoist, Loader, Dredge, Agitator, Conveyor or Baler should be packed with reliability.

Standardize on Conway Clutches—with their one point handy adjustment and interchangeable parts —wallop for all time the "bugaboo" of poor starting and stopping.

Get Bulletin No. 35 with standard clutch chart.



The Conway Clutch Co.

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spindle specifications. For a copy see page 83. Jacobs Mfg. Co.

Features of the New Keyless, Ball Bearing Drill Chuck are described on page 145 by Eastern Tube & Tool Co.

TRANSMISSION EQUIPMENT. Including Belting

A 60-Day Trial on a Belt Preservative. See page 119. Cling-Surface Company.

Booklet on Pulleys, Gears and Sheaves is being offered by the Pyott Foundry Company makers of Pyott Red Face Pulleys. Look on page 147.

A Saving of 8% in Power with self-aligning ball bearing hangers. See page 71. SKF Industries, Incorporated.

Literature that Explains the Advantages of Pulleys and Pressed Steel Hangers is offered by the American Pulley Co. See page 133.

Medart Catalog No. 43 and Discount Sheet cover dimensions, details and list prices of the entire range of power transmission equipment made by The Medart Co. See page 120.

Belt Lacers that result in greater transmission efficiency. See 74-75. Clipper Belt Lacer Co.

A special bulletin, which gives full particulars about the automatic belt governor. A Dodge-Timken product. See page 70. Dodge Mfg. Corp.

Bulletin No. CE719 Describes a Steel Belt Lacing that is quickly joined. See page 133. The Bristol Co.

A Catalog on Flexible Shafting for tool room, machine shop, pattern shop and foundry. See page 131. N. A. Strand & Co.

Bulletin No. 35 contains a standard clutch chart. For a copy, see page 142. The Conway Clutch Co.

A Booklet, "There's Money in This for You," that answers questions on belt care and operation can be obtained from Chas. A. Schieren Co. Page 62-63.

Samples of a New Belt Fastener with self aligning plates and rivets are offered by The Bourne-Fuller Company on page 125.

A practical way to reduce belting costs. See page 66. I. B. Williams & Sons.

A short center belt drive of proven value. See page 144. T. B. Woods Sons Co.

Catalog L66 explains a vital necessity for speed flexibility of transmission drives. Reeves Pulley Co. See page 64-65.

Portable Machines for drilling, grinding and polishing. See page 2. Biax Flexible Shaft Co.

MISCELLANEOUS

Catalog on Automatic Fire Door Equipment is offered by Richards-Wilcox Mfg. Co. See page 17.

Information on Stopping the Losses Resulting from Human and Mechanical Errors in the measurement of material is offered by The Toledo Scale Co. See page 90-91.

A Booklet Describing Counters for rate setting and production work. See page 129. The Veeder Mfg. Co.

Literature Describing a Power Baler that saves waste storage space and is fire-proof is offered by Davenport Mfg. Co. See page 125.

Fabricated Sheet Metal Parts. An engineering service offered by The Breese Bros. Co. See page 135.

An Economical Means of Cleaning Parts and Products is shown on page 126. Oakite Products, Inc.

Illustrated Folders on the Hallowell Pressed Steel Bench Legs and Workbenches should interest every industrial executive. See page 93. Standard Pressed Steel Company.

Booklets Describing Temperature Control are offered by Taylor Instrument Companies. See page 58.

Lead Pencils that offer a choice of seventeen degrees of black and three copy types. See page 138. American Lead Pencil Co.

A Catalog, Showing some Valuable Suggestions for Steel Lockers, Bins, Racks and Shelving. See page 121. Durand Steel Locker Co.

A New Catalog M-28 gives complete information and data on Blue Printing. C. F. Pease Co. See page 56.

Catalog Describing 275 Styles and sizes of oilers for all types of machinery. Gits Bros. Mfg. Co. Page 135.

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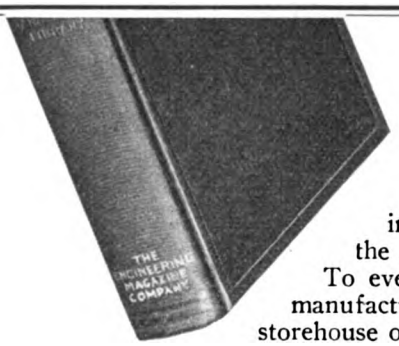
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I. Interchangeable Manufacture.
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V. Inspection Gages.
VI. Gaging of Screw Threads.
VII. Inspection and Gaging of Gears.
VIII. Manufacture and Care of Gages.
IX. Organization and Management of Inspection Department.
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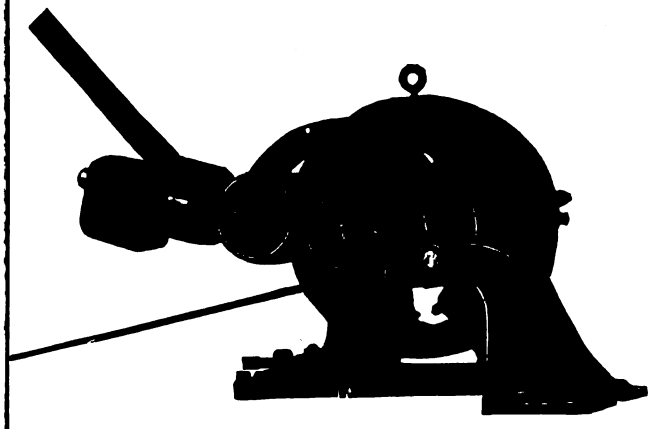
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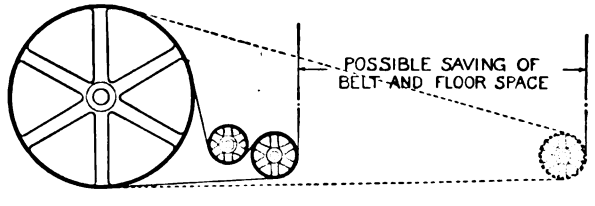
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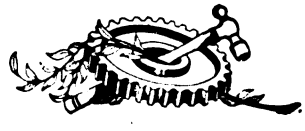
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Manufacturing Activity in 1927

DURING the past six weeks most business men have adopted a conservative policy and many have become pessimistic. The latter have emphasized the decreased purchasing power of the South, the curtailment in the automobile industry and the decreases in building contracts as compared with last year. These factors should be analyzed and allowed for. There is danger, however, that pessimism may be overdone and that the favorable factors will be overlooked. Among the favorable factors are the following:

1. People will continue to spend practically all they earn and the aggregate earnings of 117 million people in the United States and 9 million in Canada will be nearly as great in 1927 as in 1926.
2. The large cotton crop will mean a broader distribution of cotton goods and more employment in the cotton mills of New England, North Carolina, Manchester, England, and Germany.
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4. The railroads will buy as much steel as they have in 1926.
5. The present tendency toward reaction in building will not go far. Steadiness in the prices of steel and lumber and a growing supply of investment capital, evidenced in a rising bond market, will insure a substantial volume of building and fair employment in the building trades.
6. The British coal mines will again be in operation with the Bolshevik element badly defeated.
7. Russia will be attempting to make progress in restoring her industries. She will not have much foreign trade, but business sentiment in Europe should be improved with Russia bending her energies toward restoring her credit abroad instead of fomenting social revolutions in foreign countries.
8. France will be engaged in stabilizing the franc and will probably balance her budget.
9. Commodity prices will start the year at a generally low level, a level low enough to induce a heavy consumption of goods and to inspire confidence in business calculations.

The favorable factors are of sufficient importance to indicate that the tonnage of goods sold and distributed in 1927 will be equal to the average of the past three years, and if there is an average volume of production and employment, thousands of small concerns and many large ones can realize average profits.—*Alexander Hamilton Institute.*



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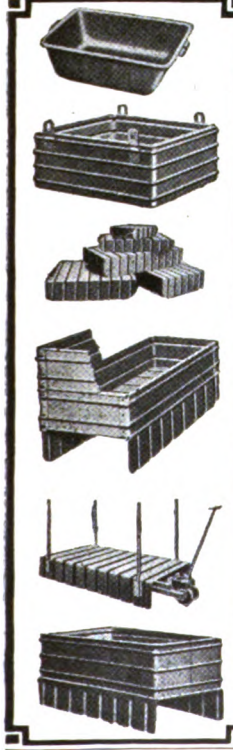
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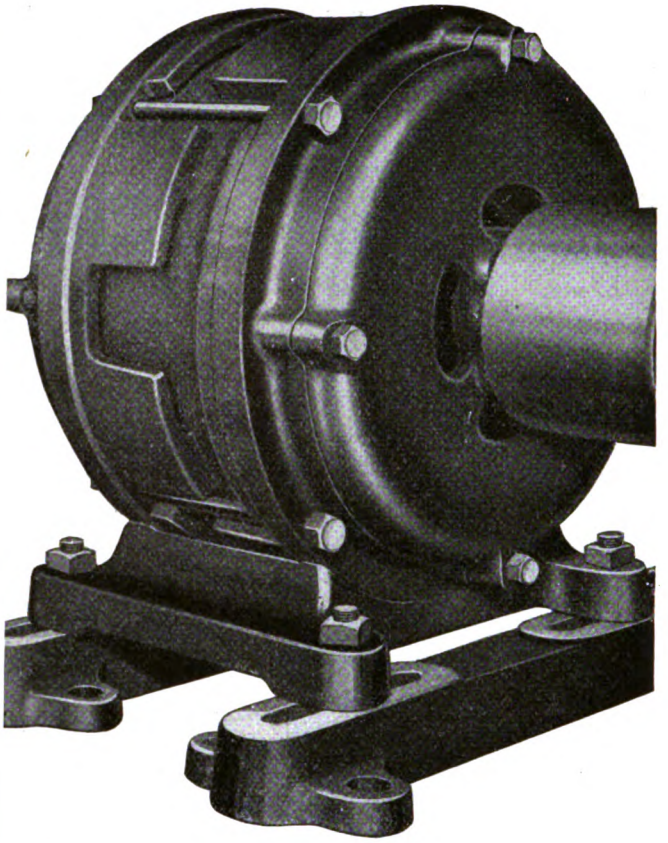
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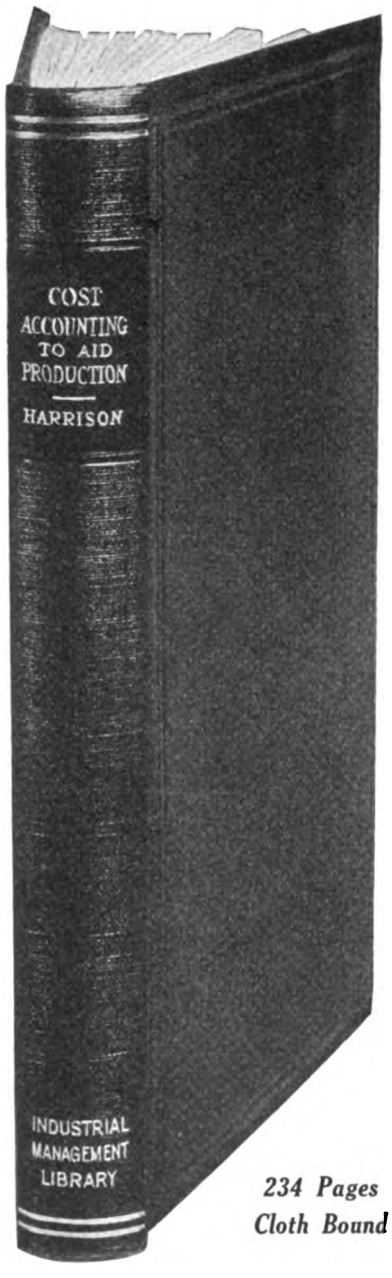
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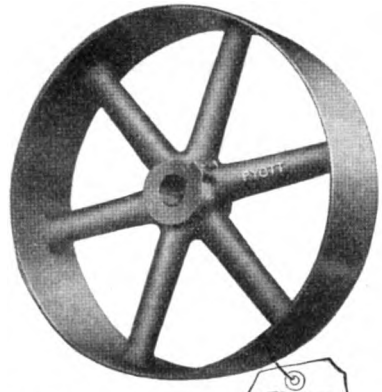
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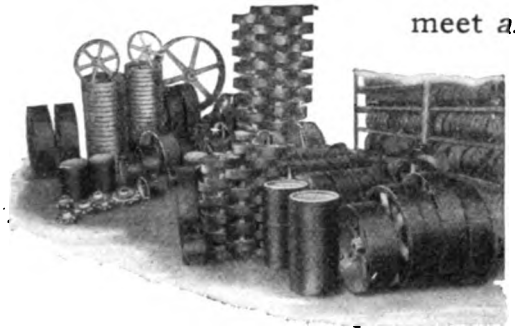
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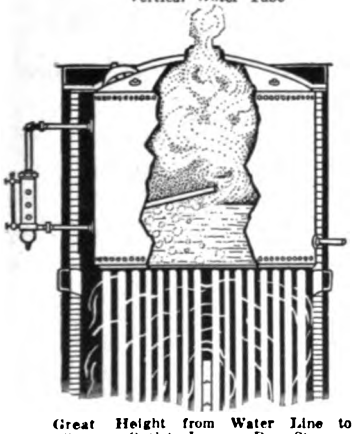
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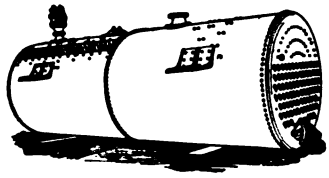


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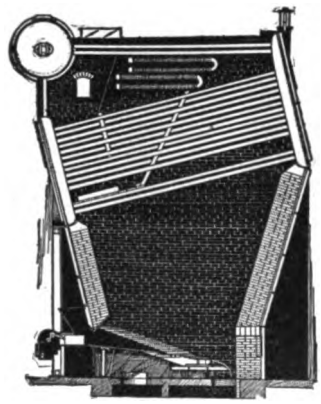
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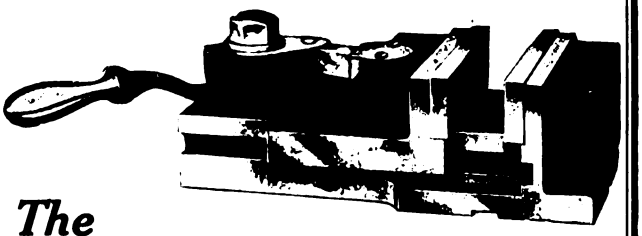
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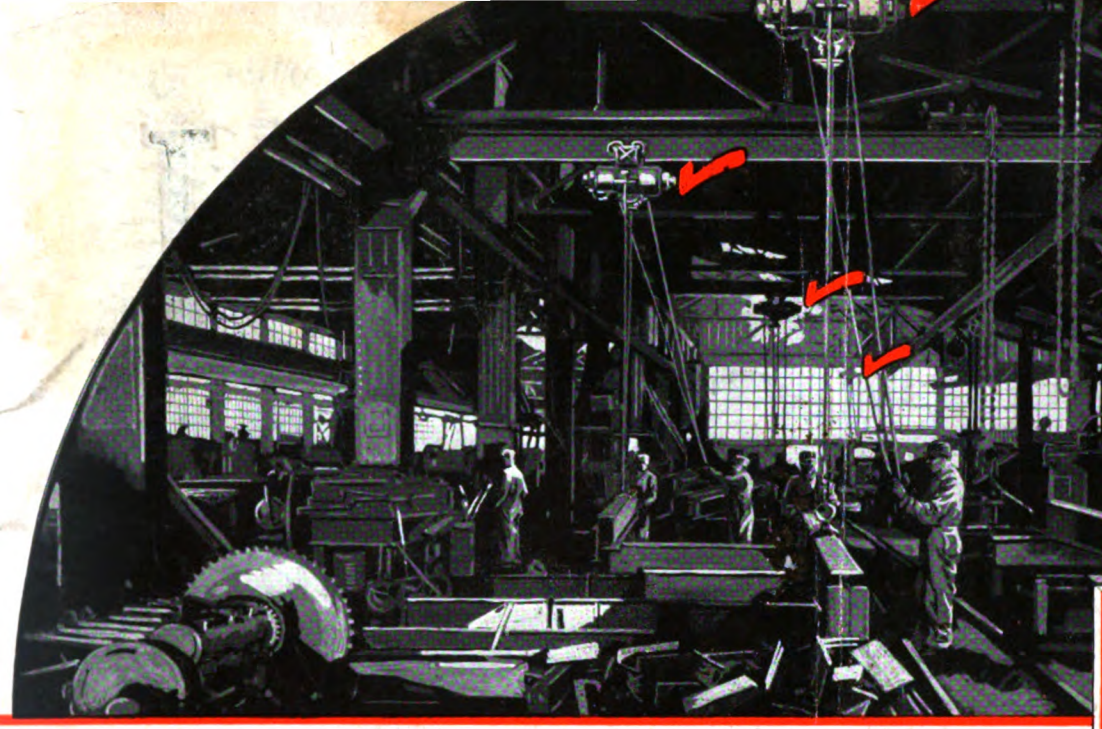
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An Average of 29 Shepard Electric Hoisting Units in Each of these Metal Working Plants

The following well known plants represent a portion of Shepard's Iron and Steel and Metal Working installations.

The list contains only plants using five or more Shepard Floor Operated Electric Hoists, three or more Shepard Cage Operated Electric Hoists and Shepard Single I-Beam Cranes, and two or more Shepard Transfer and Double Girder Traveling Cranes. It does not include over 1000 Shepard installations in the Automotive Industry.

Listed are several firms using over 200 Shepard Units; many over 100, 75 and 50 Units. Many are repeat orders, received year after year because of Shepard's proved performance.

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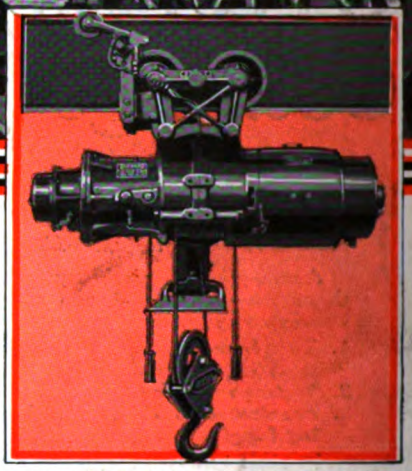
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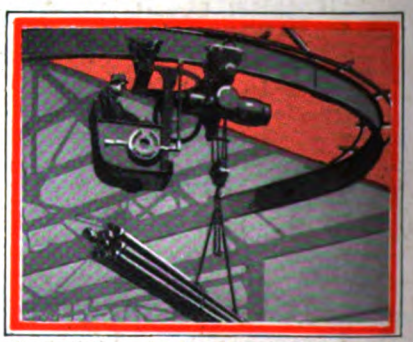
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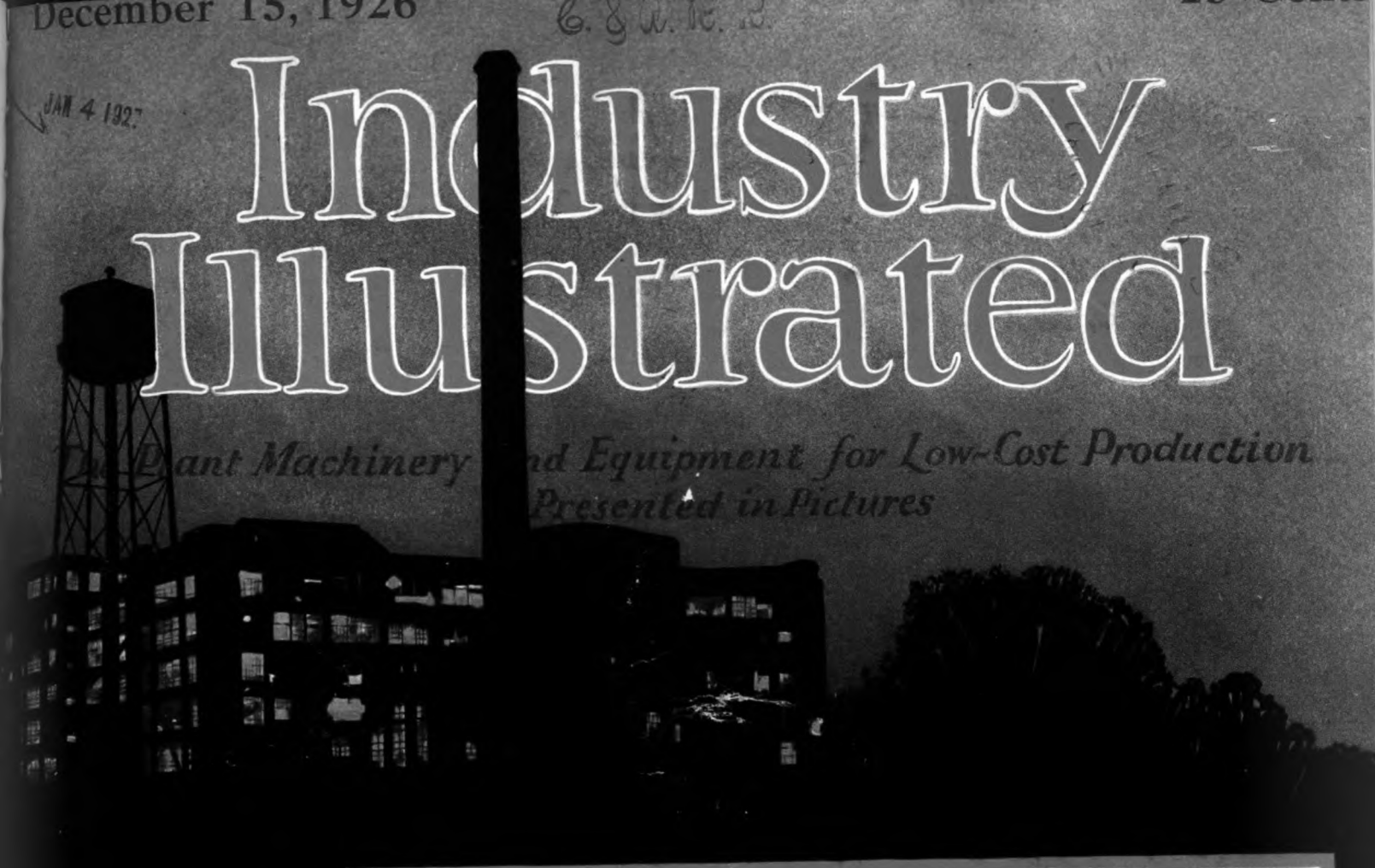
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Industry Illustrated

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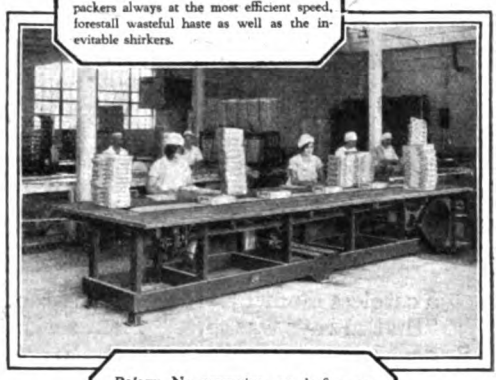


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The Publisher's Column

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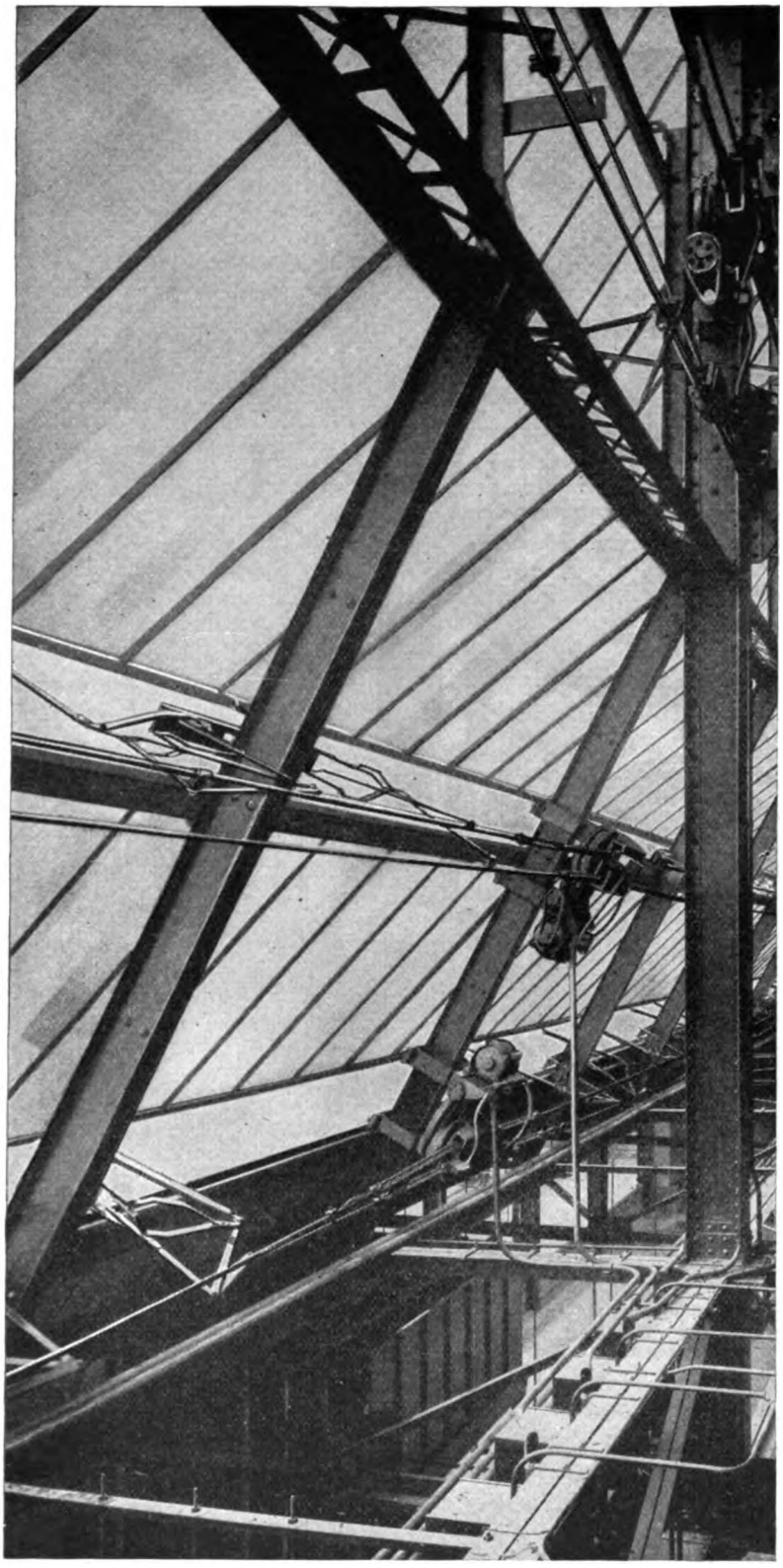
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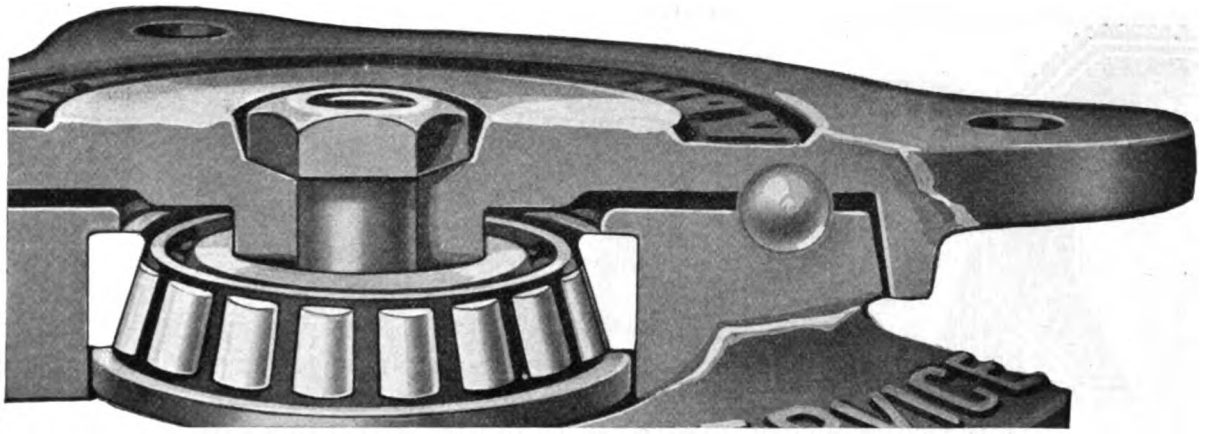
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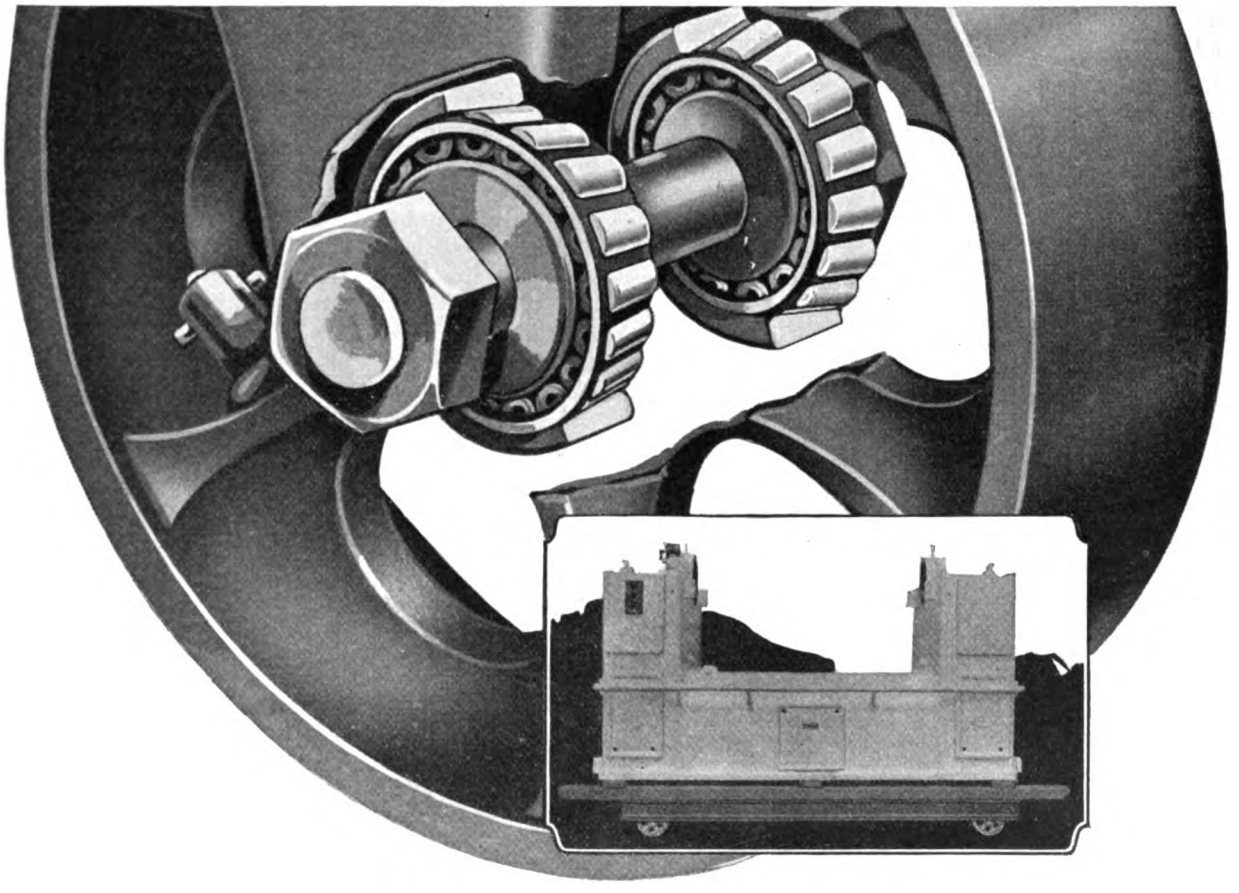
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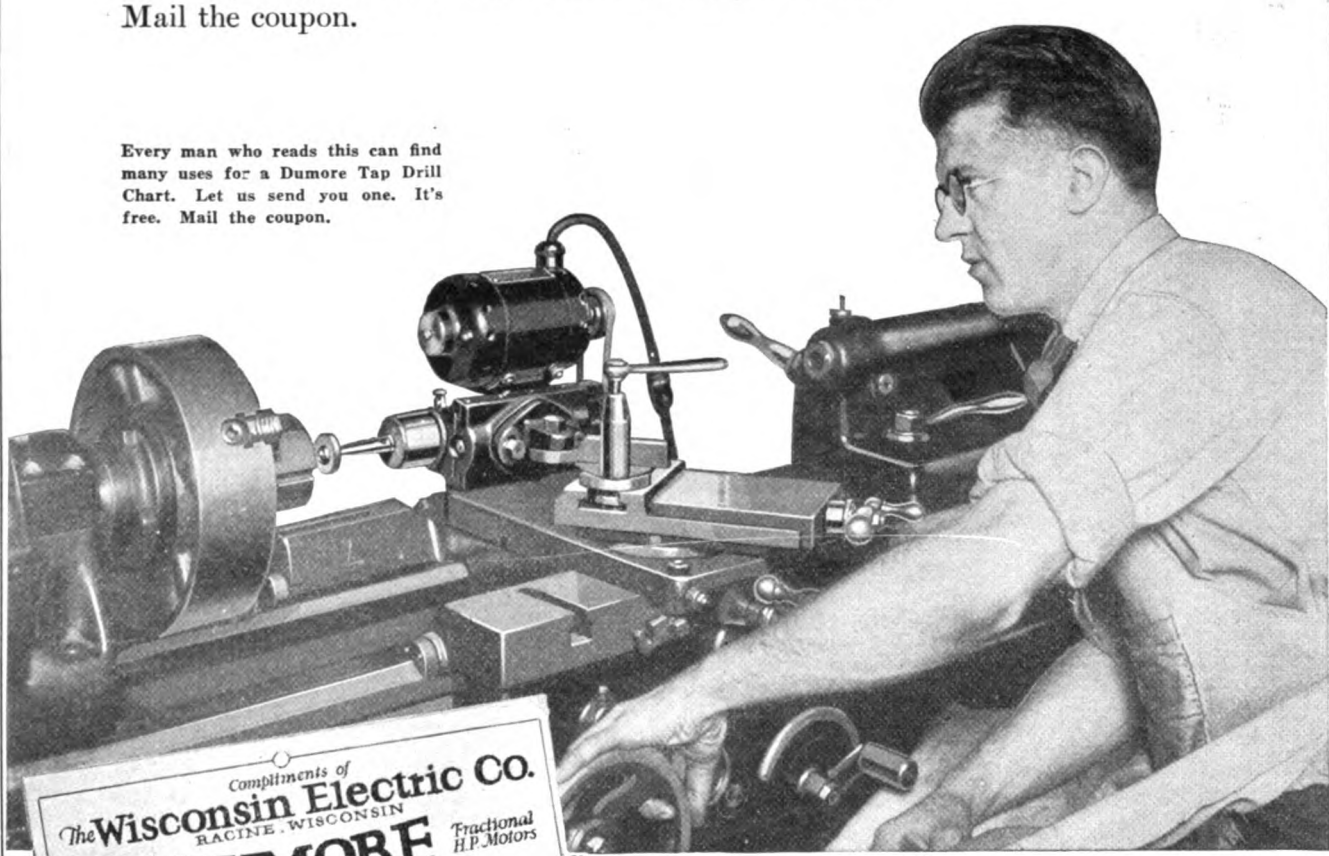
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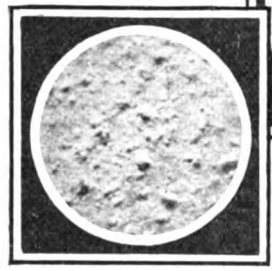
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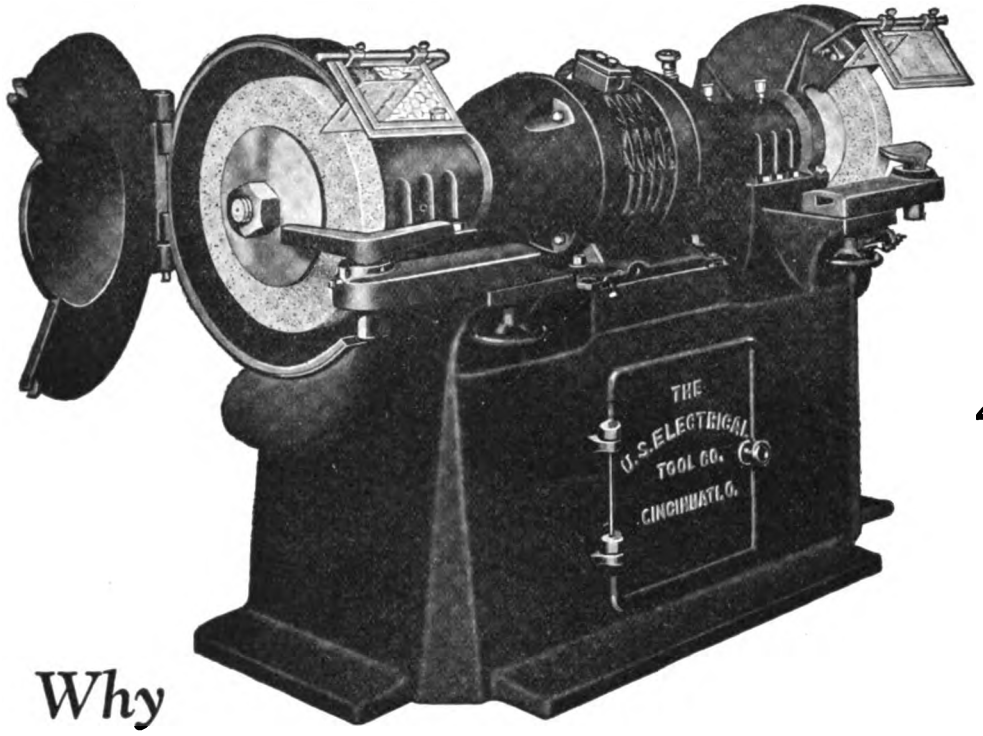
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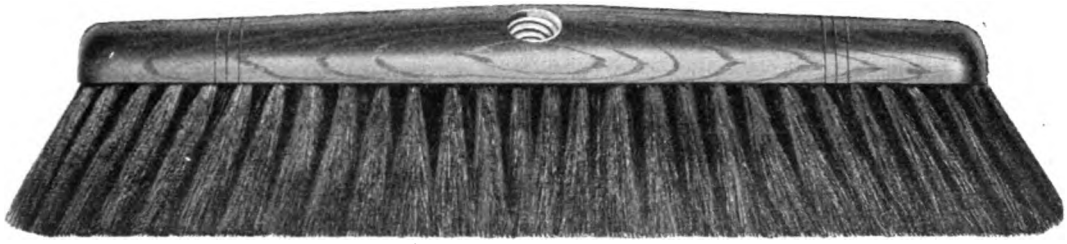
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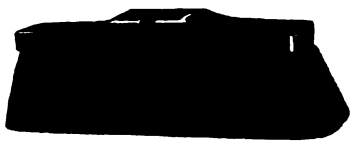
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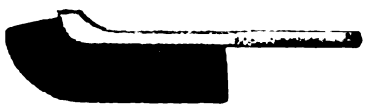
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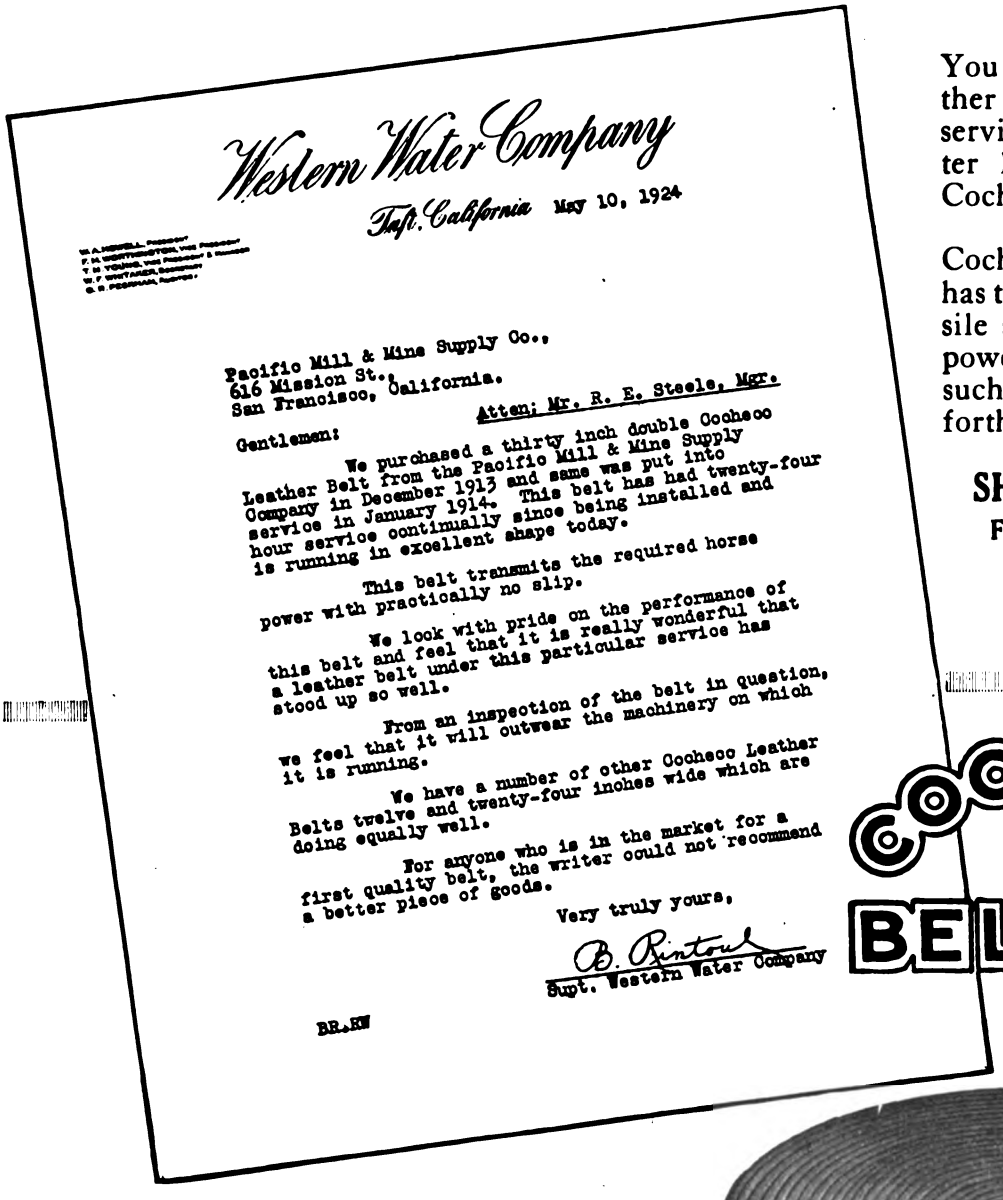
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Taft, California May 10, 1924

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Attn: Mr. R. E. Steele, Mgr.

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Very truly yours,

B. Rintoul
Supt. Western Water Company

BR.KW

You can't beat honest leather for faithful belting service; you can't get better leather belting than Cocheco.

Cocheco Leather Belting has the resiliency, the tensile strength, the pulling power that make possible such service as called forth this letter.

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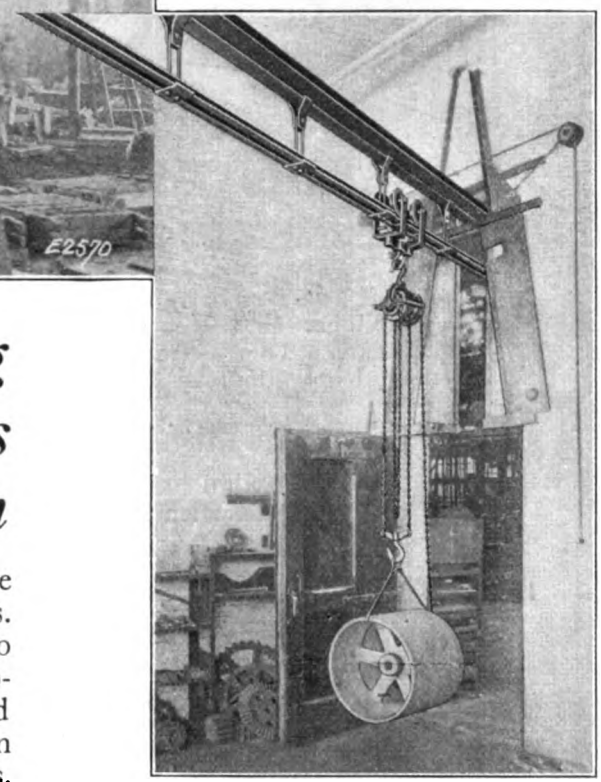
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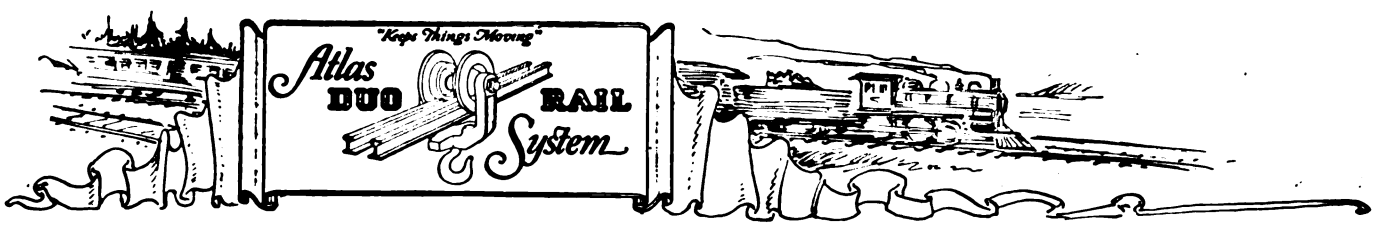
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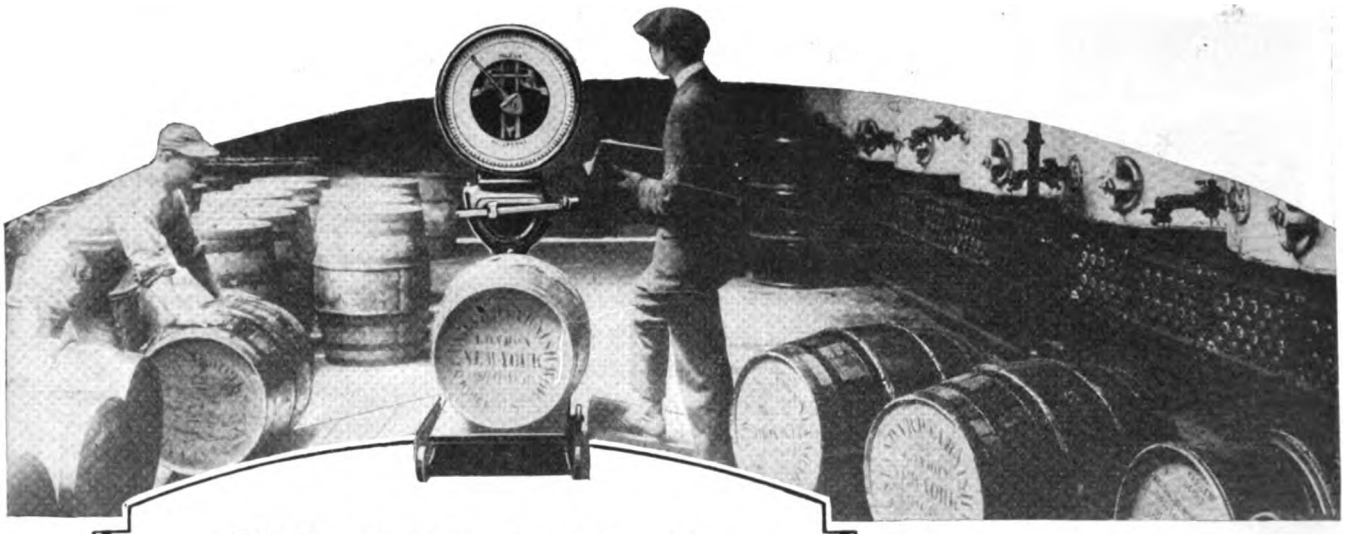


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Dial Scales
For Every Purpose In Every Industry

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A STUDY by a Toledo man will show whether time is lost or material wasted in the weighing operations in your plant. This study will cost you nothing. It may save you much. Write us. Kindly address Industrial Sales Department, Section U.

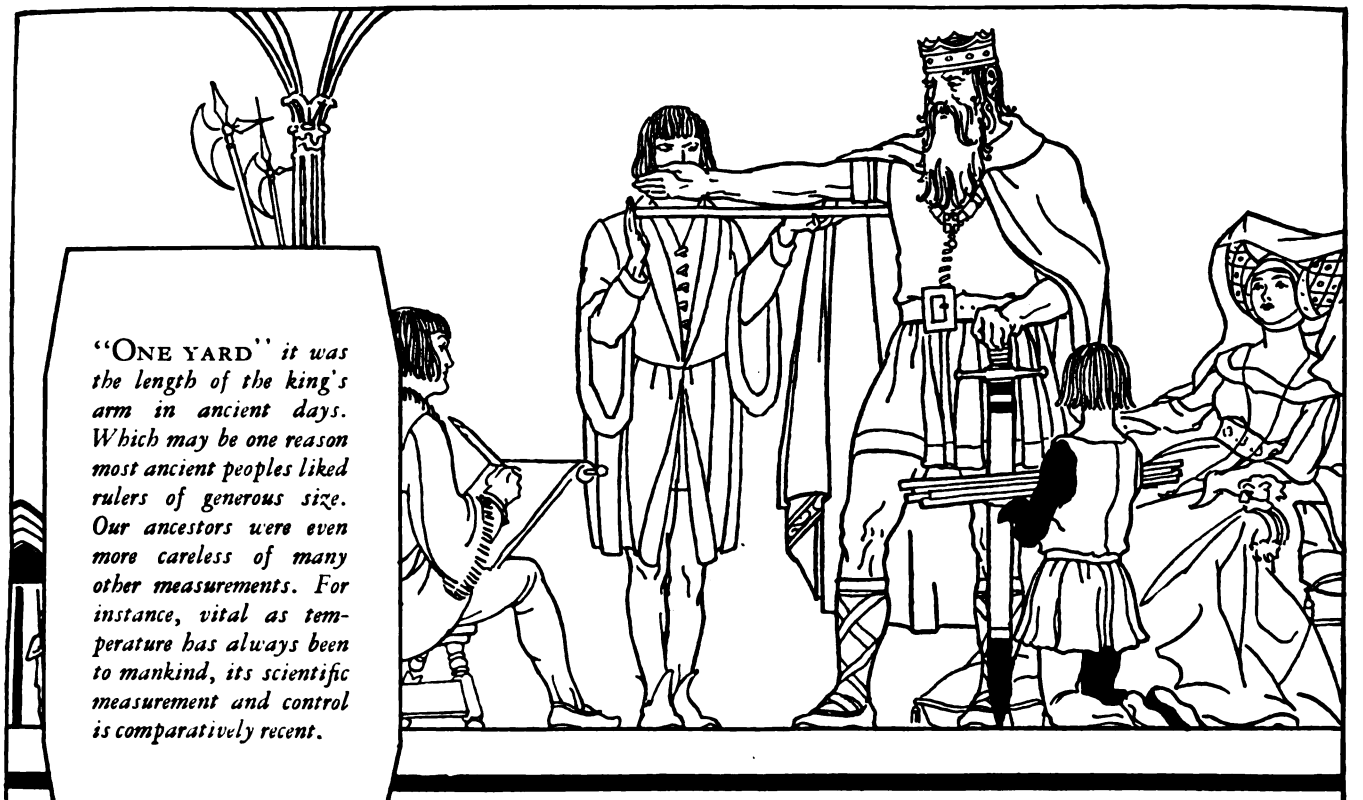
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"ONE YARD" *it was the length of the king's arm in ancient days. Which may be one reason most ancient peoples liked rulers of generous size. Our ancestors were even more careless of many other measurements. For instance, vital as temperature has always been to mankind, its scientific measurement and control is comparatively recent.*

When your customer purchases an instrument of measurement you must sell him HONESTY

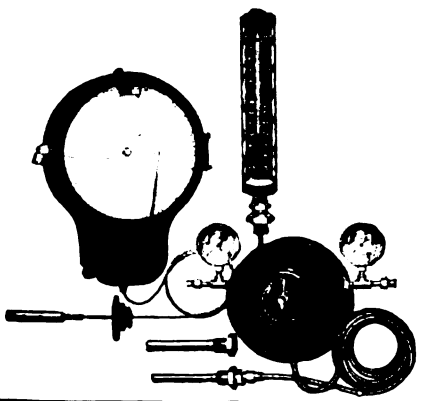
If your child asked you to give him dimes for a dollar bill you would give him ten, not nine. A public which cannot be expected to know all the details of scientific instrument manufacture should be able to place the same confidence in the manufacturers of such instruments that your child places in you.

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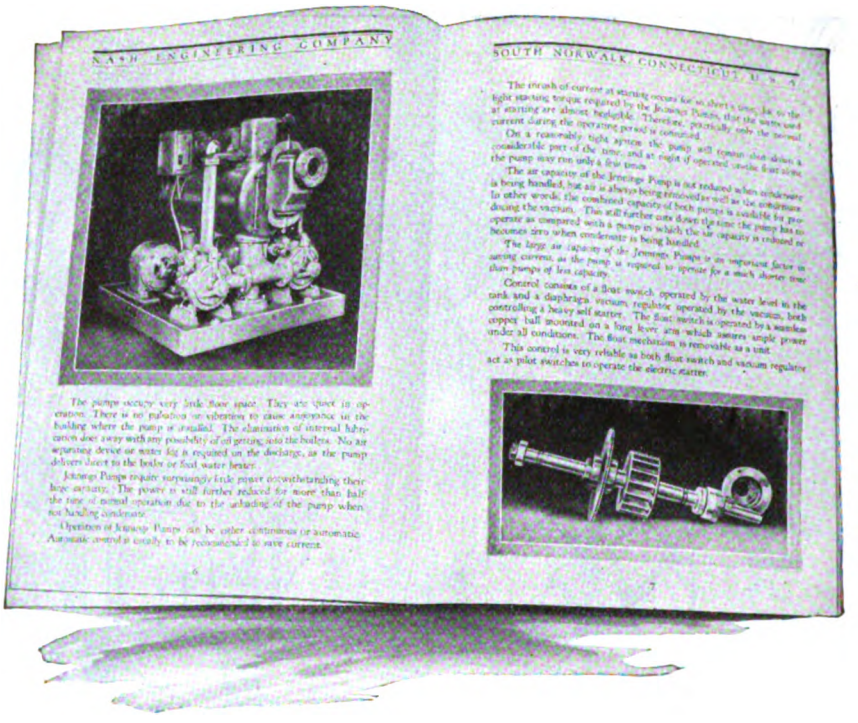
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Industry Illustrated

The Plant, Machinery and Equipment for Low-Cost Production Presented in Pictures

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Art Director

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The Use and Abuse of Drill Chucks

By William W. Baxter

ASIDE from hammers, drills were probably the first mechanical tools conceived by mankind, and with the development of civilization they have been improved and extended in use until at the present time they are one of the most essential requirements of practically every industrial institution.

From drills reamers were developed, and later taps came into general use, and as different types of machine tools were introduced eventually the drill chuck was perfected, primarily to adapt the many and varied kinds and sizes of drills, reamers, taps and similar tools to the various types of machines.

Today drill chucks are just as essential in manufacturing plants as are drills, and as a consequence, because of their wide range of uses, particular care should be exercised in selecting the right chuck for the right operation. Likewise, particular care should be used to see that the chuck is not misused unnecessarily, which can easily be done either through carelessness or ignorance.

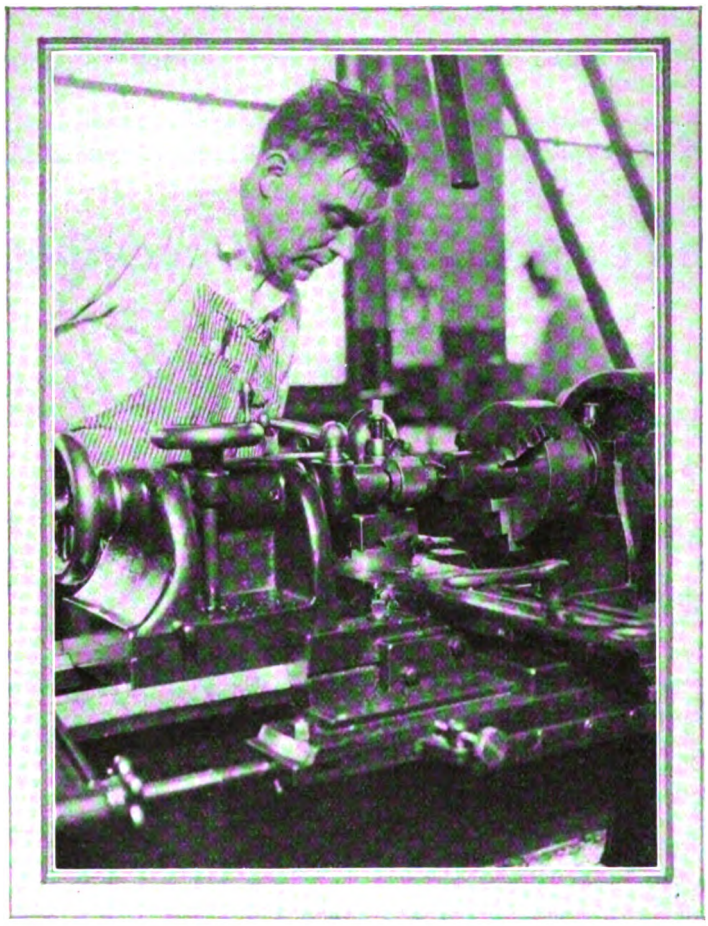


Fig. 1. Drill chucks having taper shanks to fit into tail stocks of machines are handy tools for centering operations in engine lathes.

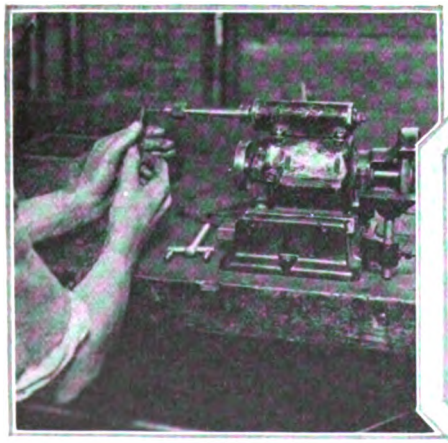


Fig. 2. Light, high speed drilling or burring operations become comparatively simple if an electrically driven bench grinder and a small drill chuck are available.



Fig. 4. Lapping the inside of small bushings is a simple operation when the lap is held in a drill chuck driven at high speed by a portable electric drill, clamped in a vise.

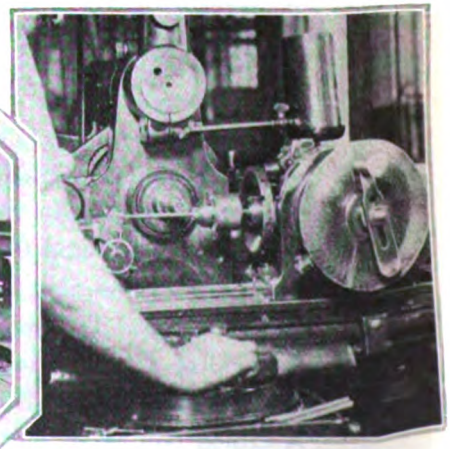


Fig. 3. Milling flutes in small reamers or taps is easily done with the use of an index head if a small drill chuck is used to hold the work between centers.

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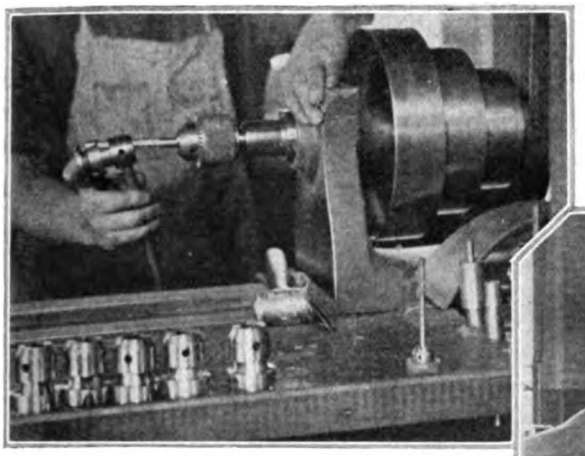


Fig. 5. Another simple lapping operation, but this time the drill chuck holding the lap is used in a small engine lathe. Similar set-ups may be used in engine lathes, or in drill presses, for light burring or polishing jobs.

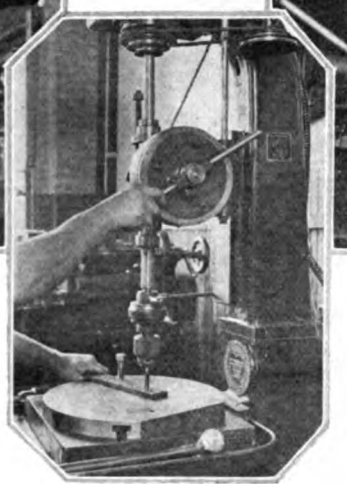


Fig. 7. In tapping operations drill chucks are often used in drill presses with tapping attachments.

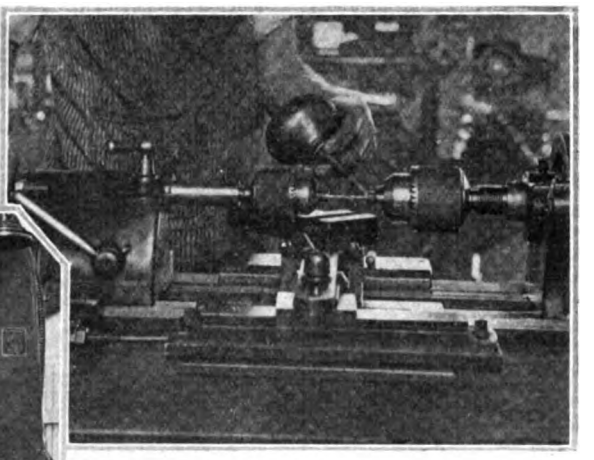
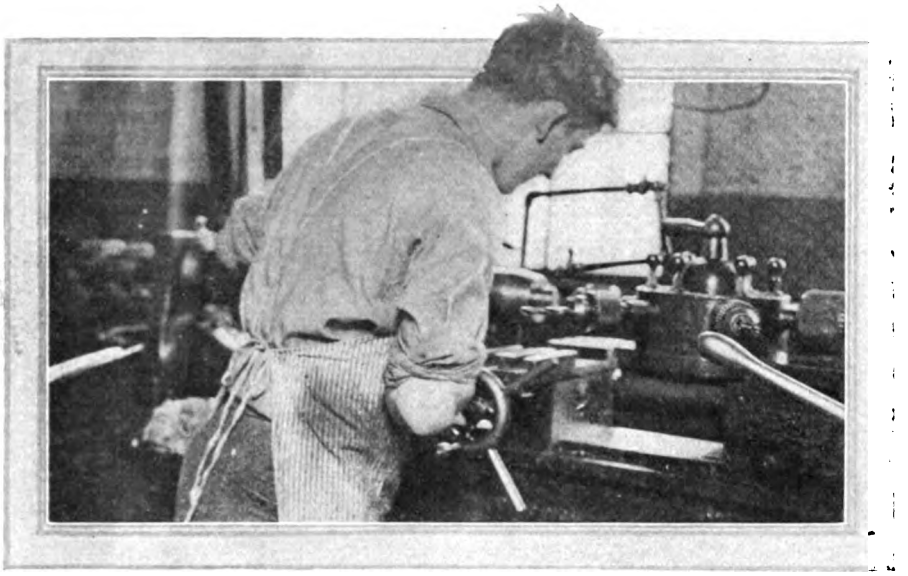


Fig. 6. Two drill chucks are often used together, much in the manner shown in the illustration above. In this case one chuck, mounted in the tail stock, holds the drill while another similar chuck in the lathe spindle holds the small bushing which is being drilled, reamed and burred.



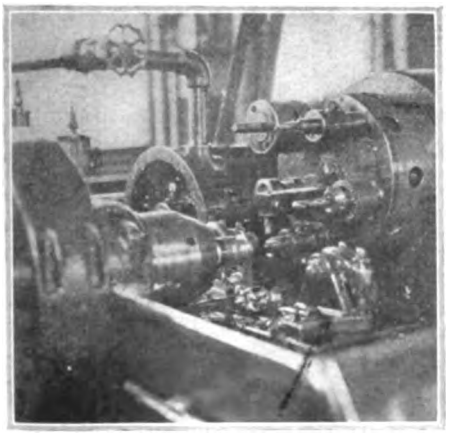
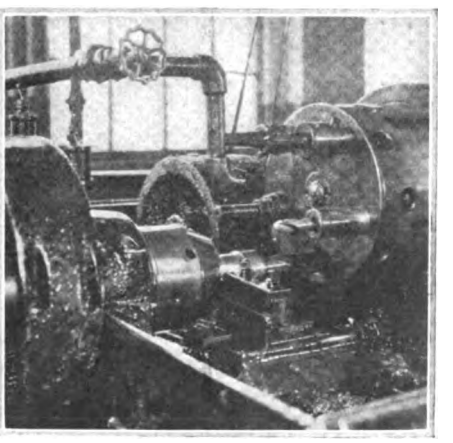


Fig. 8. Five different sizes of drill chucks are being used in this turret lathe for drilling, reaming, counterboring and countersinking.



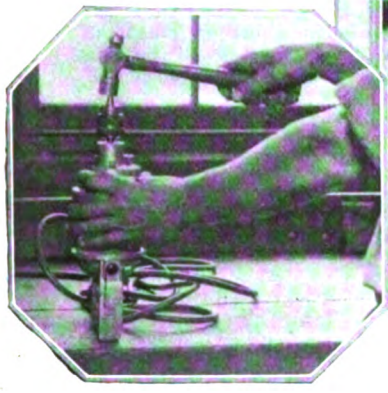
Figs. 9 and 10. Drill chucks instead of collars or holders with set screws are now used extensively for holding drills in screw machines. Both the old and the new method are shown in the illustrations.

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Fig. 11. Never drive a drill chuck on a taper spindle by striking the chuck with a hammer when the chuck jaws are extended. If it is necessary to hit the chuck use a lead hammer, but do not strike the chuck jaws; screw them back into the chuck body first.



Fig. 13. Below—Using a wedge to remove the chuck from a tapered spindle. The type of wedge employed is shown at the left of the illustration.



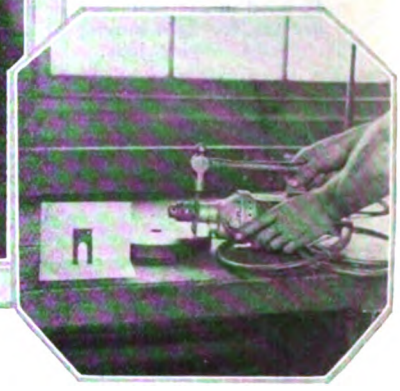


Fig. 12. If the drill chuck cannot be removed from the electric drill do not hammer the drill as shown above. Use the wedges as shown in Fig. 13, but first ascertain whether the spindle is tapered or threaded.

Fig. 14. Don't attempt to drive a drill chuck out of a machine spindle as this operator is. Drive a tapered drift key into the slot in the machine spindle and save the chuck from abuse.

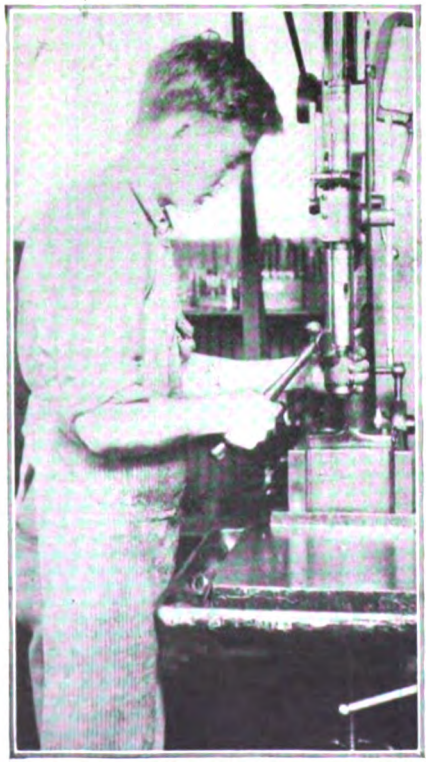




Fig. 15. Care should be used in selecting the proper size chuck. In the illustration the chuck is entirely too small and too light in construction to drive such a large drill.

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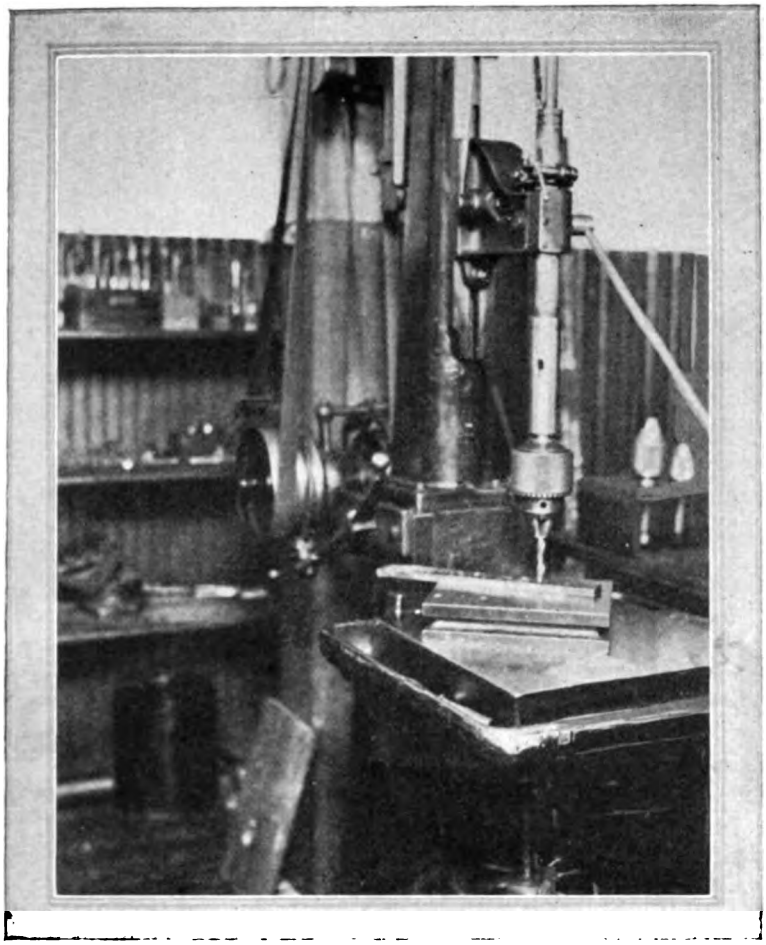


Fig. 16. The drill chuck shown is entirely too large for the drill and the machine. Better results are obtained when chucks of proper sizes are used. Quite frequently when large chucks are used with small drills the jaws do not always grip the drill tightly, resulting in damage to the jaws of the chuck.

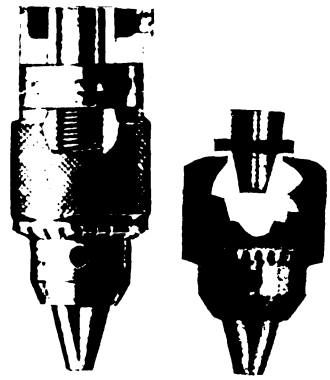
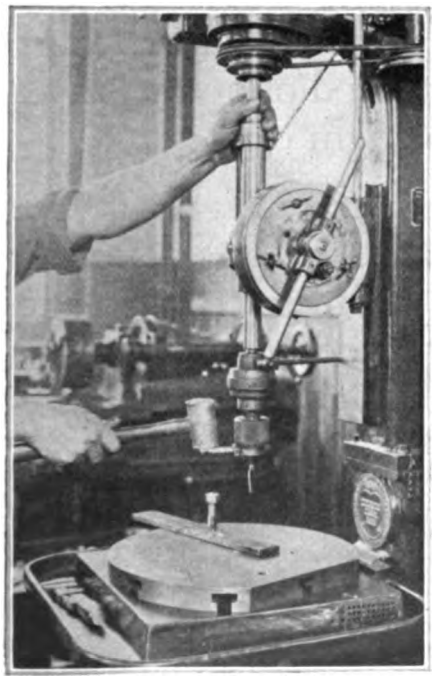
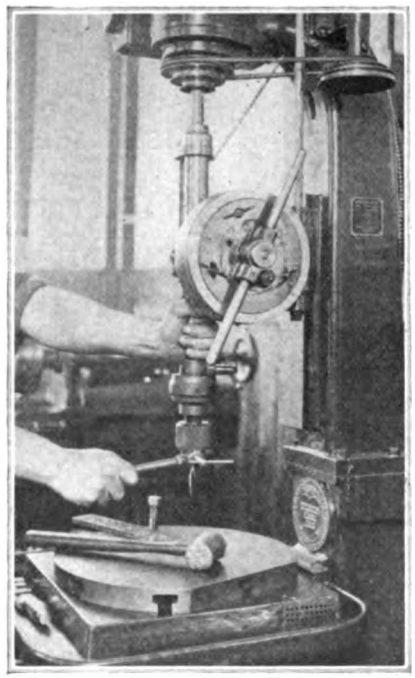
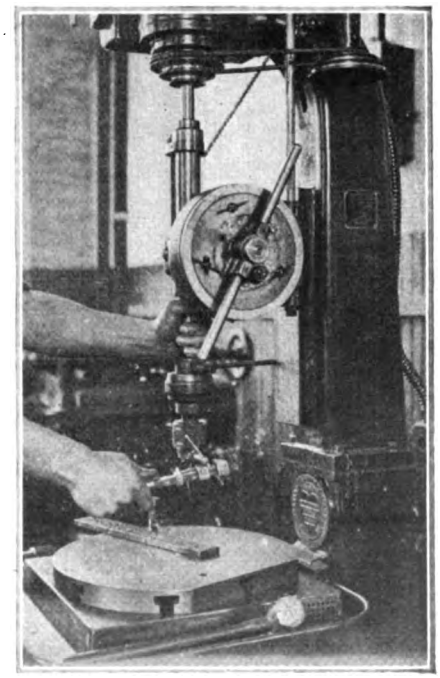


Fig. 20. Two methods are commonly used for attaching drill chucks to portable tools. The operator should know whether the chuck fits on a taper spindle or whether the spindle is threaded, for otherwise in attempting to remove the drill chuck from the spindle he might do considerable damage to either the chuck or the drill.

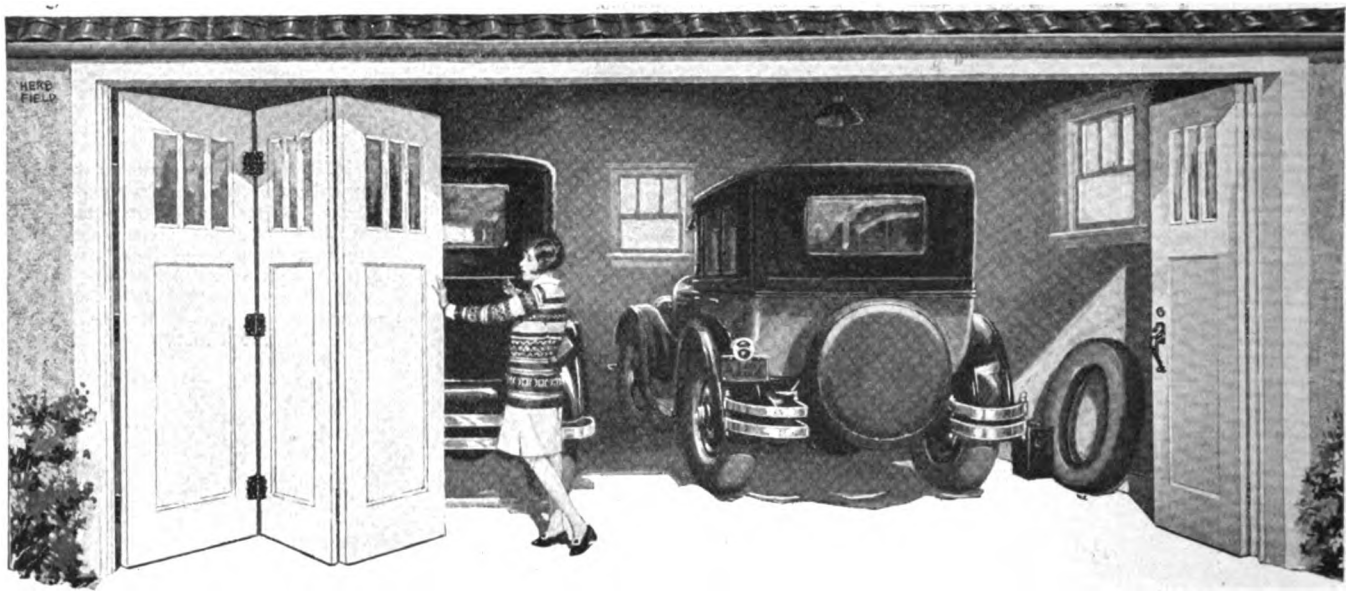






Figs. 17, 18 and 19. With drill chucks requiring keys there is no necessity for using a hammer, a wrench or a piece of pipe to clamp a drill in the chuck. The handle in the key provides ample leverage to clamp any drill adapted to the chuck.

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Slide the doors

One of these methods will take care of any condition



Slidetite hardware is made for 2 to 10 garage doors and for openings up to 30 feet wide. Regardless of width, there's no center post. *Slidetite* equipped doors cannot shrink or swell, stick, sag or work on rusty hardware, for it's all *inside the garage*.

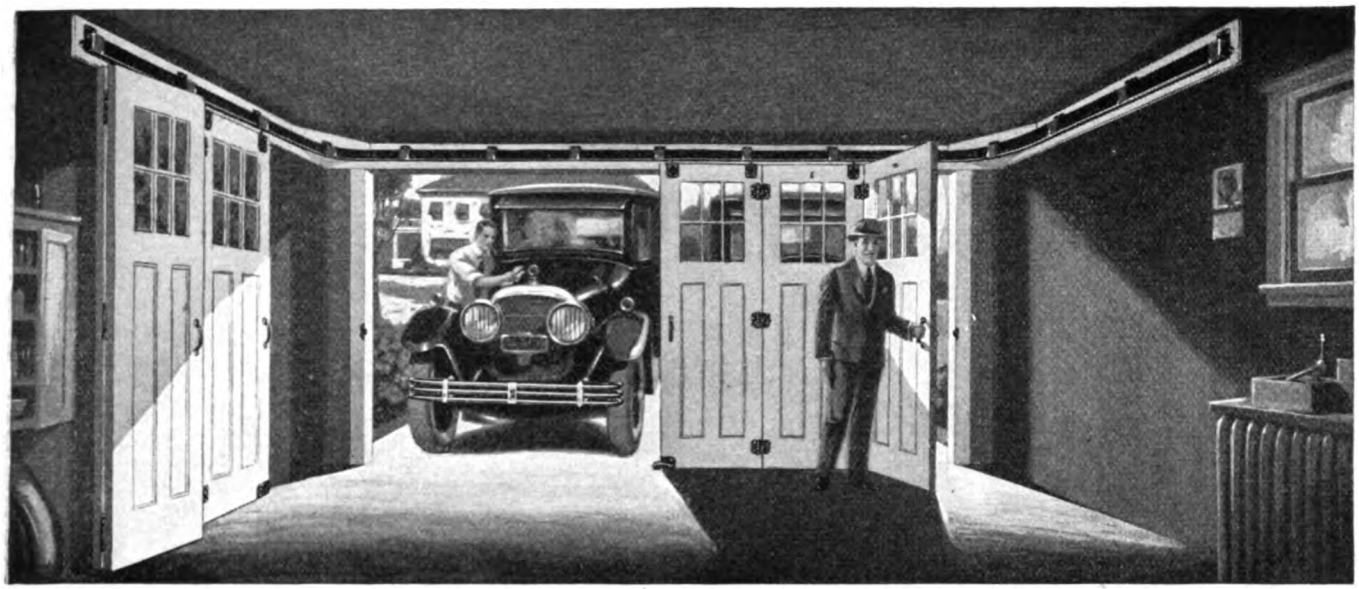
(1142)

GARAGE door installations seem so simple that it is just as easy to make a mistake in choosing the method of operation as it is to select the right one.

You cannot make a mistake if you specify R-W hardware. R-W experts have perfected many methods that meet all garage door requirements. Four of them are illustrated here.

Slidetite equipped doors (upper left) are so easy to operate that a child can open and close them. All the hardware is *inside* the garage where it will work better and last longer—away from wind and snow and rain and sun.

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inside

Slideaside (upper right) is frequently the method specified when a garage is not deep enough to fold the doors inside. The doors slide around the corner against the wall, regardless of the distance from door jamb to side wall.

Both *Slidetite* and *Slideaside* equipment provide for an entrance door—does away with the expense and inconvenience of a separate entrance. R-W garage door hardware eliminates center posts, leaving a clear and unobstructed full width opening. Doors are adjustable—always fit and snug.

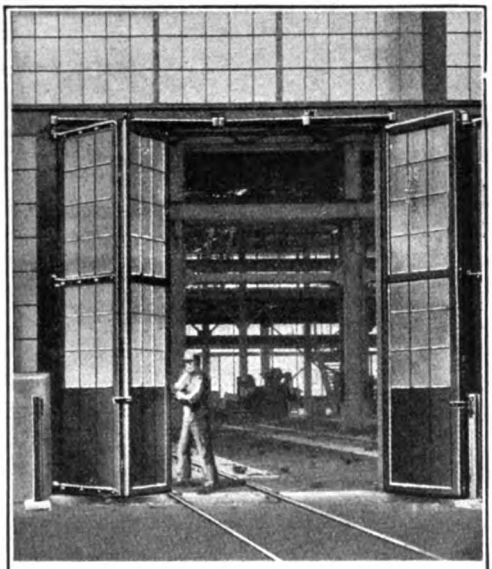
R-W door hardware, the largest and most complete line made, solves any and every doorway problem you'll ever meet.

Richards-Wilcox Mfg. Co.

A Hanger for any Door that Slides

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Industrial Slidetite

The *Slidetite* principle of operating doors is used in hardware designed for heavy industrial doors.

Industrial *Slidetite* will efficiently handle doors of extreme height and provides for clear and unobstructed openings in doorways up to 30 feet wide.

An R-W Doorway Engineer will gladly confer with you regarding the best method of handling your doorway problems.

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The Versatile Portable Elevator

A Piece of Equipment Which Is More Than Its Name Implies

By Frank L. Eidmann

Associate Professor of Machine Design, School of Engineering
Princeton University



Fig. 1. Here is a space-saving application in the store room, permitting these tires to be stacked roof-high with a minimum of labor.

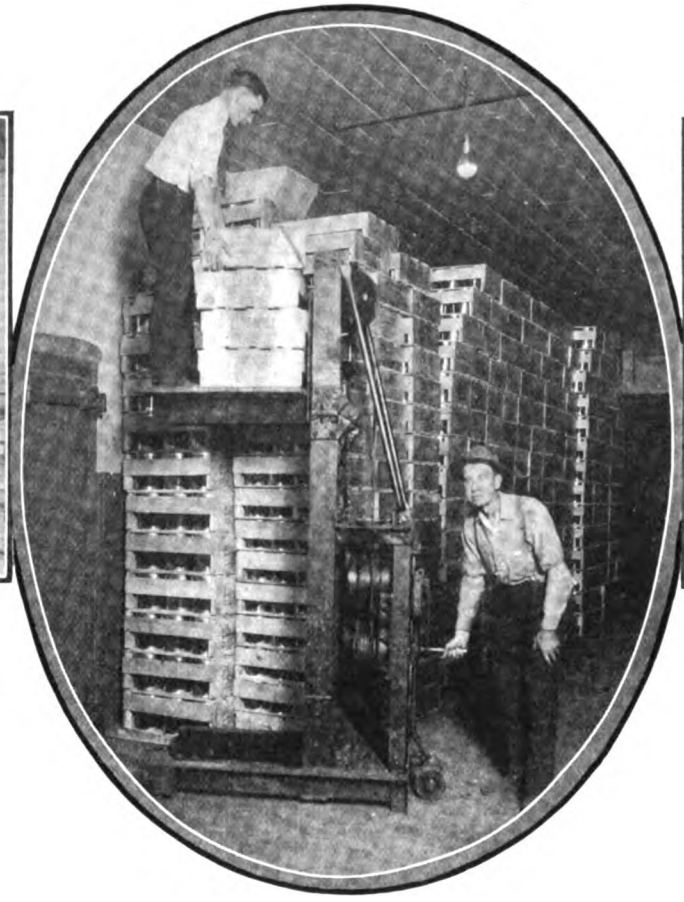




Fig. 2. Above—Refrigerator storage space is especially valuable. Here is a case where packed meat is being stacked up to ceiling height by means of a portable elevator operating within the refrigerator.

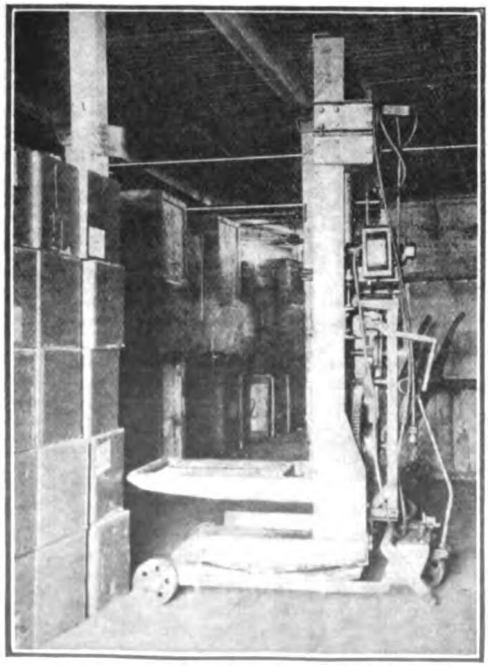


Fig. 3. Double deck storage of pianos with consequent obvious savings in storage space is made possible by this unit which, at the same time materially lowers the labor charge in handling and storing these bulky pieces of furniture.

Fig. 4. At the left—This revolving base type portable elevator is in use in the storage room of a large truck factory.

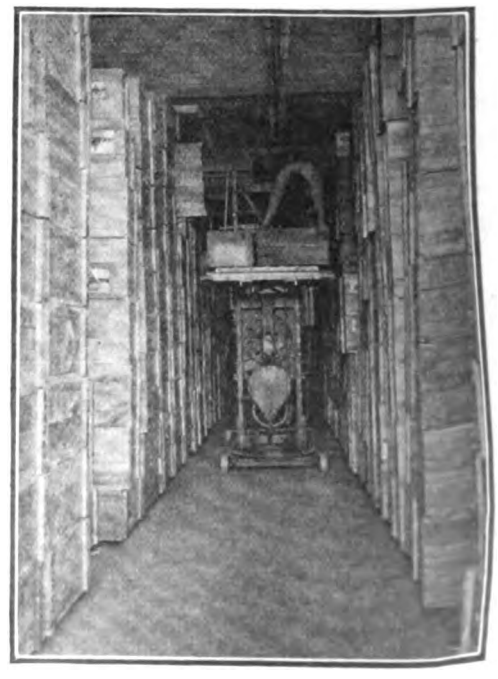


Fig 5. At the right—Heavy cases of printed matter stored in rows to ceiling height at the Stecher Lithographing Company.

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Fig. 6. In this installation the operator's platform rises with the collecting table and facilitates collection of the complete sets of printed posters which are stored in racks at varying heights.

Fig. 8. As an example of versatility, this is only one of the many jobs performed by this small hand-operated unit in a garage.

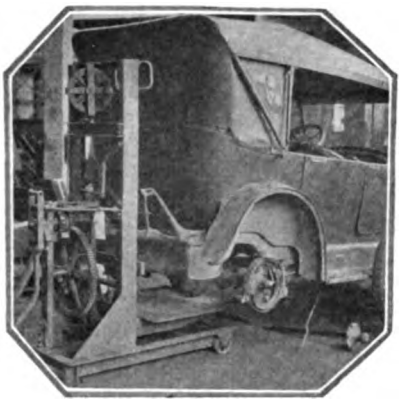




Fig. 7. A man-sized job. Stacking bales of cotton at the Weber Storage Company, with a portable elevator.

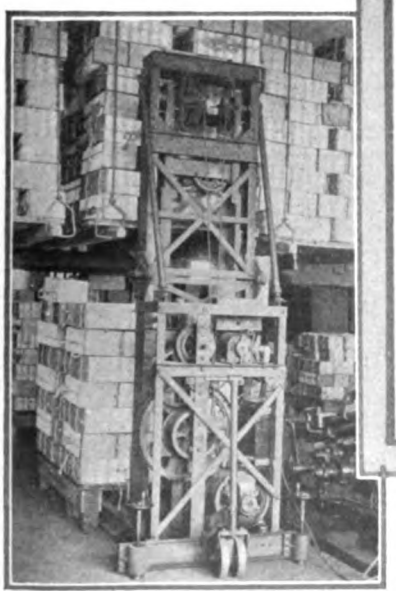


Fig. 9. Storing the upper loads so that the lower loads may be withdrawn. The 5,000 pound signatures (book insides) are suspended from tee-slots in the concrete ceiling.



Fig. 10. On the ordinary jobs encountered everywhere, such as loading barrels and cases on to trucks, a portable unit of this kind not only does away with back breaking labors, but it also cuts both the time and the cost of the work.

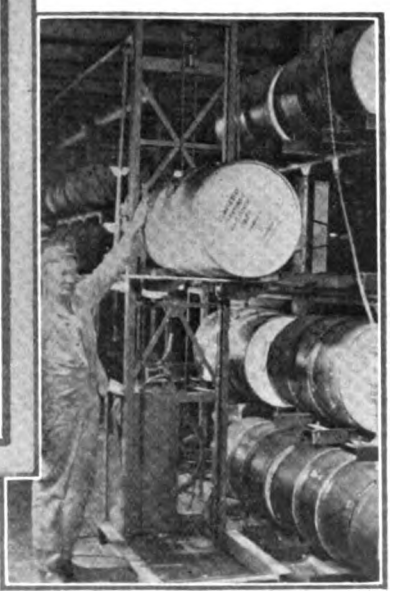
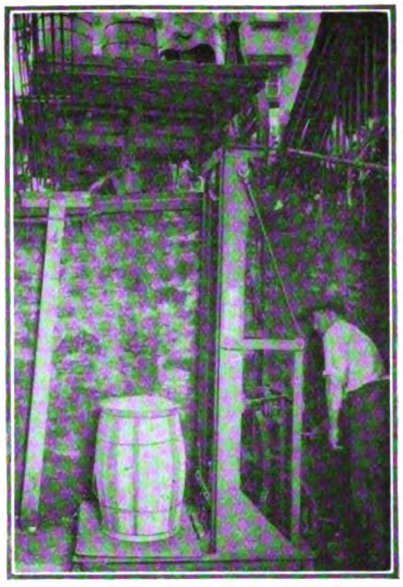
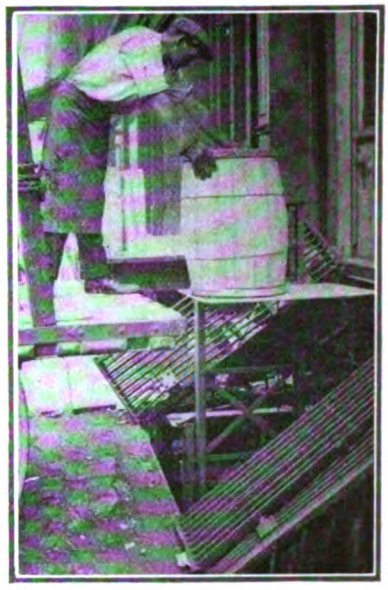


Fig. 11. Handling drums of denatured alcohol which are stored in racks permitting access to any pier independent of the others.

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Figs. 12, 13 and 14. Three photographs illustrating the use of a telescopic type of portable elevator. Barrels of material are taken from ceiling height in a part of the basement where the headroom is low. The loaded elevator is transported outside the basement and the load is elevated to the level of the wagon, for loading.

Fig. 15. At the right—Making a one-man job of what would otherwise be a highly difficult feat for three men by the portable elevator raising materials to a high storage balcony.

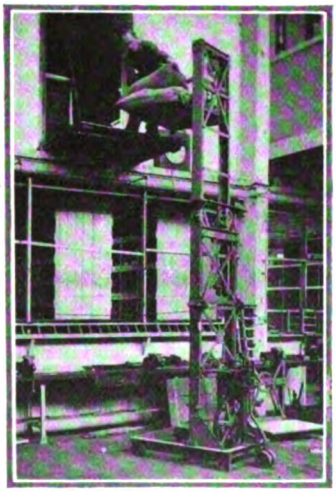




Fig. 16. At the left—the portable elevator as a heavy-duty dumb-waiter. Independent of the walls of the building, and may be removed for use in other parts of the plant.



Fig. 17. A portable elevator used for loading motor trucks through a door, the sill of which is at truck height.

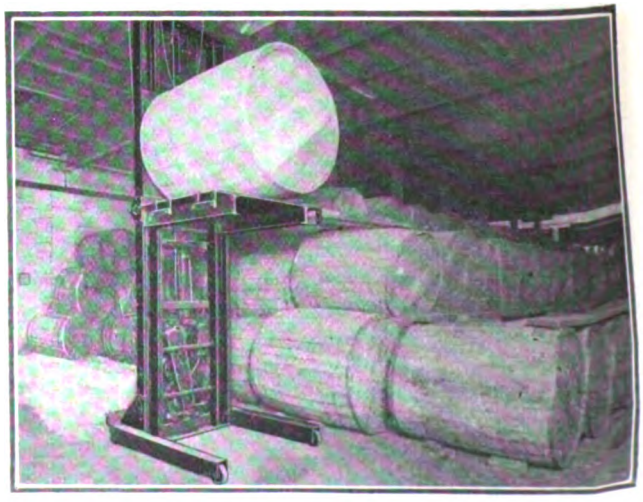
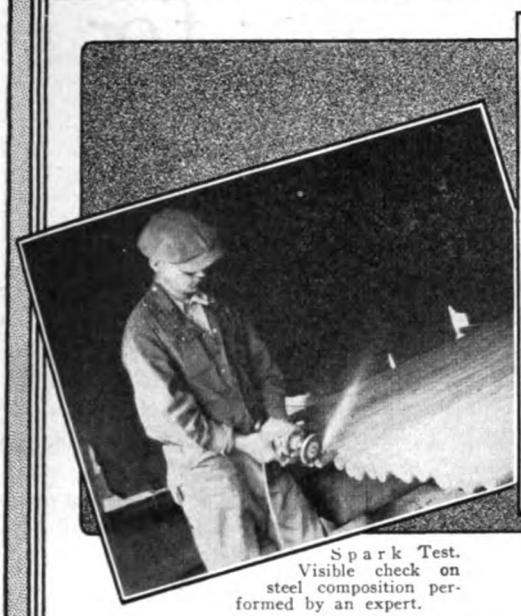


Fig. 18. Handling hogsheads at the plant of the American Snuff Company. The labor-savings on work of this kind are especially important.

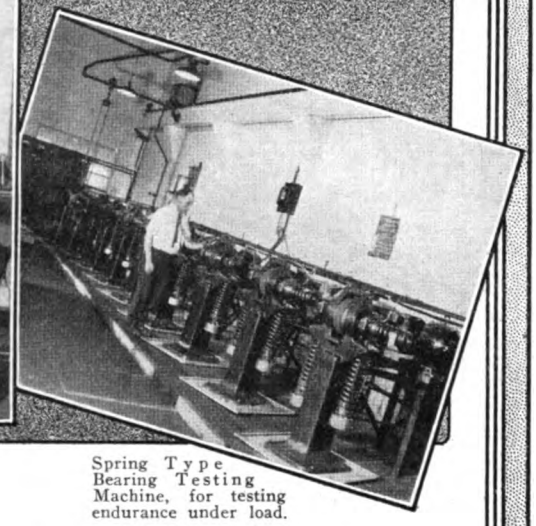
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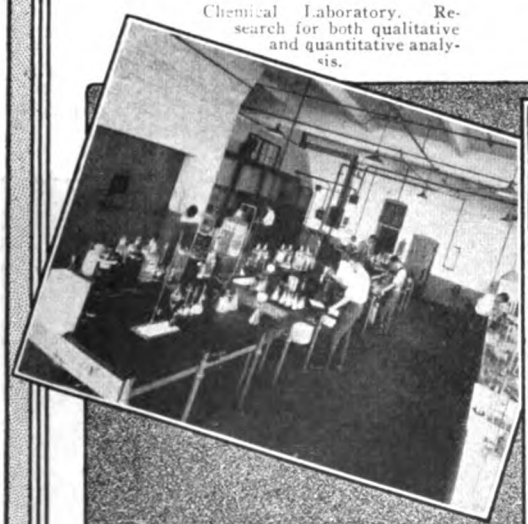
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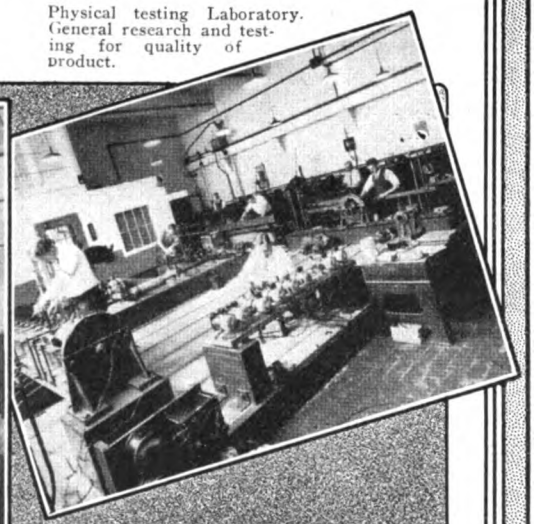
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Choosing the Right Motor for Pumping Service

By George Lee

IN selecting a motor for driving pumping machinery, the essential things to remember are that the motor must have sufficient starting torque, pull-out torque and good speed regulation, depending upon the voltage conditions. If a motor is called upon to operate from a circuit having poor voltage regulation it may so happen that the motor will not be able to raise the water to the discharge level and yet it may continue to drive the pump, thus merely churning the water and wasting energy.

The most popular types of motors are exceptionally well protected and insulated to withstand atmospheric and other conditions to which the majority of motors are subjected. For unusual conditions, which are common in some kinds of service, motors having specially impregnated windings are desirable.

Generally the special conditions under which motors are applied are listed as follows:

1. Inflammable gases or dusts.
2. Strong acid or alkali fumes.
3. Steam or extreme moisture.
4. Dripping oil or water.
5. Room temperature more than 40 deg. C. (104 deg. F.) or below 0 deg. C. (32 deg. F.).

Where dust is present motors are at a disadvantage because of the wear on the bearings, commutator or slip rings. A motor may be enclosed to obviate this disadvantage but then it must usually be derated. None but an approved permissible motor should be used where explosive dusts or gases may be present at any time, as a spark might cause a serious explosion.

Size Motor Must Suit Pump Characteristic—If a pump has an unloading characteristic curve it is generally advisable to select a motor of such size that it cannot at any pump capacity or head become overloaded.

An over-motored pump is sometimes quite a serious disadvantage because as it works at a low value of efficiency it may also cause poor power factor conditions or needlessly require a larger capital investment than necessary.

Motors are usually selected with as high a standard normal speed as is feasible because, within limits, the lower the speed of a motor, the more costly it is to build. Frequently the operating characteristics of slow-speed motors are not quite as good as those of high-speed standard motors.

Constant-speed motors

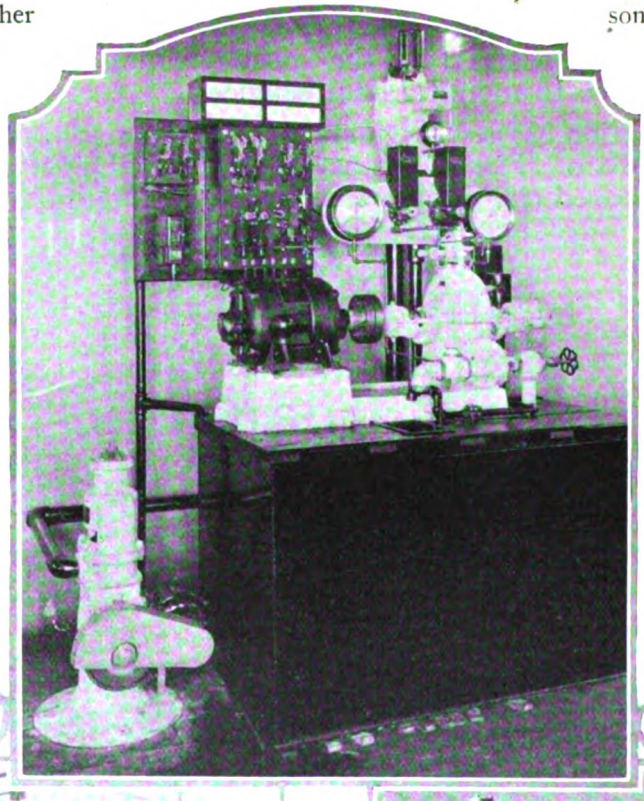


Fig. 1. At the left is shown a complete automatic pumping outfit with centrifugal pump driven by a squirrel-cage motor.

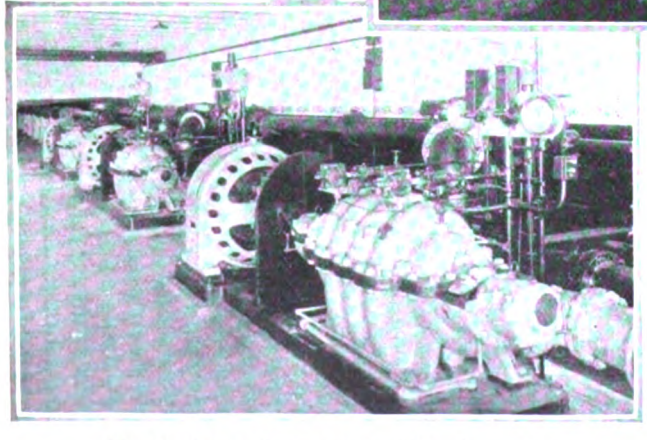


Fig. 2. Three four-stage centrifugal pumps, driven by individual synchronous motors.

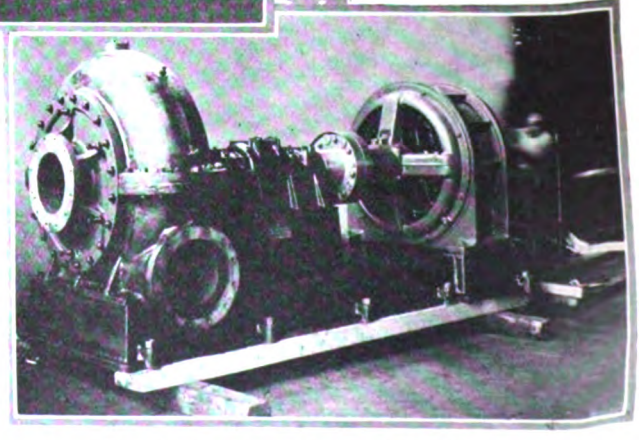


Fig. 3. A squirrel-cage induction motor, driving direct a large capacity, low head pump.

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Fig. 5. Below—This shows a well known make of synchronous motor, with exciter attached.

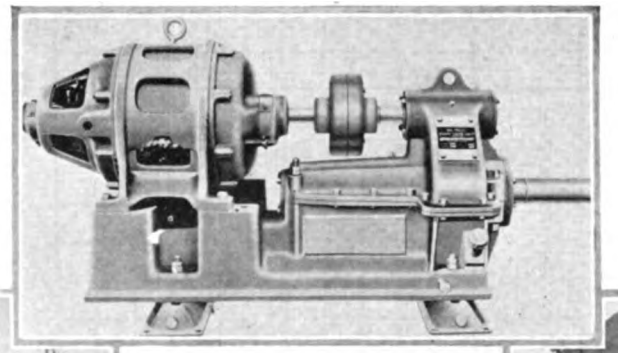


Fig. 6. Below—An enclosed, back-geared induction motor, especially suited for driving reciprocating pumps in moist atmosphere.

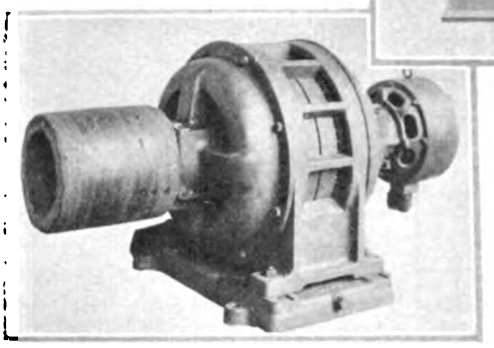
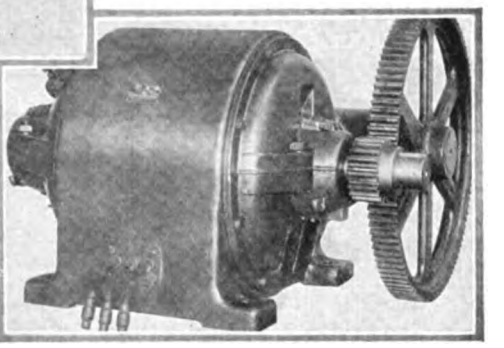


Fig. 4. Above—A slip-ring motor coupled to a speed-reducing gear unit, for driving an oil well pump.



are found to be best for the vast majority of pumping machines. Adjustable-speed motors are more expensive and in ordinary size are seldom justified unless necessary because some peculiar operating condition must be met.

For direct-current service on reciprocating pumps, the compound-wound motor will be found most suitable. Generally, the speed adjustment will be found most economical when obtained by means of shunt field control.

For alternating current, on the same type of pump, squirrel-cage, slip-ring, or synchronous motors are used where constant speed is applicable. The squirrel-cage induction motor will be found satisfactory on nearly all sizes of pumps but owing to its jerky starting characteristic it may sometimes be objectionable. The slip-ring induction motor is highly suitable as it will develop the necessary starting torque without drawing an excessive

Friction of Water in Pipes

Loss of head in feet due to friction per 100 feet of ordinary cast iron pipe

Gal's per Min.	6" Pipe Vel.	6" Pipe Fric.	8" Pipe Vel.	8" Pipe Fric.	10" Pipe Vel.	10" Pipe Fric.	12" Pipe Vel.	12" Pipe Fric.	14" Pipe Vel.	14" Pipe Fric.	15" Pipe Vel.	15" Pipe Fric.	16" Pipe Vel.	16" Pipe Fric.	20" Pipe Vel.	20" Pipe Fric.
40	1.01	0.22														
45	1.17	0.28														
50	1.28	0.34														
70	1.79	0.63	1.14	0.21												
75	1.92	0.72	1.22	0.24												
100	2.56	1.23	1.63	0.39	1.14	0.14										
125	3.19	1.86	2.04	0.64	1.43	0.25										
150	3.84	2.53	2.45	0.86	1.71	0.32										
175	4.45	3.36	2.86	1.18	2.00	0.48										
200	5.11	4.37	3.27	1.48	2.28	0.62										
225	5.72	5.61	3.67	1.86	2.57	0.74										
250	6.40	6.72	4.08	2.24	2.90	0.92	1.80	0.22								
270	6.90	7.70	4.42	2.60	3.03	1.13	1.70	0.25								
275	7.03	7.99	4.50	2.72	3.06	1.15	1.73	0.27								
300	7.66	9.38	4.90	3.15	3.40	1.29	1.90	0.36								
325	8.30	12.32	5.72	4.19	3.98	1.69	2.20	0.41								
400	10.20	15.82	6.54	5.33	4.54	2.21	2.60	0.56								
450	11.50	19.74	7.35	6.65	5.12	2.74	2.92	0.64	1.80	0.21						
470	12.14	22.40	7.78	7.42	5.49	3.12	3.07	0.77	1.92	0.24						
475	12.30	22.96	7.88	7.23	5.55	3.21	3.10	0.79	1.94	0.28						
500	12.77	24.0..	8.17	8.12	5.60	3.26	3.20	0.81	2.04	0.28	1.42	0.11				
550			8.96	9.66	6.16	3.93	3.52	0.98	2.25	0.33	1.57	0.14				
600			9.80	11.34	6.72	4.70	3.84	1.16	2.46	0.39	1.71	0.15				
650			10.62	13.16	7.28	5.50	4.16	1.34	2.66	0.46	1.85	0.19	1.37	.09		
700			11.44	15.12	7.84	6.38	4.48	1.54	2.86	0.52	2.00	0.22	1.47	.10		
750			12.26	17.22	8.50	7.00	4.80	1.74	3.06	0.59	2.13	0.24	1.58	.11		
800			....	....	9.08	7.90	5.12	1.97	3.28	0.67	2.27	0.27	1.68	.13		
850			....	....	9.59	8.75	5.48	2.23	3.48	0.75	2.41	0.31	1.79	.14		
900			....	....	10.30	10.11	5.75	2.46	3.65	0.83	2.56	0.34	1.89	.16		
950			....	....	10.72	10.71	6.06	2.87	3.88	0.91	2.70	0.38	2.00	.16	1.79	.12
1000			....	....	11.32	12.04	6.40	3.02	4.08	1.01	2.84	0.41	2.10	.19	1.82	.14
1050			....	....	11.90	13.30	6.70	3.21	4.29	1.09	2.96	0.48	2.20	.22	1.91	.16
1100			....	....	12.50	14.31	7.03	3.51	4.50	1.20	3.13	0.49	2.31	.23	2.00	.16
1150			....	....	12.95	15.34	7.35	3.84	4.71	1.34	3.27	0.53	2.42	.25	2.09	.17
1200			....	....	13.52	16.66	7.67	4.26	4.91	1.48	3.41	0.57	2.52	.26	2.18	.19
1250			....	....	14.10	18.20	8.00	4.45	5.11	1.51	3.55	0.62	2.63	.29	2.28	.20
1300			....	....	....	....	8.60	6.27	6.10	2.99	4.20	0.85	3.15	.39	2.73	.28
1350			....	....	....	....	12.70	10.71	8.10	3.50	5.60	1.43	4.20	.66	3.64	.47
1400			....	....	....	....	....	....	10.10	5.33	7.00	2.18	5.25	1.01	4.56	.72
1500			....	....	....	....	....	....	12.10	7.42	8.40	3.39	6.30	1.57	5.46	1.12
1600			....	....	....	....	....	....	14.10	10.05	9.80	3.92	7.35	1.82	6.37	1.29
1700			....	....	....	....	....	....	....	....	11.35	5.32	8.40	2.47	7.28	1.78
1800			....	....	....	....	....	....	....	....	11.93	6.30	8.82	2.93	7.64	2.08
1850			....	....	....	....	....	....	....	....	12.78	6.78	9.45	3.13	8.19	2.23
1900			....	....	....	....	....	....	....	....	14.20	8.15	10.50	3.78	9.10	2.69
1950			....	....	....	....	....	....	....	....	....	....	11.55	4.50	10.01	3.16
2000			....	....	....	....	....	....	....	....	....	....	12.60	5.40	10.92	3.79
2100			....	....	....	....	....	....	....	....	....	....	13.65	6.14	11.83	4.30
2200			....	....	....	....	....	....	....	....	....	....	14.70	6.65	12.74	4.66
2300			....	....	....	....	....	....	....	....	....	....	....	....	13.10	4.96
2400			....	....	....	....	....	....	....	....	....	....	....	....	13.66	5.60
2500			....	....	....	....	....	....	....	....	....	....	....	....	....	....
2600			....	....	....	....	....	....	....	....	....	....	....	....	....	....
2700			....	....	....	....	....	....	....	....	....	....	....	....	....	....
2800			....	....	....	....	....	....	....	....	....	....	....	....	....	....
2900			....	....	....	....	....	....	....	....	....	....	....	....	....	....
3000			....	....	....	....	....	....	....	....	....	....	....	....	....	....

Vel.—Velocity ft. per second. Fric.—Friction head in feet.

Friction of Water in 90° Elbows

Equivalent Number of Feet Straight Pipe

Size of Elbow, Inches	4	5	6	8	10	12	14	15	16	20
Friction Equivalent Feet Straight Pipe	16	19	18	24	30	40	54	55	55	70

NOTE—The figures given are based on the assumption that the total velocity head of the water flowing through the elbow is used up to overcome the friction.

Friction of Water in Pipes

Loss of head in feet due to friction per 100 feet of ordinary cast iron pipe.

Gal's per Min.	24" Pipe Vel.	24" Pipe Fric.	30" Pipe Vel.	30" Pipe Fric.	36" Pipe Vel.	36" Pipe Fric.	42" Pipe Vel.	42" Pipe Fric.	48" Pipe Vel.	48" Pipe Fric.
2000	1.43	0.06								
2500	1.77	0.07								
3000	2.13	0.10								
3500	2.49	0.14	1.56	0.04						
4000	2.85	0.18	1.81	0.06						
4500	3.20	0.22	2.04	0.08						
5000	3.54	0.27	2.26	0.09						
5500	3.90	0.33	2.50	0.11						
6000	4.25	0.38	2.72	0.13	1.90	0.05				
6500	4.61	0.45	2.95	0.15	2.05	0.06				
7000	4.97	0.53	3.18	0.17	2.21	0.07				
7500	5.32	0.60	3.40	0.20	2.37	0.08				
8000	5.68	0.66	3.63	0.22	2.53	0.09				
8500	6.03	0.74	3.86	0.25	2.69	0.10				
9000	6.35	0.81	4.08	0.27	2.84	0.11				
9500	6.74	0.91	4.31	0.30	3.00	0.12				
10000	7.07	0.98	4.54	0.33	3.14	0.13	2.21	0.06		
10500	7.46	1.10	4.76	0.37	3.30	0.14	2.43	0.06		
11000	7.80	1.20	5.00	0.40	3.46	0.16	2.55	0.07		
11500	8.16	1.30	5.21	0.43	3.62	0.18	2.65	0.08		
12000	8.50	1.40	5.44	0.47	3.77	0.19	2.77	0.09		
12500	8.86	1.53	5.67	0.51	3.94	0.21	2.89	0.09		
13000	9.22	1.63	5.91	0.54	4.10	0.22	3.00	0.10		
13500	9.60	1.75	6.13	0.58	4.27	0.24	3.13	0.11		
14000	9.96	1.87	6.36	0.63	4.43	0.26	3.23	0.13		
14500	10.3	2.00	6.61	0.68	4.59	0.27	3.35	0.13	2.57	0.06
15000	10.65	2.12	6.81	0.72	4.76	0.29	3.47	0.14	2.66	0.07
16000	11.38	2.40	7.26	0.83	5.05	0.33	3.71	0.15	2.87	0.08
17000	12.09	2.70	7.73	0.91	5.36	0.37	3.94	0.17	3.02	0.09
18000	12.78	2.97	8.18	1.00	5.67	0.41	4.16	0.19	3.19	0.10
19000	13.50	3.28	8.66	1.11	6.00	0.45	4.40	0.21	3.37	0.11
20000	14.20	3.60	9.09	1.23	6.30	0.50	4.63	0.23	3.54	0.13
21000	14.90	3.96	9.54	1.34	6.63	0.55	4.86	0.26	3.71	0.13
22000	....	....	10.0	1.47	6.98	0.60	5.10	0.28	3.90	0.14
23000	....	....	10.45	1.59	7.34	0.66	5.33	0.30	4.07	0.15
24000	....	....	10.90	1.71	7.54	0.70	5.55	0.32	4.26	0.17
25000	....	....	11.36	1.85	7.88	0.76	5.79	0.35	4.43	0.18
26000	....	....	11.80	1.97	8.20	0.82	6.03	0.38	4.61	0.20
27000	....	....	12.26	2.12	8.53	0.87	6.28	0.41	4.78	0.21
28000	....	....	12.72	2.26	8.85	0.94	6.51	0.44	4.96	0.23
29000	....	....	....	....	9.17	1.00	6.71	0.47	5.14	0.24
30000	....	....	....	....	9.45	1.06	6.98	0.50	5.33	0.26
32000	....	....	....	....	10.10	1.19	7.42	0.56	5.67	0.29
34000	....	....	....	....	10.75	1.33	7.88	0.63	6.08	0.33
36000	....	....	....	....	11.33	1.49	8.33	0.70	6.39	0.37
38000	....	....	....	....	12.00	1.65	8.80	0.77	6.78	0.40
40000	....	....	....	....	12.62	1.81	9.28	0.85	7.11	0.44
42000	....	....	....	....	13.25	1.99	9.75	0.93	7.45	0.49
44000	....	....	....	....	....	....	10.18	1.01	7.80	0.53
46000	....	....	....	....	....	....	10.63	1.10	8.14	0.58
48000	....	....	....	....	....	....	11.10	1.19	8.52	0.62
50000	....	....	....	....	....	....	11.58	1.29	8.86	0.67
52000	....	....	....	....	....	....	12.05	1.38	9.21	0.72
54000	....	....	....	....	....	....	12.50	1.48	9.55	0.77
56000	....	....	....	....	....	....	12.94	1.59	9.93	0.83
58000	....	....	....	....	....	....	....	....	10.27	0.88
60000	....	....	....	....	....	....	....	....	10.60	0.94
62000	....	....	....	....	....	....	....	....	10.98	1.01
64000	....	....	....	....	....	....	....	....	11.35	1.07
66000	....	....	....	....	....	....	....	....	11.68	1.13
68000	....	....	....	....	....	....	....	....	12.08	1.19
70000	....	....	....	....	....	....	....	....	12.41	1.26

Vel.—Velocity ft. per second. Fric.—Friction head in feet.

Friction of Water in 90° Elbows

Equivalent Number of Feet Straight Pipe

Size of Elbow, Inches	24	30	36	42	48
Friction Equivalent Feet Straight Pipe	80	100	120	140	160

NOTE—The figures given are based on the assumption that the total velocity head of the water flowing through the elbow is used up to overcome the friction.

Figs. 7 and 8. The above tables give the loss of head, in feet, due to friction of water, per 100 feet of ordinary cast iron pipe.

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line current; furthermore, it can be gradually accelerated quite smoothly by suitable secondary control equipment. Synchronous motors may be successfully applied to many reciprocating pumps but each case is a special problem necessitating due consideration of starting and pull-in torques and the proper flywheel effect to suit the pulsations of the pump.

Alternating-Current Adjustable Speed Service—Where only single-phase current is available an adjustable, varying-speed commutator type motor is recommended. When a small amount of speed reduction is desired the wound-rotor slip-ring induction motor is suitable. Although its efficiency decreases as the speed is made less, the power required to drive the pump at the lower speed drops off so rapidly that the actual power input to the motor is reduced. For the higher speeds, when the horsepower taken by the pump is large, the efficiency is high.

For adjustable-speed pumps the brush-shifting commutator-type polyphase motor may also be used. This motor has a high efficiency characteristic at slow speeds, thus justifying its high cost if operated below normal speed for large proportions of the running time.

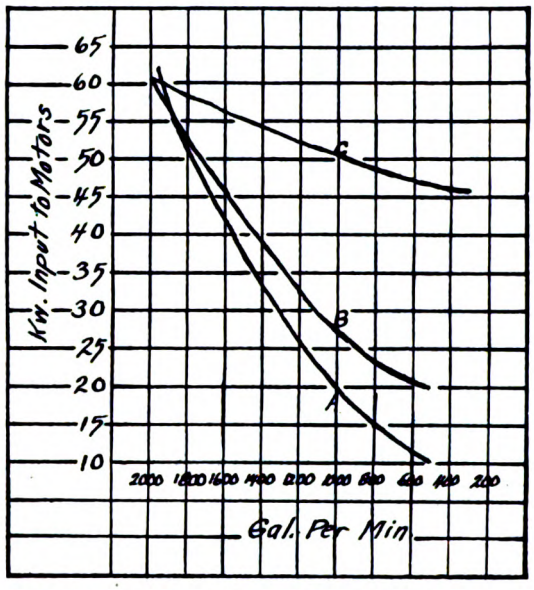


Fig. 9. Curve A shows the kilowatt input of a brush-shifting motor slowed down to deliver different quantities of water, curve B shows the input of a wound-rotor motor under the same conditions, while curve C shows the input to a wound-rotor motor running at full speed but when the pump valves are throttled to give a discharge of various quantities.

Direct-Current Constant or Variable Speed Units—For either constant or variable speed service motors equipped with a moderate series field of about 10 per cent. compounding are used. Such motors will slow down in case of overload and automatically protect themselves within certain limits.

Alternating-Current Constant Speed Service — Squirrel-cage motors are commonly applied to loads less than 50 hp. when the starting current and frequency of starting is not excessive. Large capacity pumps are also driven by squirrel-cage motors but generally by slip-ring motors. Synchronous motors are also used for pumps of 75 hp. or more. The advantage of power-factor correction and high efficiency are important features of the synchronous motor. This is especially true for slow-speed pumps. Most centrifugal pumps driven by synchronous motors must be started with the discharge valve closed; as stated before, this reduces the pull-in torque to about 60 per cent. of the full load torque. Synchronous motors with sufficiently high pull-in torque to operate centrifugal pumps which must be started with the discharge valve open are now becoming available in almost all sizes.

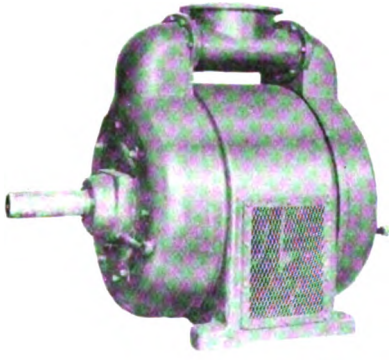


Fig. 10. A 440 volt induction motor, with special ventilation casing.



Fig. 11. An enclosed, ventilated motor of another type.

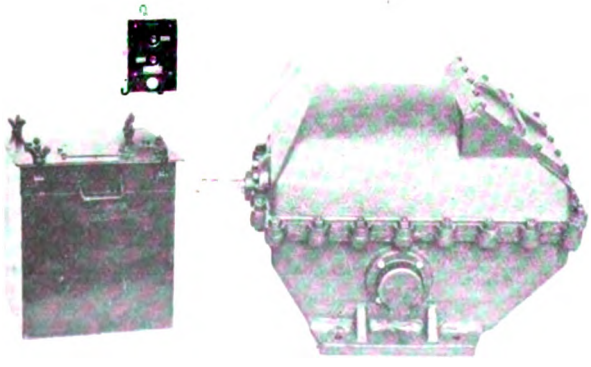


Fig. 12. Above is a 550 volt, 5 hp. motor, designed to be proof against gasoline fumes, with its control equipment.

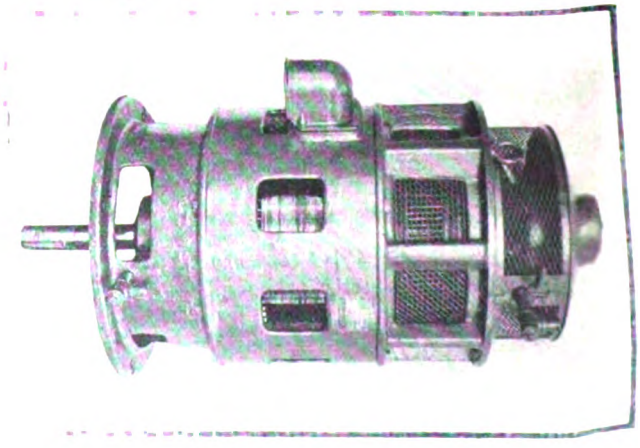
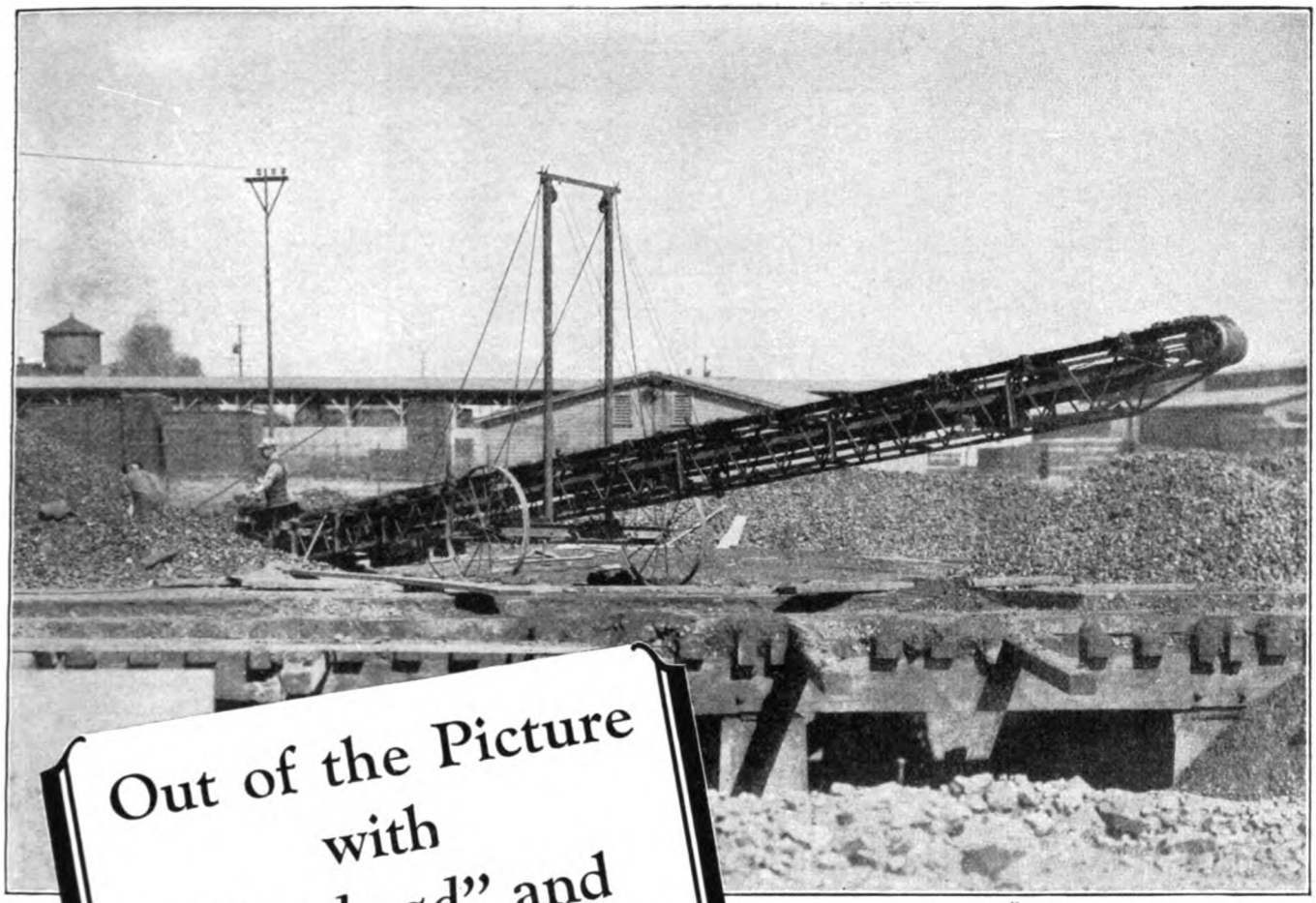


Fig. 13. A 30 hp. vertical squirrel-cage motor for centrifugal pump drive.

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Out of the Picture with "Overhead" and "Shovel Executives"

There are two big reasons why the cost of getting coal and bulk materials out of cars to wherever you want them can be high.

1. *Too much "Shovel Executive"*
2. *Too much "Overhead"*

The high price of "shovel executives," and other unskilled labor, has too long been a subject of Pullman Smoker debates to be classed as news

But, it is in the yards of industrial plants that the "shovel executive" is often overlooked.

"Too much overhead" is easily figured out. Expensive equipment, usually based on the estimated demands of a couple of years from now, depreciates too many dollars yearly.

Its maintenance costs are likely to be excessive. And its operating costs are usually high.

Barber-Greenes effectively combine the merits of both the "shovel executive" and the mechanical handling equipment — without the high costs of either.

Barber-Greene "N" Conveyors, alone, in series, or in conjunction with Barber-Greene Coal Feeders, chase "shovel executives" away from any sized industrial yard.

For, Barber-Greenes are versatile and portable. They handle any bulk materials rapidly and inexpensively.

Barber-Greene "N" Conveyors, and Feeders nudge their noses underneath gondola hoppers and take the coal or material directly to where you want it.

They reduce shovel help to a man or so for cleaning the car corners.

And in both price and operating cost Barber-Greenes are often one-half and one-fourth the cost of permanent immovable equipment of the same capacity.

If you believe in pushing both "Shovel Executives" and "Overhead" out of the picture mail the coupon for "Mr. Barber's *famous* Scrapbook." It shows in detail what many other plants are doing—surely some of these layouts will meet your own particular conditions.



Send for a copy of "Mr. Barber's *famous* Scrapbook" today. It contains many and varied material handling layouts, some of which will surely meet your own particular conditions. And all of them show the way to get rid of the shovel executive without inviting in "high overhead." Send the coupon today.

This coupon brings you the many low cost layouts in "Mr. Barber's Scrapbook." Send it today to

Barber-Greene Company,
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BARBER GREENE

Portable Belt Conveyors — Self Feeding Bucket Loaders

Coal Loaders, Permanent and Portable Belt Conveyors, Bucket Loaders, Coal Feeders

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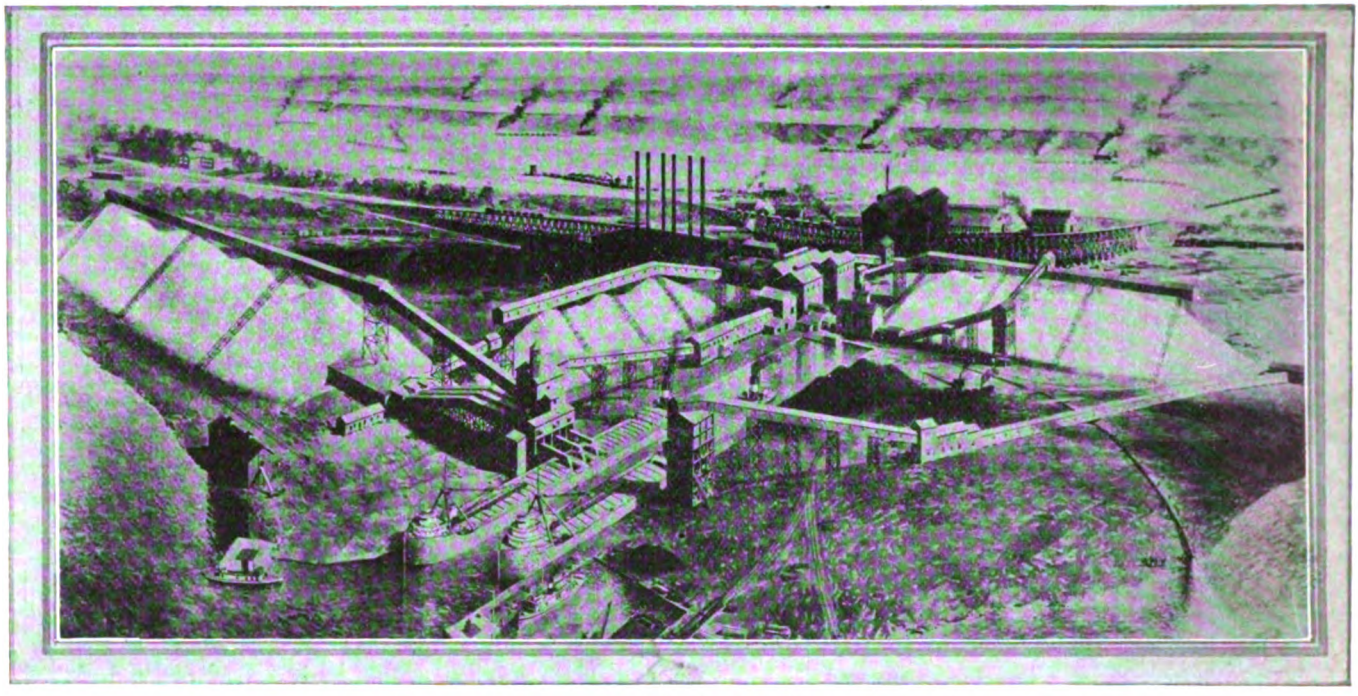


Fig. 1. The lime stone crushing, screening and shipping plant of the Michigan Limestone and Chemical Co., Rogers City, Michigan, has a daily capacity of 40,000 tons.

Cutting the Costs of Handling Sand and Gravel

By Edward J. Tournier

HANDLING six million cubic yards of sand is a task that requires sturdy and efficient equipment. This large amount is the quantity used in 1925 to produce twelve million cubic yards of concrete during that year.

All of the sand and gravel thus used had to be extracted from sand banks and lakes, and by dredging, employing in that labor a variety of materials handling equipment.

Some of the materials in their natural state, were dry, with little gravel or loam, some contained only a small proportion of sand. A part of the sand could be shipped direct with only one screening operation, and part had to be washed and graded several times, to make it suitable for use.

Whatever the origin of the sand, however, there is a standardized equipment for its economical handling, both out of the pit and into cars for final shipment.

For the small producer there are portable machines to load trucks direct from the bank, with possibly a stationary screen when required. In the case of more extensive operations steam shovels combined with flexible belt conveyor installations may be used. This arrangement in combination with industrial cars, permits of very large and rapid operations. In such cases excavated materials are carried by fixed belt conveyors to a central screening station.

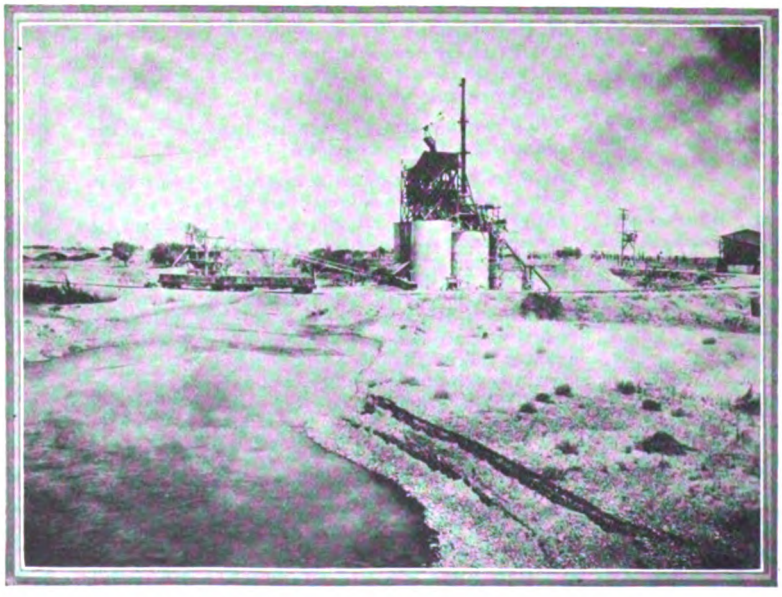


Fig. 2. A cableway excavator may be used to bring sand and gravel from the pit without auxiliary conveying equipment.

It is also possible, under favorable conditions, to use a cableway excavator in place of the steam shovels

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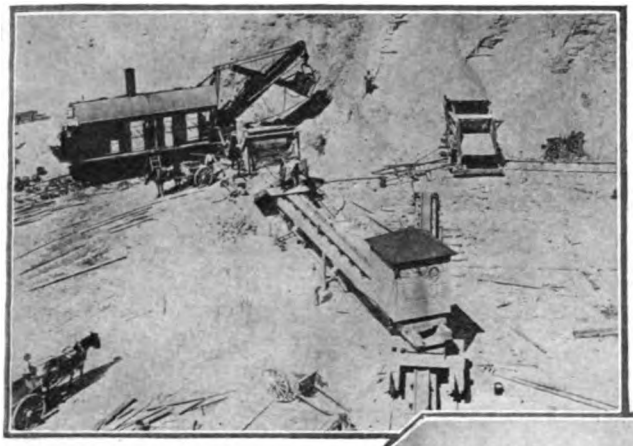


Fig. 3. Steam shovels are generally used for excavating in dry sand banks and may be operated in conjunction with primary screens and belt conveyors.



Fig. 4. In direct loading from pit to trucks, steam shovels are standard equipment.

and conveyors. Materials may then be brought direct to the screening station without auxiliary conveying. The excavator will convey and elevate simultaneously, and will work in a dry bank or in a sand deposit submerged in a river.

It is capable of dipping into the stream, digging the sand and carrying it to the top of the screens 100 feet above water level, if necessary in one operation.

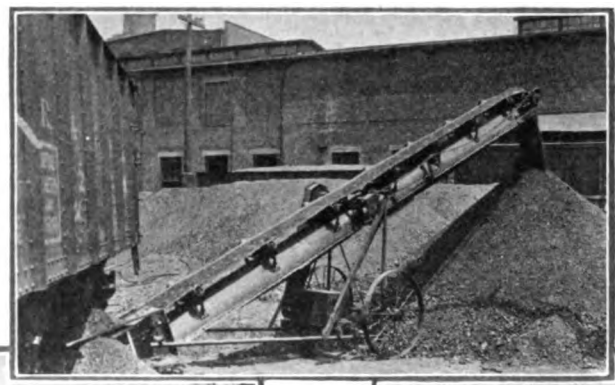
The preparation of dry sand is a simple process of screening, the number of screens depending on the products required. Either revolving screens or grizzlies may be used for preliminary screening and for final sizing shaking screens are preferred. The use of rotary grizzlies for primary screening gives a more clean and uniform product. Where very fine screening is desired it is becoming customary to use a vibrating type screen.

Sand and gravel containing loam and clay must be washed in addition to being screened. This is done by means of a series of conical screens mounted on a common shaft. A stream of water is applied to each product as it passes through the screen. The final product from the last screen in the series is sand mixed with water and soils. In order to reclaim the sand from this mixture it must be allowed to settle in a separator. In this device the sand settles to the bottom of a conical



Fig. 5. A portable belt conveyer is used extensively for loading direct from the sand bank to a truck. The machine illustrated is of the flat belt type and is electrically driven.

Fig. 5A. Another type of belt conveyor uses a troughed belt, which has the advantage of less wear than the flat belt, in operation.



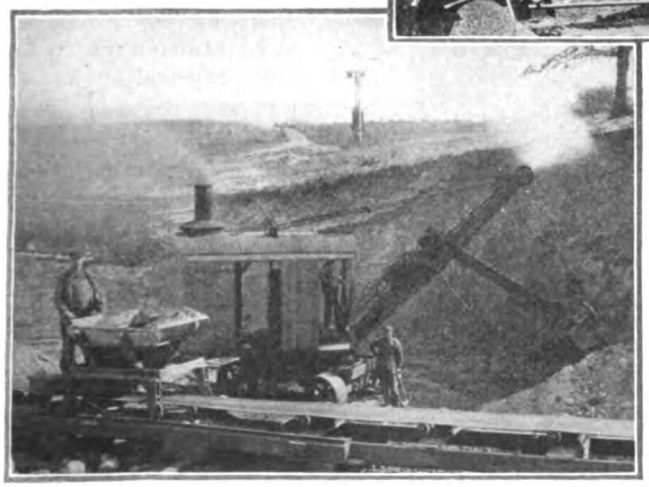


Fig. 6. The steam shovel in this view may operate at any point along the belt conveyor. The hopper at the left is movable along tracts at each side of the belt, which permits loading whenever desired.

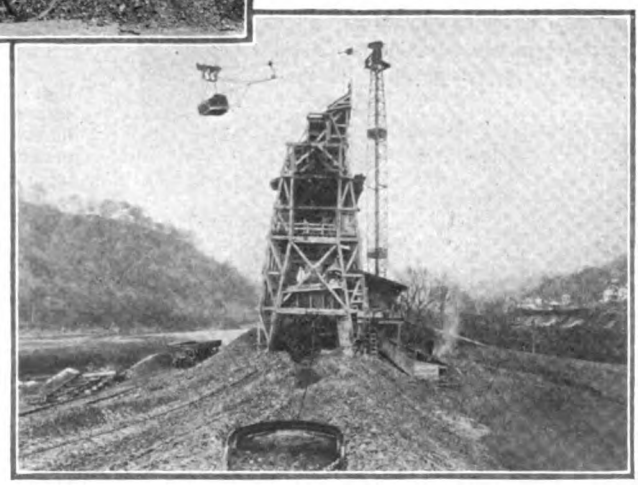


Fig. 7. A cableway excavator may be used to bring sand and gravel direct to the screens. In conjunction with this, the dragline scraper in the foreground is taking gravel to a reserve storage.

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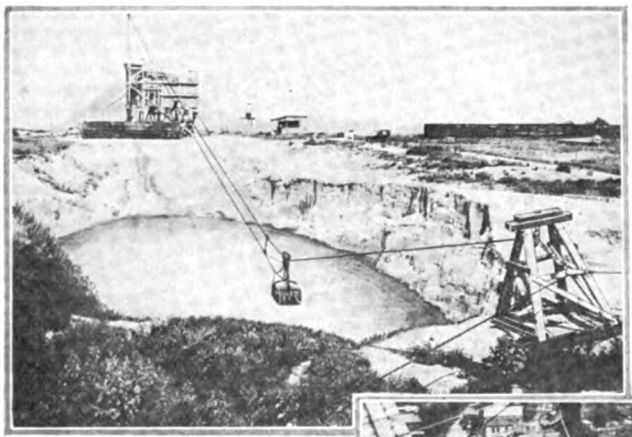


Fig. 8. A slack-line cable way excavator is used for taking sand and gravel either from sand banks or from the bed of streams or lakes. It conveys and elevates simultaneously.

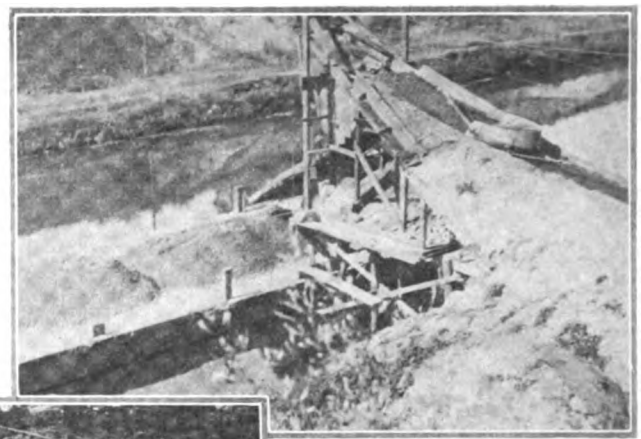


Fig. 9. The drag scraper may also be used for loading barges direct from the sand bank, if there is a navigable river close at hand.



Fig. 10. This view illustrates the simple construction of a drag line scraper bucket.

tank, the soils and water overflow at the top, and washed sand flows out automatically through a valve at the bottom.

The various operations just described are functions of a central plant located at a distance from the sand pit. The raw materials are brought to it by rail. The cars have been loaded from balancing bins or storage piles at the excavation. A locomotive crane may be used for loading if desired. If sand is in ground storage, the latter may be formed by means of a telpher system or an overhead cable and bucket conveyor.

Sand received at a central plant from dry sand-banks requires only screening and grading which may be accomplished either by the use of revolving screens or rotary grizzlies and shaking screens. Where accurate sizing of the gravel content is necessary, the rotary grizzly type produces a more clean product with the minimum expenditure of power and it requires less space than a revolving screen of equal capacity.

In connection with the central plant there may be a reserve storage to take care of failure of the usual source of supplies. This may be obtained by means of a locomotive crane, telpher or a drag-line scraper. The latter is probably the most flexible. The storage may also be made by means of belt conveyors, and reclaimed through a tunnel below the ground. A reclaiming belt receives the sand through gates in the tunnel roof.

The problem of handling crushed stone is similar in most respects to sand and gravel handling, and the same kind of machinery is used for this purpose.

Sand lying in coastal waters and inland lakes is usually taken out by means of suction dredges mounted on self-propelled scows. A

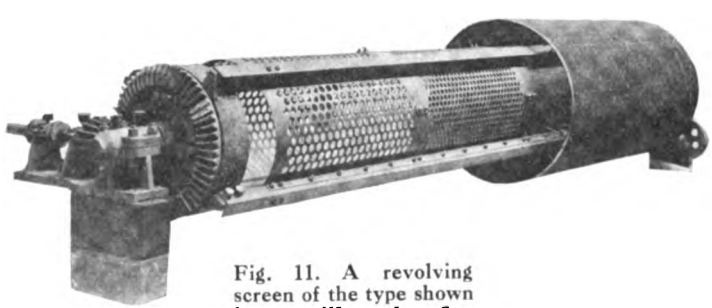


Fig. 11. A revolving screen of the type shown here, will make five products simultaneously, from 2½ inch to ¼ inch.

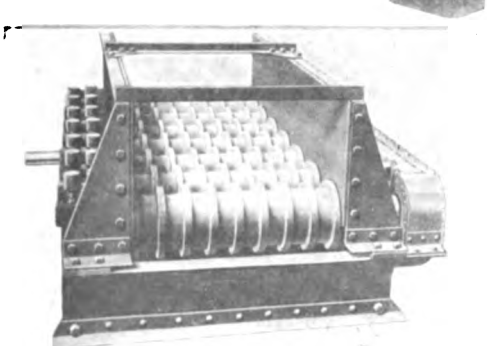


Fig. 12. A rotary grizzly screen ensures accurate screening and a clean product for sizing gravel.

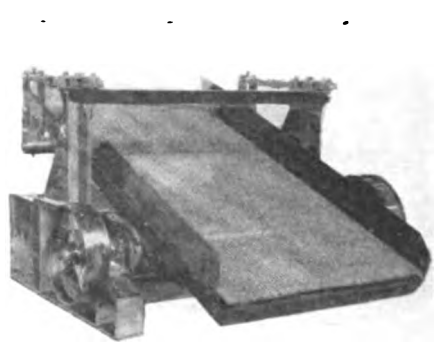


Fig. 13. For final screening a shaking screen is used. This may be single deck as illustrated, or double decked. The latter type will make three products in one operation.

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primary screen is frequently part of the equipment. Partially screened sand is delivered to an auxiliary scow and the gravel to a second one. Both auxiliaries are then towed to a central screening plant for final treatment.

The final loading of sand for shipment in most cases consists of discharging bins into waiting cars. If the sand is kept in ground storage a locomotive crane may be used for loading.

Where sand must be kept dry in transit it is shipped in box cars. These are loaded by means of belt type loaders, which are generally portable. They are generally high speed belts which are able to project material the distance of half a car length, so that very few changes in position are required to fully load a box car.

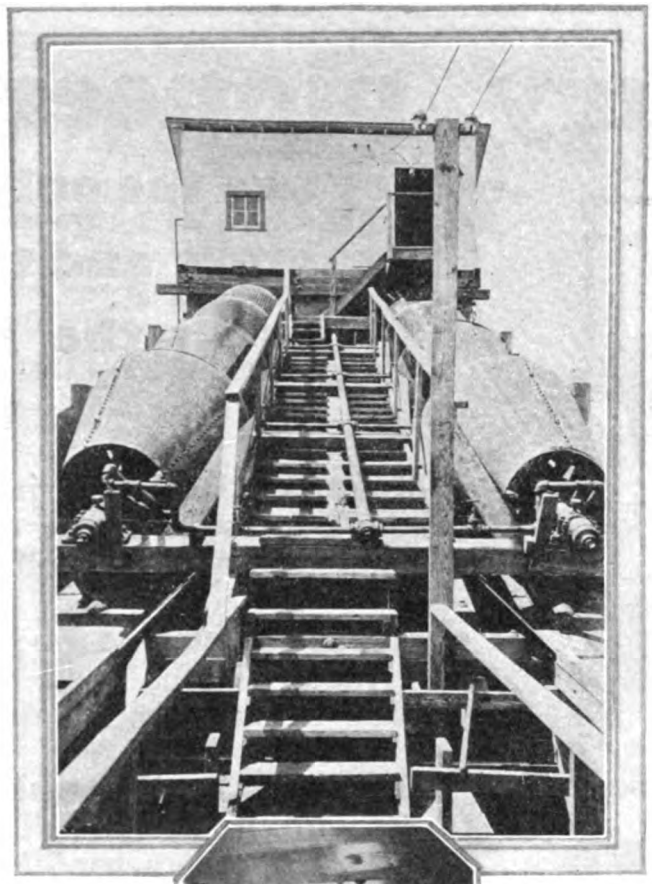


Fig. 14. Conical screens mounted in series on a common shaft are used with water sprays both for screening and washing sand.



Fig. 17. A locomotive crane on crawler treads is a convenient means of loading cars serving a central screening plant.

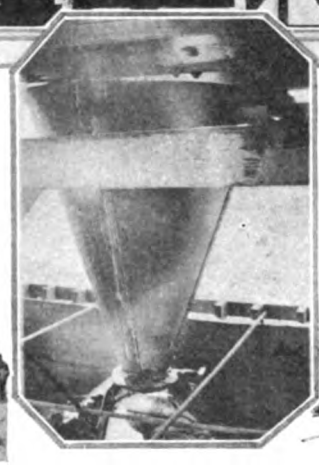


Fig. 15. The belt conveyor shown is delivering sand to the inclined conical screens in the background.

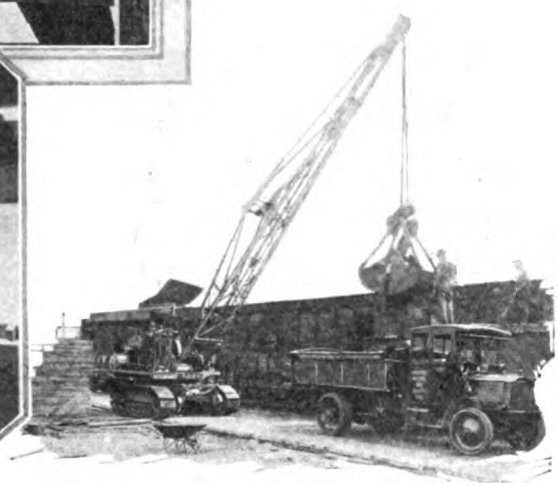


Fig. 16. A most important part of a gravel washery is the sand separator. Sand is automatically discharged through the bottom while the soils and loam are carried out in suspension with the overflow water at the top. The waste water is carried wherever convenient in a sluiceway.

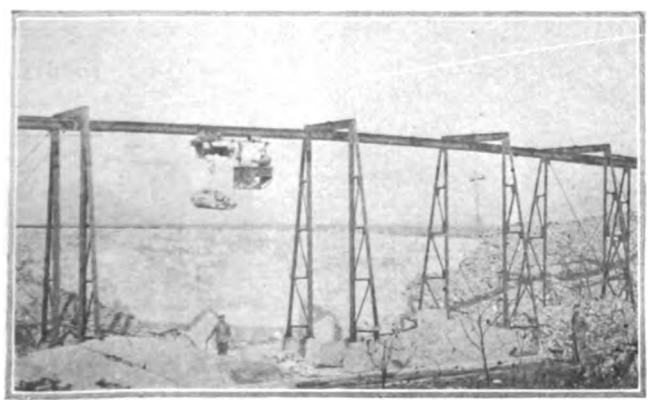


Fig. 18. Where ground storage is extensive, a telpher system is frequently used, both for stocking out and reclaiming.

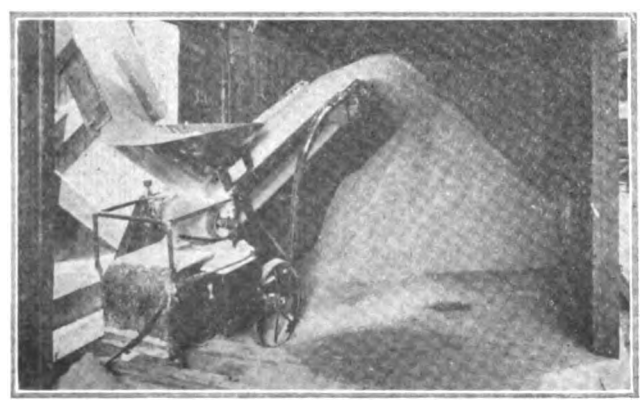


Fig. 19. For loading box cars, when sand must be kept dry, the high speed belt illustrated serves effectively at the plant of the Crystal Sand Co., Vineland, N. J.

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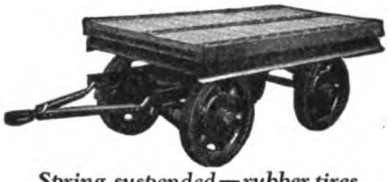
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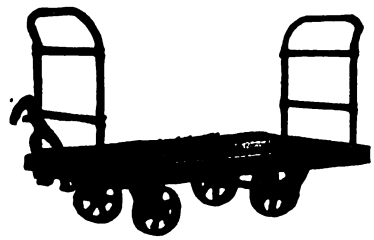
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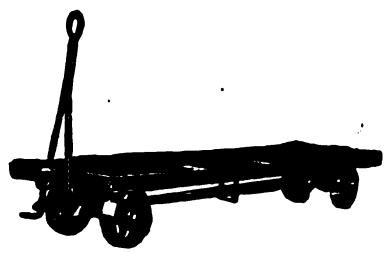
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Tips on Tooling

Combined Cuts, Multiple Cuts, and Rigid Tooling

By M. E. Lange, Production Engineer, and H. P. Bailey, Assistant to the President
The Warner & Swasey Company, Cleveland, Ohio.

THE executive who surveys the chucking work in his shop is often puzzled by the great variety of problems presented. The types of work, the material used, the accuracy required, and the quantity produced all seem to vary, so that at first sight it is impossible to reduce the best methods to a few simple principles.

Furthermore, the conditions in the average shop do not warrant highly developed methods suitable for quantity lot production. In the average shop only five to one hundred pieces of one kind are made in one lot. The intensive methods suitable for quantity lots are impossible for small or average lot production, and the problem becomes one of increasing production without elaborate equipment.

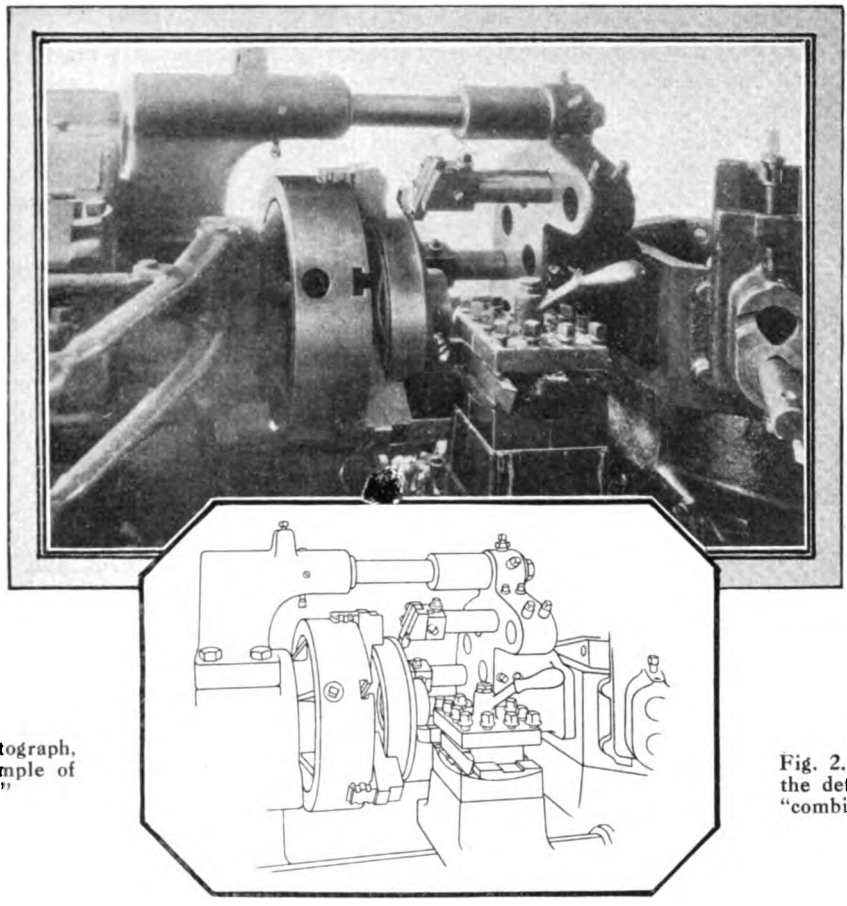


Fig. 1. The large photograph, above, shows an example of "combined cut."

Fig. 2. The sketch brings out the details of the principle of "combined cuts" illustrated in Fig. 1.

Increasing Production

First, let us discuss the principles of increasing production on chucking work. The three fundamental principles for increasing turret lathe production through proper tooling methods are:

1. Combined cuts; by taking cuts from both the square turret station and from the hexagon turret station at the same time.

2. Multiple cuts; replacing single cuts from one of the tool stations with two, three or more cuts from the same tool station.

3. Rigid tooling for heavy feeds;

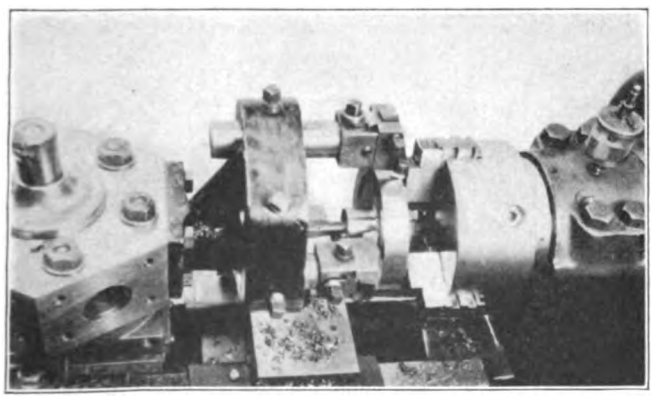


Fig. 3. Here is an example of "multiple cuts." Three cuts are operating from the same tool at the same time.

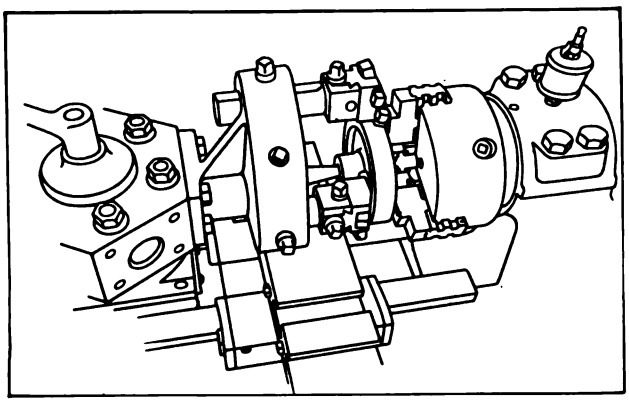


Fig. 4. A sketch of operations shown in Fig. 3. Two cutters are reducing the two outside diameters while a third is boring the hole.

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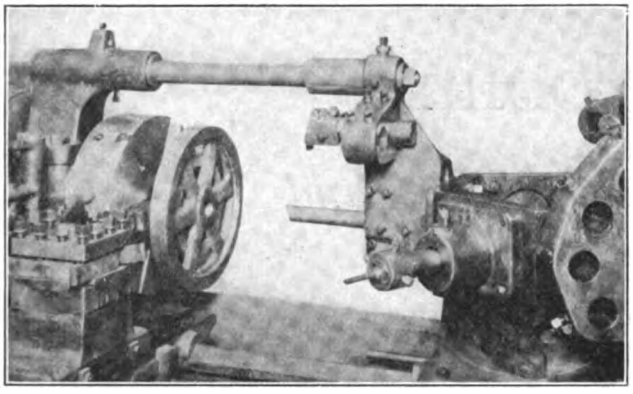


Fig. 5. A simple illustration of the use of "rigid tooling" for heavy feeds.

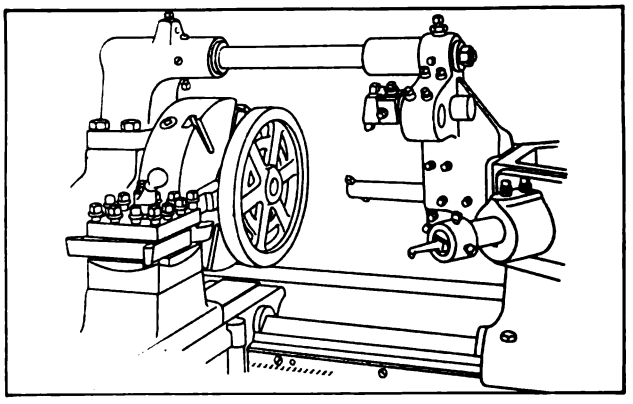


Fig. 6. The essential details of the pump gear job shown in Fig. 5.

providing exceptionally rigid tooling which will permit heavy feeds without destroying the accuracy required.

Since chucking work is rather more complicated usually than bar work, first let us examine examples of these principles without confusing the issue by referring to exact details of completed jobs.

Fig. 1, for example, with the sketch (Fig. 2) accompanying it, shows clearly the principle of "combined cuts" from both the square and hexagon turret stations at the same time. While the square turret is facing this gear blank, the cutters in the turning head on the hexagon turret are turning two outside diameters. This method often reduces the cutting time almost one-half in comparison with methods using only one tool station at a time. Full advantage is thus taken of the possibilities of the modern turret lathe.

The rear view in Fig. 3 illustrates the principle of "multiple cuts." While the two cutters, held in the multiple turning head, are reducing the two outside diameters, the forged boring cutter, held in the same tool, is cutting the hole. Thus three cuts are all operating at the same time from the same tool and maintaining the accuracy required. The use of Universal tooling equipment thus makes possible "multiple cuts" which may be applied by the same tool to a great variety of work with a great range of sizes.

Fig. 5 shows a simple illustration of the use of "rigid tooling" for heavy feeds. As we increase the feed of the cutting tools into the metal, we of course cut larger quantities of metal and increase production. The purpose of overhead piloted tools is to obtain rigidity for heavier feeds, as illustrated in this pump gear job. The turning head is mounted on the hexagon turret and supported rigidly by the overhead pilot. This makes it possible to use inexpensive stub bars for boring the center hole, instead of making highly special center piloted boring bars.

In order to show more clearly the practical application of these principles, let us take a typical chucking job showing in more detail the exact tooling and the exact application of the principles. The drawing, Fig. 7, shows the piece itself which is made in small lots on a 16" Universal carriage type of turret lathe. The photo, Fig. 8, and layout, Fig. 9, show the general arrangement of the tools. A consideration of several of the individual tools will explain why the production was increased and emphasize the Universal nature of the tooling.

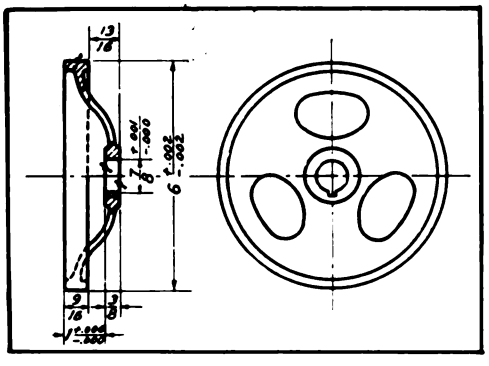


Fig. 7. Drawing of a part made in small lots, as described in the text.

First Operation

The dial is rough turned on the outside diameter, and rough bored with a multiple cutter head, using standard forged cutters. A rocker bushing in the center hole provides quick adjustment for the forged

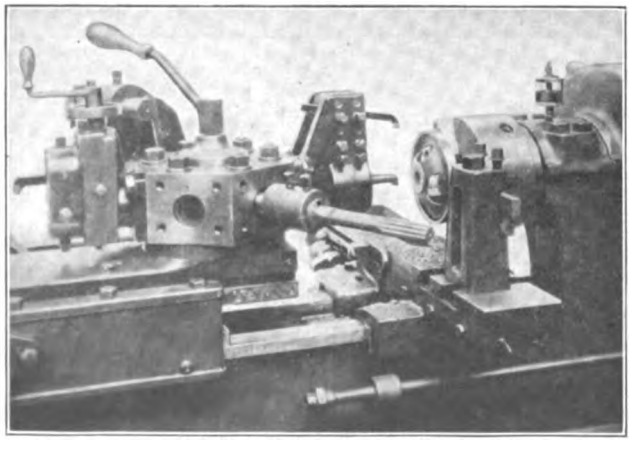


Fig. 8. Tool arrangement for machining the piece shown in Fig. 7.

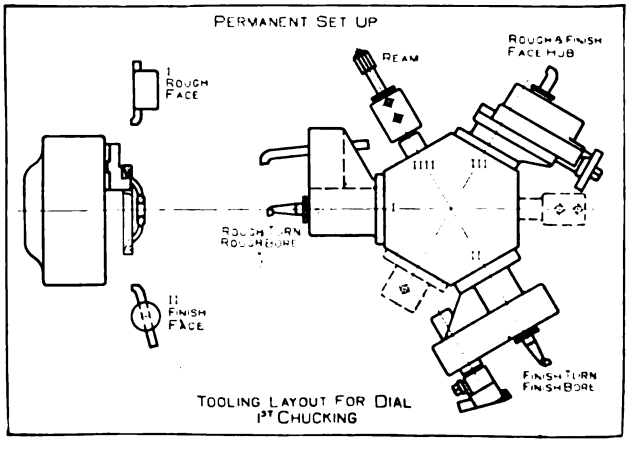


Fig. 9. The tooling layout for the operations as shown in Fig. 8.

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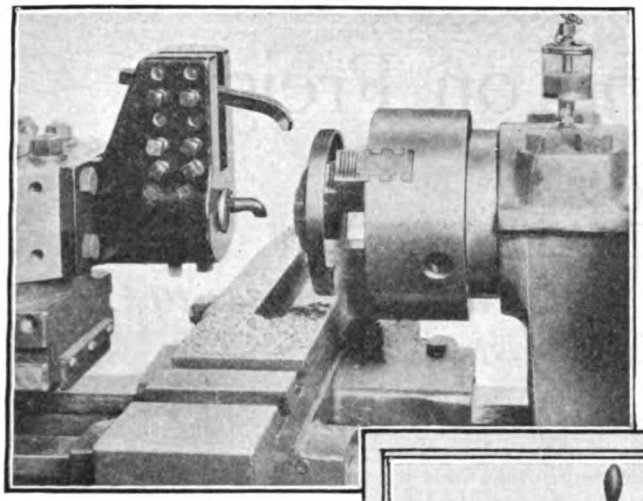


Fig. 10. At the top is shown the first operation on the piece (Fig. 7), as described in the text.

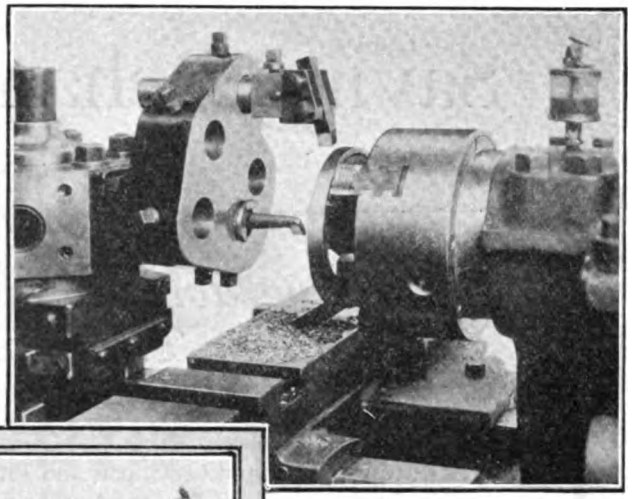


Fig. 11. The second operation on the same piece, as described in detail in the text.

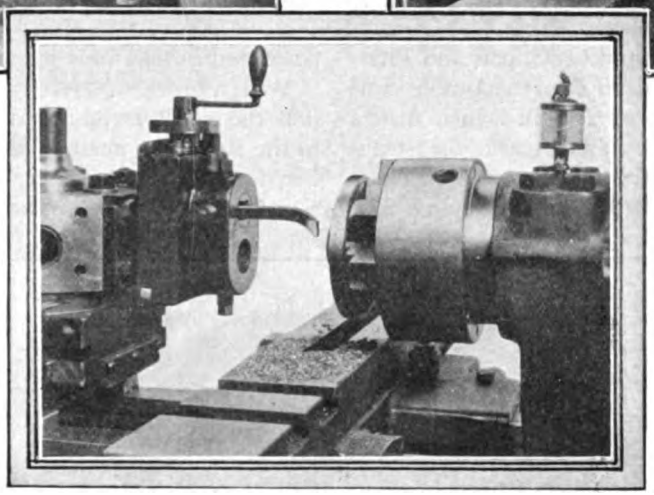


Fig. 12. Illustrating the third operation, of rough and finish facing.

boring cutter. (See Fig. 10.)

The rim is also rough faced from the cross slide at the same time, which is not shown in the photo.

Notice the application here of the principles of both "multiple cuts" and "combined cuts."

Second Operation

The hole is now finish bored, and the outside is also finish turned, using a standard multiple turning head. At the same time the outer diameter is faced with the cross slide, which is not shown in the photo.

Note the positive micrometer screw adjustment of the cutter holder itself and the possibility of performing similar operations on a wide variety of work by moving the cutter holder quickly to the different holes.

Here is another example of "multiple cuts" and "rigid tooling."

Third Operation

The hub is then rough and finish faced with one vertical slide tool. Note the slotted bushing and the graduated dial with clips for the adjustment of the standard forged cutters.

The Universal nature of the tooling equipment is shown by the double use of this slide tool.

The principle of "rigid tooling" is so important for increasing production that another illustration is given in Figs. 13 and 14. Here the tooling for making a valve cage from a drop forging is illustrated. Rigidity is secured by the use of an overhead piloted tool as shown in the sketch. Note the provision for the adjustment of the overhead piloted bar and the guide bushing. This new and added feature makes it possible to compensate the alignment for wear of the machine.

The tool can be readily transferred from one machine to another, or can be installed on an old machine. It is a standard multiple turning head tool, and the overhead piloted feature may be added at any time by obtaining the bracket for the head end of the machine and the necessary pilot bar. From the description the extreme rigidity of this tool is quite apparent. Moreover, it is clearly evident that with the use of these added features, eliminating entirely all vibration or chatter, that more accurate production may be obtained.

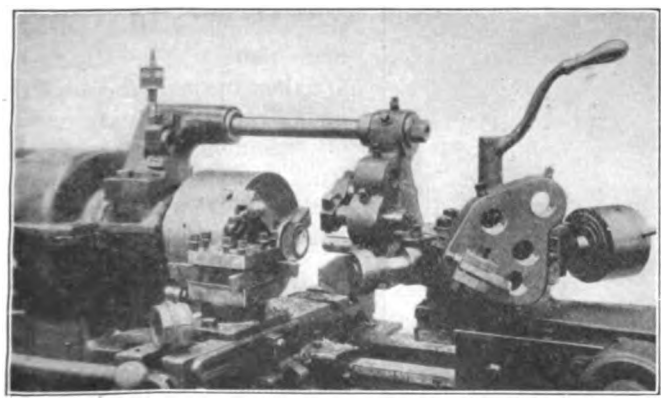


Fig. 13. Making a valve casing from a drop forging.

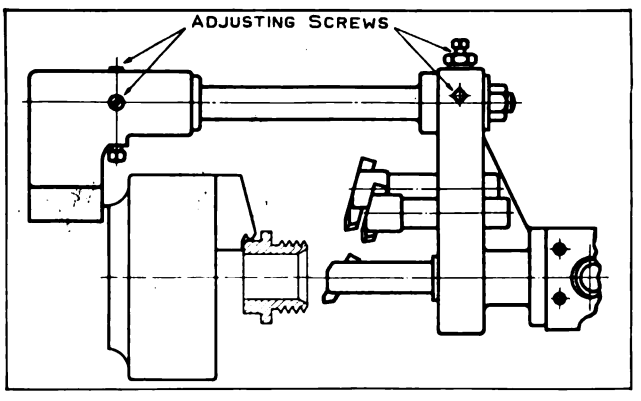


Fig. 14. Sketch, showing the overhead pilot used in Fig. 13.

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Saving Rehandling on Freight Shipments

An Interchangeable Container Unit that Promises to Cut Transportation Costs

By Uthai Vincent Wilcox

A GROUP of railways around Cincinnati and Pittsburgh have combined on an interchangeable container for the handling of freight which makes it possible to efficiently use the motor truck, the steam railway, the street railway system and barges and boats. After much use in an intensive way the simplicity of the plan has made freight as fast or faster than express within the areas where the system is operated.

By the use of removable containers or boxes that can be used on flat cars and on motor trucks and on street car trucks or even on river boats the handling charges and time have been greatly reduced. The figures show that the time of handling average freight has been reduced 52 hours and the cost decreased 35 cents a ton. Around Cincinnati the platforms instead of being over-crowded making it necessary to wait to get to them, there has been 15 per cent. more room. Also these containers permitted the railways to remove 200 cars from transfer service, and saving 300,000 switchings a year.

These containers are all of steel and have four doors, making it possible to enter them from all four sides, which permits of easy access no matter where they are placed. They are all so fitted that they can be either lifted about by hoists and chains or rolled about on platforms. Large trucks will carry these containers on the chassis as they are within the maximum load permitted by city and state ordinances for street service.

With a group of these containers at each railway terminal the small freight that comes in is sorted similarly to the sorting of mail—the containers used to take all of one destination about a city together. The containers are sealed as a freight car and a fleet of trucks are used to take them to another station of another line or to their destination. In Pittsburgh the street railways have used some of their time during the night hours to transfer by means of these containers freight where their rails can do so economically. Boats have also been used.



Fig. 1. The containers are of steel, and have four doors; making it possible to enter them from all four sides. This permits of easy access, no matter where they are placed.

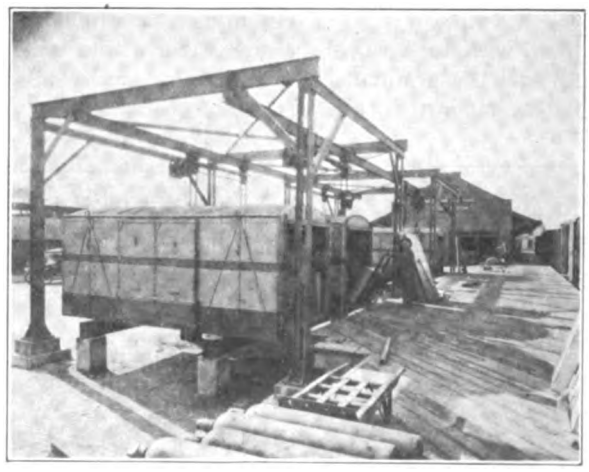


Fig. 2. The containers are readily handled by hoists, and the sealed container is placed on motor truck, flat car or barge, with a minimum of cost for the transfer.

As the trucks are used largely because of their flexibility of movement, a city operating company working through the various terminal railways controls the freight movement as passenger traffic is controlled in a Union station by a single terminal company.

With the container on the truck by means of the block and tackle the driver notes the total weight, signs a receipt and then takes the load to its destination where he delivers the waybills to the foreman there. The bodies are then opened or placed on flat cars, or electric cars or steamers or other trucks. The routing of the fleet of trucks from one station to another is in the hands of a dispatcher who is in constant telephone communication with all parts. He runs a miniature railways freight system. An average of 660 tons is moved daily.

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Giving the Electric Motor a Square Deal

What Proper Lubrication Means to Motor Life and Efficiency

By Allen F. Brewer

IN the operation of industrial plant equipment, the electric motor and its lubrication will be of decided interest. The extent to which the motor is used as a driving agent for industrial machinery renders its maintenance of the utmost importance. Effective lubrication is probably the most direct factor in bringing about efficient operation of any piece of equipment. Especially does this hold true in the case of the electric motor, for as a means of transmitting power, it is evident that its own frictional resistance and power consuming tendencies must be kept down to a minimum.

Electric motors, dependent upon their size, their duty and the operating conditions to which they will be subjected, will be equipped with bearings of either the plain sleeve type served by ring oilers or wick or wool yarn lubrication, or with anti-friction (ball or roller) bearings, grease or oil lubricated.

The extension of ball and roller bearings to electric motors of a wide variety of sizes renders a discussion of their construction and lubrication requirements of primary interest. As a means of promoting continued operation under intensive conditions, bearings of this type are particularly valuable. In fact, where it is essential to install motors in out-of-the-way localities, in the presence of dust, dirt, water or chemicals, etc., ball and roller bearings will be a decided insurance of efficient operation with but relatively little possibility of the development of abnormal friction. This is provided, of course, that high-grade lubricants are used, which have been refined to meet such specifications as have been determined by research and test to best meet the constructional requirements.

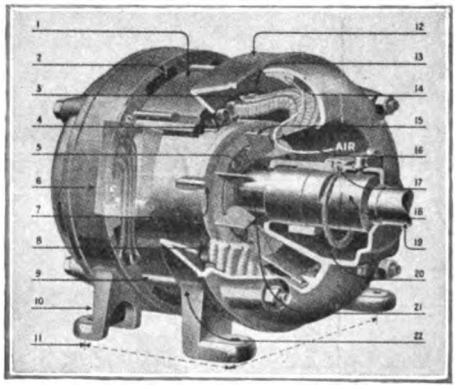


Fig. 1. Cutaway view of a typical electric motor of the ring oiled bearing type. Note in particular the baffle clip (No. 17), which prevents oil ring from riding upon bearing or becoming stuck; and the two-piece grooved ring (No. 20), capable of carrying ten times as much oil as a solid ring.

The function of a lubricant in a ball or roller bearing is more to serve as a protective agent for the highly polished surfaces of the bearing elements, than as a means of reducing friction. Rolling motion is essentially involved, meaning that in a properly designed bearing which has not been subjected to abnormal wear, the possibility of sliding contact will be relatively negligible. Sliding contact between metallic bearing surfaces is the direct cause of wear due to development of metallic or solid friction. To prevent this a lubricating film is interposed, that

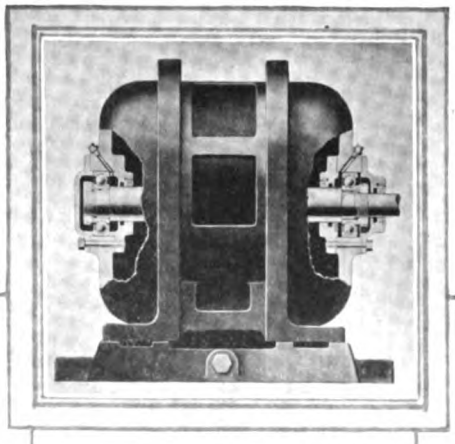


Fig. 2. The relative size of a ball bearing mounting to the body of an electric motor is exemplified above. Note the location of pressure lubricating fittings and the general all-round dust and moisture-tight nature of the bearing housings.

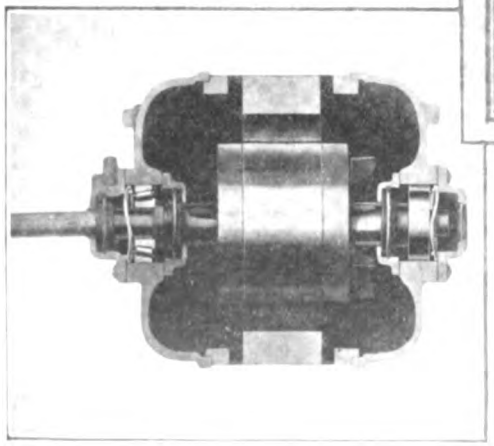


Fig. 3. Details of an electric motor equipped with tapered roller bearings. Note compression spring which is held tightly against outer edge of each bearing by the grease cap. This spring serves to keep the bearing always tight, to take up wear and to eliminate noise.

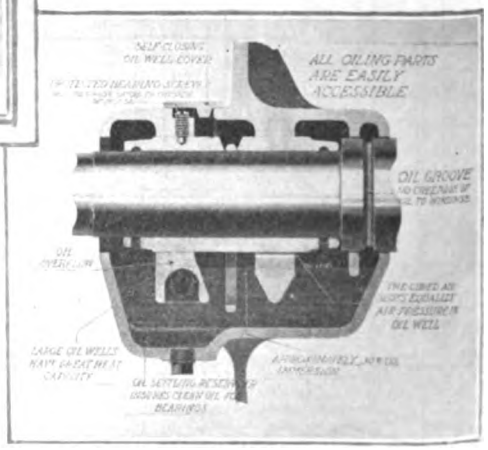


Fig. 4. Details of a ring oiled motor bearing. The provision in the form of an oil groove, to prevent oil leaking into windings is especially note-worthy. The ample capacity of the oil well insures effective temperature reduction.

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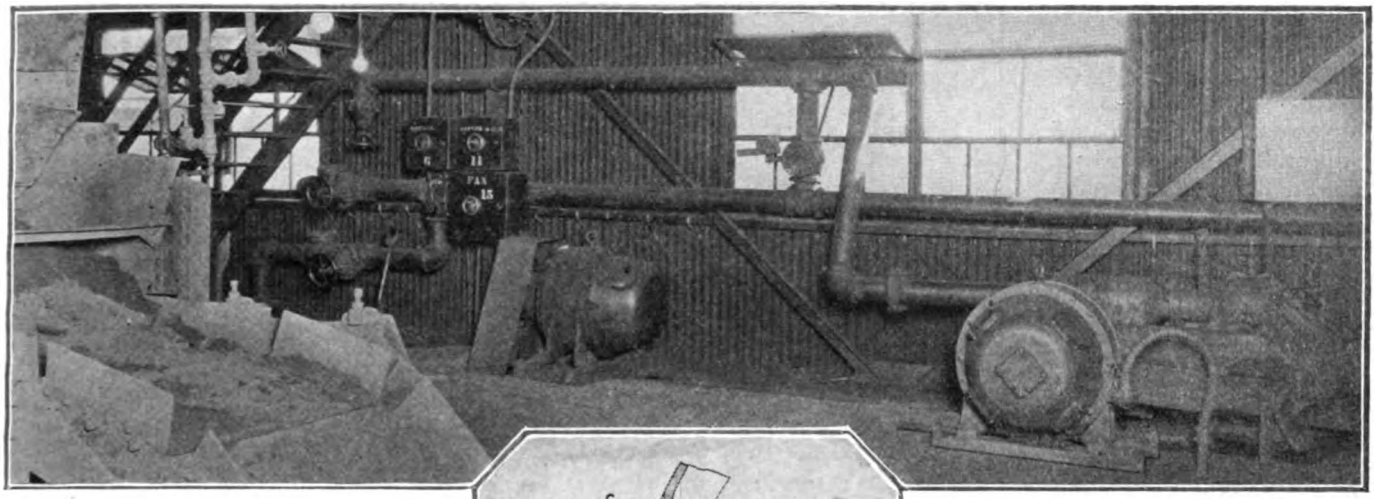


Fig. 5. Dust-tight motors in service in a cintering plant. Where coke dust and other abrasive materials are prevalent, electric motors must be absolutely dust-tight, especially with respect to the bearings.

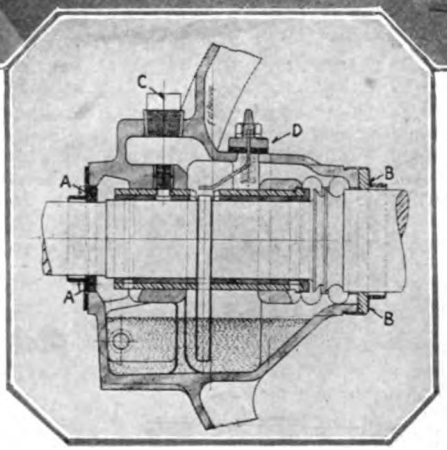


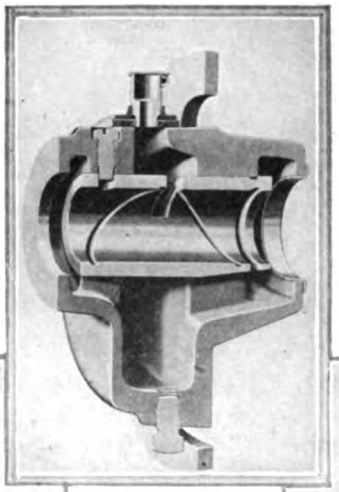
Fig. 6. At the left—Details of a sealed sleeve type of ring oiled electric motor bearing. At A and B are indicated soft felt washers at each end which respectively prevent leakage of oil. C is the oil filling plug; D is the cover that closes the opening through which the oil ring is admitted. As a result of this construction, it is impossible for oil to leak out or dust to get in to contaminate the oil.

is a film of suitable thickness and body to keep the metallic surfaces apart in the face of the prevailing speed and pressure. In this way fluid friction supplants solid friction to reduce the ultimate wear.

It is, of course, desirable to reduce frictional wear in any electric motor bearing as much as possible. The occurrence of undue wear which may cause the rotor shaft to pound in its bearings and the armature coils to come in contact with the pole pieces may result in burnouts. Not only will these be costly from a repair point of view, but also will they slow up production or whatever process of manufacture the motor in question may be connected with.

The fact that so many operations in modern industry are coordinated, that is dependent one upon the other, will lead us to appreciate that slowing down or cessation of any one may easily disrupt a production schedule. Hence the importance of keeping all electric motors running efficiently and economically by that most salient provision—effective bearing lubrication.

Fig. 7. Below—Cross-section showing details of a ring-oiled electric motor bearing oil well. Size of the latter, manner of grooving of the bearing and oil return ducts are points of decided interest.



The evident advantages of the ball and roller bearing type of motor have been discussed above. In sequence it is, therefore, fitting to mention the plain or sleeve bearing type. The latter may involve ring oilers, as illustrated, or wick or wool yarn feed devices. Essentially they require fluid oils for lubrication, whereas ball or roller bearings may be served by either oil or grease, according to the design, provisions for

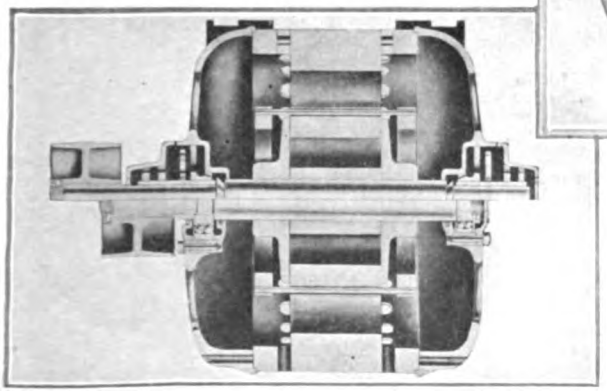


Fig. 8. An excellent illustration of the relative amount of space required by a self-aligning ball bearing as compared with a ring-oiled bearing. Note in addition the comparative areas of lubrication space.

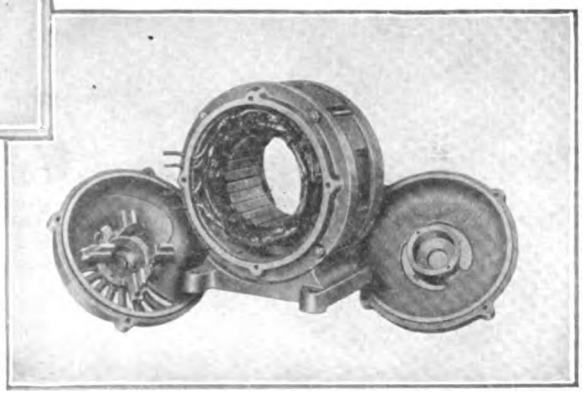


Fig. 9. Disassembled view of an electric motor showing nature of windings in the stator and how adjacent they are to the bearings. The necessity for care in selection and usage of lubricants to prevent their access to the windings can therefore be appreciated.

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retention of the lubricant, the recommendations of the manufacturers, or the intensity of the service involved. As stated, the lubricant in bearings of the above type serves a dual purpose,—to protect the wearing elements from corrosion and to reduce friction.

In the ring and wick or wool-yarn oiled motor, the oil is primarily a lubricant. Flood lubrication in the former, however, renders it also a coolant or medium for removing a certain amount of heat from the bearings. The wick oiler, or wool-yarn packed bearing, on the other hand, in general supplies oil to the bearing just as it is needed for lubrication.

In many phases of service bearing cooling will be decidedly important, and where the oil reservoir in the base of the lower bearing is adequate to allow for so-called storage of a considerable excess of oil over that required for actual lubrication, not only will oil as carried over from the bearing be given a chance to rest and cool, but also abrasive foreign matter will be more able to settle out.

In the ring-oiled motor the possibility of the occurrence of windage and the subsequent effect which this latter may have on proper operation, etc., requires attention. In certain conditions of motor operation involving bearings of this type, unless precautions are installed there will be a tendency towards air being drawn in through the bearings to carry a certain amount of oil into the windings. Where oil spray in a bearing housing is considerable, it is evident that proportionately more oil will be carried along by such an air current. In many cases, it is well to state, oil spray will be due to carrying the oil level too high, or because of an overflow of insufficient size to lead the oil away from the bearing and back to the reservoir as fast as the rotating ring delivers it.

The presence of oil on the coils is objectionable. Not only will it cause the insulation to become oil soaked, but also it may lead to burnouts. All this ultimately involves increased expense of maintenance, repair and operation. For this reason, many types of electric motors are equipped with baffles, or oil-throwers,

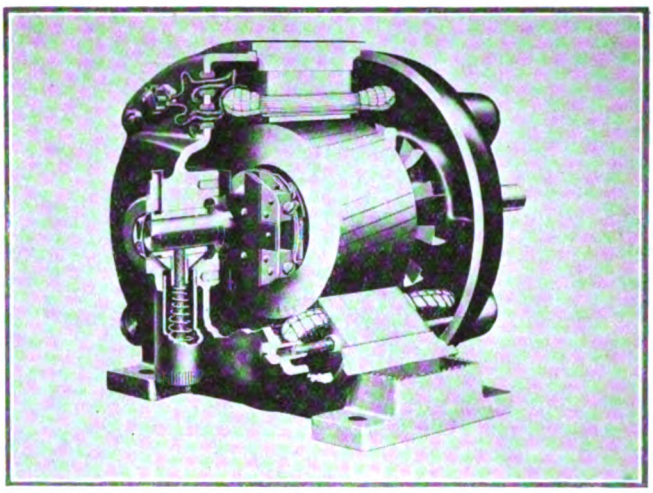


Fig. 10. The wick oiler is also adaptable to the lubrication of electric motor bearings. In this device the wick is held against the shaft by a combination guide and steady pin. Note the oil return ducts which carry excess oil from the bearing ends back to the reservoir below. The wick oiler is well suited to fractional horsepower motors.

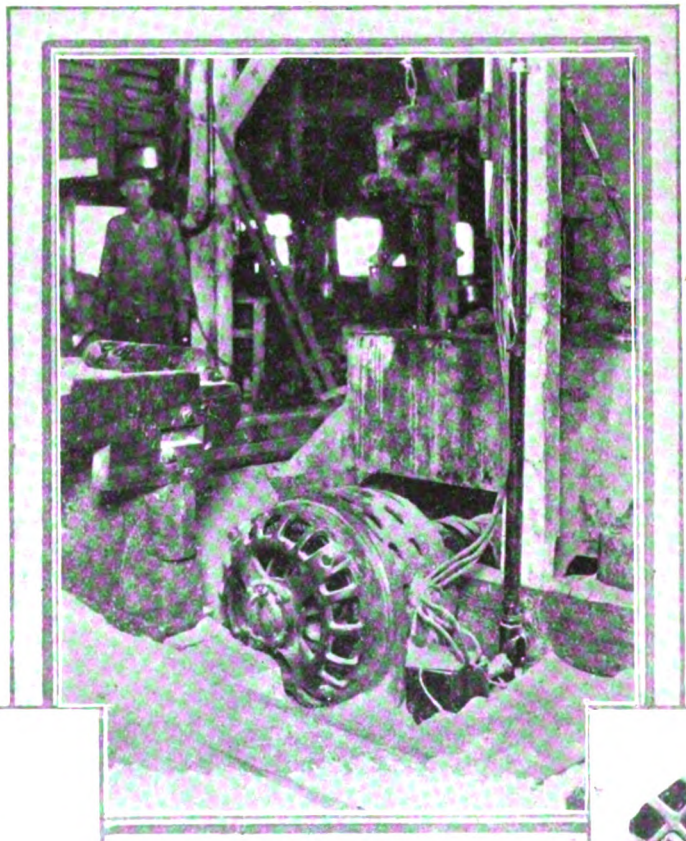


Fig. 11. An illustration of conditions to which a motor may be subjected in actual operation. In this instance, of sawmill service, for example, the motor bearings must be effectively guarded against entry of dirt and sawdust which might seriously impair lubrication.

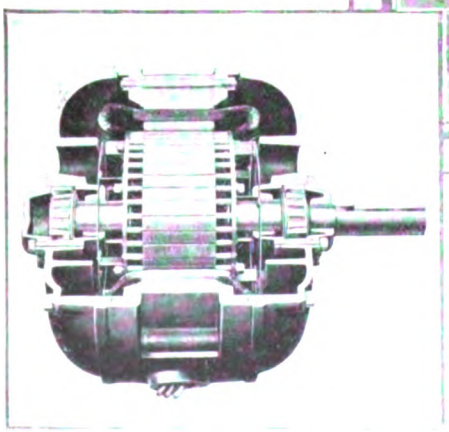


Fig. 12. Another method of adapting the tapered roller bearing to electric motor service. Note here the grooved sections to prevent leakage of lubricant into the motor, or out via the drive shaft.



Fig. 13. An excellent end view in detail of the bearing of a fractional horsepower electric motor designed for wool-yarn lubrication. The manner in which yarn should be packed, the oil-overflow and the dust-tight nature of the bearing cap are all of extreme interest.

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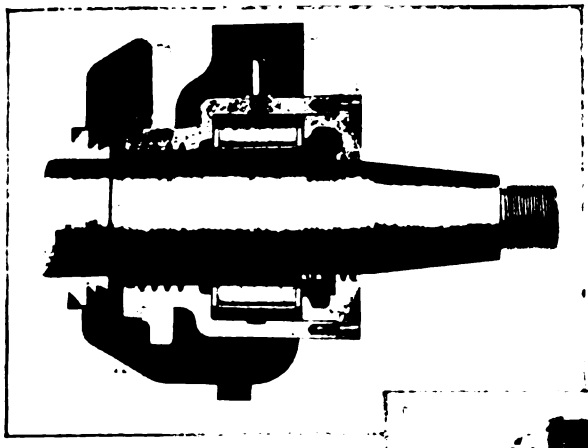


Fig. 14. An excellent view of the details of a flexible roller type of bearing. Such rollers being hollow serve as lubricating reservoirs, hence the lubricant must be of sufficient fluidity to readily pass out through the rollers to maintain a suitable lubricating film on the raceway and roller surfaces in contact with each other.

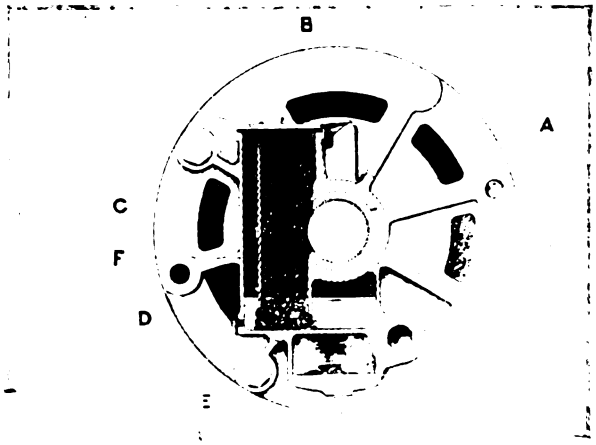


Fig. 15. A railway type motor designed for lubrication by oil-saturated waste packing in contact with the rotor shaft. "A" is the bearing; "B" the waste cellar cap; "C" the oil compartment; "D" the plug of waste in the bottom of the well; "E" the lower oil reservoir and "F" the waste itself in contact with the shaft at the bearing window.

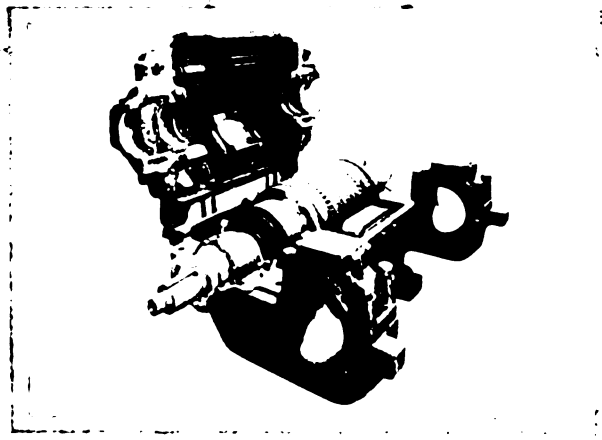


Fig. 16. Flexible roller bearings in replacement housings on a mill and crane type electric motor. Relative positions of the armature, pole pieces and bearings are brought out clearly.

to serve as a preventative.

To rely on such attachments or constructional provisions, however, is not enough. Attention should also be paid to the oil level. Too many operators seem to feel that, inasmuch as a ring-oiled bearing will function for several weeks without replenishment of the oil supply, that it can be left alone entirely. Usually such an attitude will be costly, for in their desire to cut down on work they will also be prone to give such motor bearings an extra ounce or two of oil to "keep her running that much longer."

Wick feed oilers are, in turn of interest, due to the extent to which they are used on fractional horse-power motors. They are adaptable to domestic or household labor-saving machinery, or other types of equipment of a portable nature which may be subject to neglect.

From the viewpoint of oil economy, such systems of lubrication rank with the best. Many are of the "up-feed" type, that is, they employ the principles of capillarity in the delivery of the requisite amount of oil to the bearings. As in the case of ring-oilers, lubrication automatically starts and stops with the starting and stopping of the armature shaft. The possibility of waste is therefore remote.

The same holds true for the waste or wool-yarn packed bearing. In this latter capillarity is also made use of to carry the necessary oil to the frictional elements. In general such a lubricating system involves a reservoir or oil well adjacent to the bearing, which can be packed with sufficient oil-soaked waste or wool-yarn. By careful

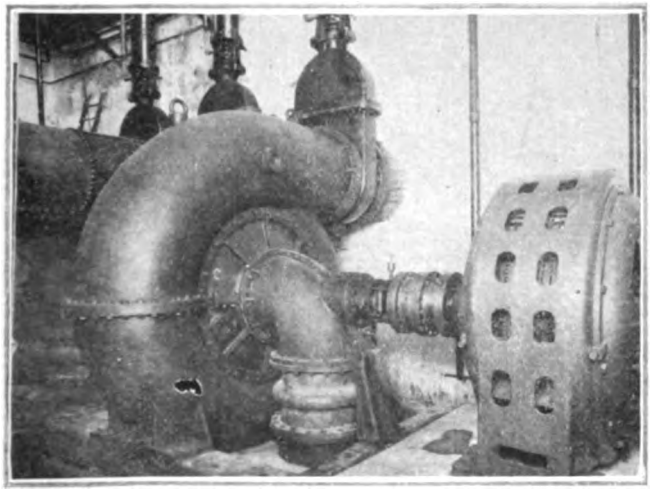


Fig. 17. The flexible coupling is an important adjunct in many motor drive installations. In this case, the coupling takes care of any misalignment between the motor at the right, and the centrifugal pump.

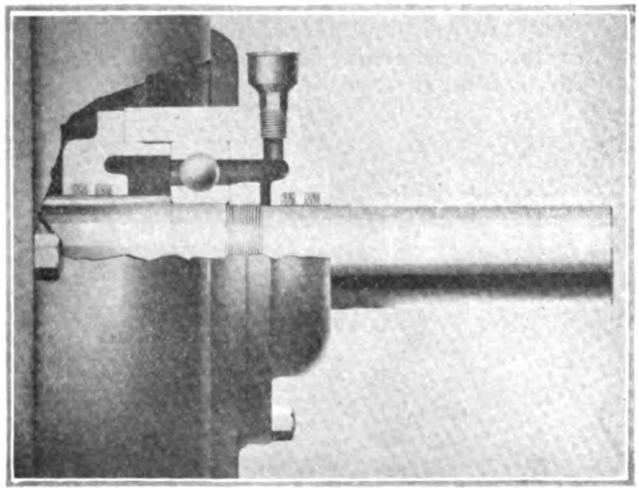
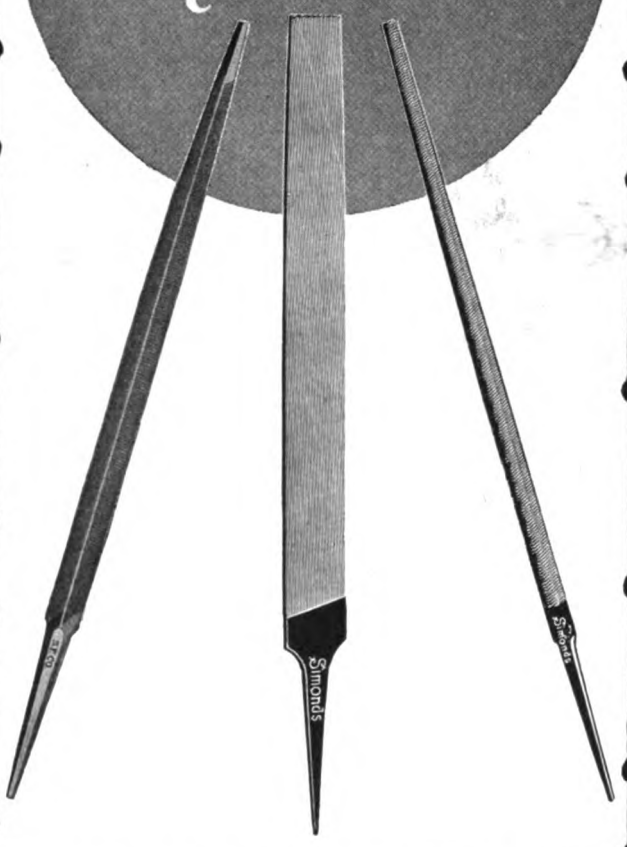


Fig. 18. Cut-away view of a ball bearing electric motor showing bearing assembly, the grease cup for lubrication, and the felt washers which, on the outboard side prevent entry of dirt or other foreign matter into the bearing; on the inside preventing oil from seeping into the windings.

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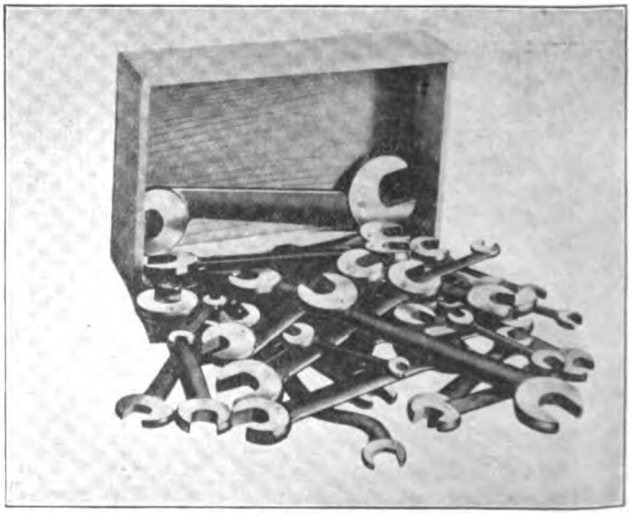
packing this latter will remain in close contact with a certain part of the shaft (according to the design of the system). By virtue of continued saturation of the lubricating medium the shaft and bearing will, in consequence be supplied with sufficient oil to maintain an effective, positive and economical state of lubrication for an extensive period.

To attempt to express any more detailed opinion relative to the use of any particular type of lubricating system for electric motor bearings would be inadvisable. Motor builders in general have given the most careful attention to construction, design and adaptability of their systems. Research to determine constructional details and suitability of lubricants has been extensive.

In industry, therefore, the operator may with justification assume that his motors are right, if they have been judiciously selected, and properly installed. From a mechanical point of view, his only future concern will be to keep all such bearings adequately supplied with the proper grade of oil or grease, according to constructional and operating requirements, and to periodically flush and clean the systems to remove any foreign matter that may have gained entry. The evidence of motors operating for extensive periods under most adverse conditions of moisture, dust, dirt or temperature, is ample proof of their ability to deliver the goods when their bearings are effectively lubricated.

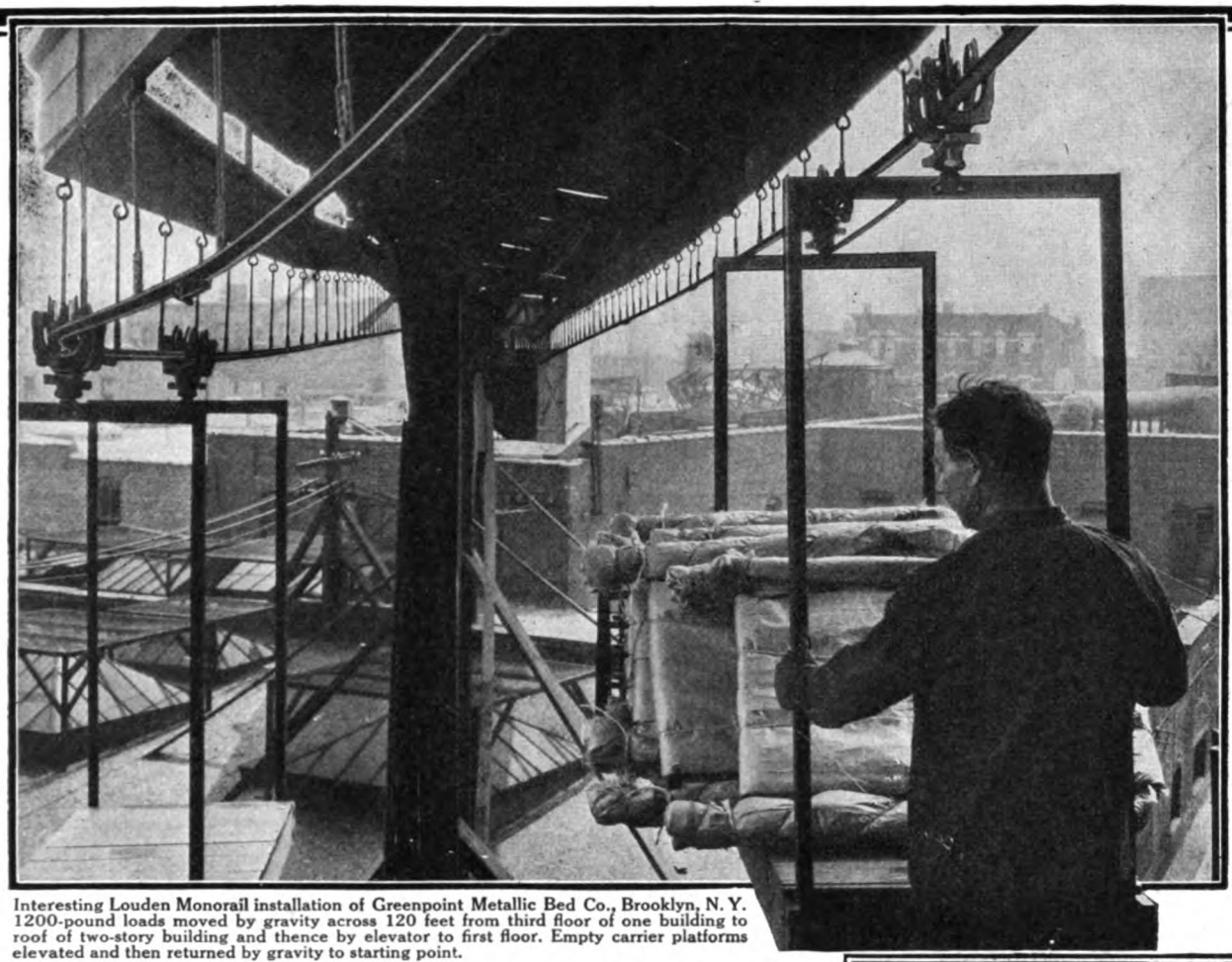
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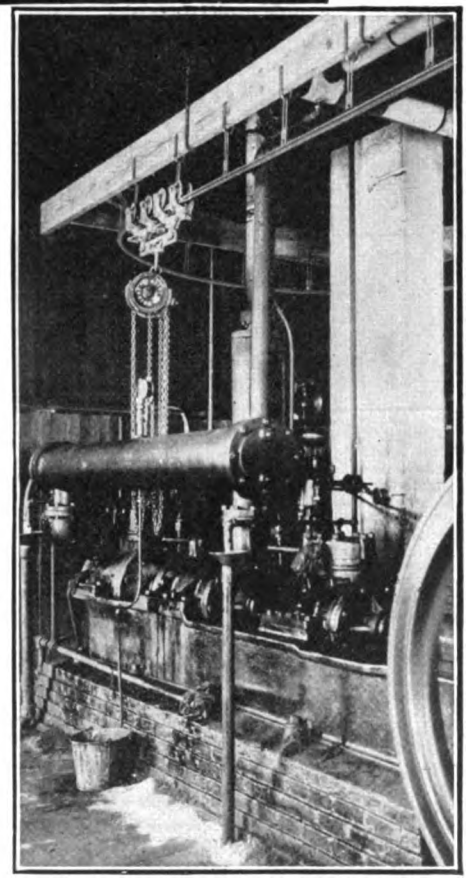
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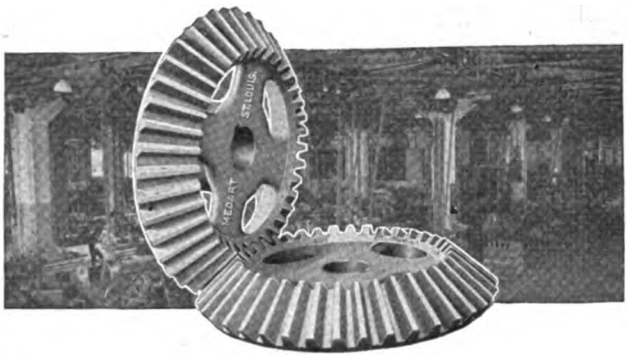
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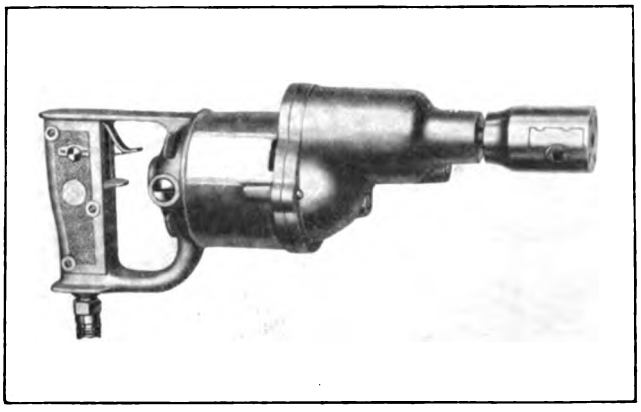
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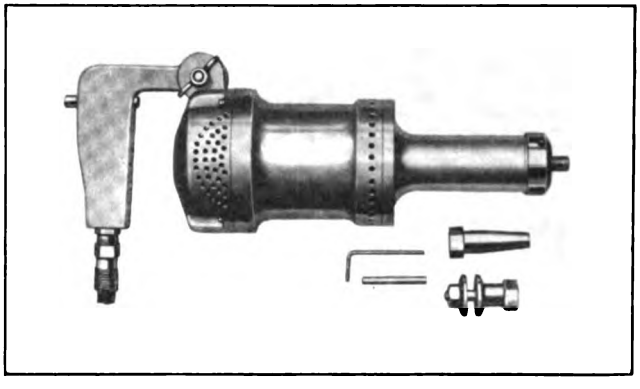
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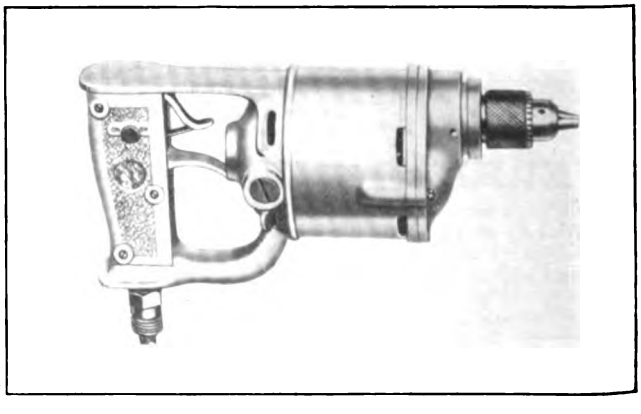
THE United States Electrical Tool Co., Cincinnati, Ohio, announces the following new products, shown here in the order described:



U. S. Portable Tapper, made in two sizes, No. 1 and No. 2; list prices, $62.00 and $70.00, respectively. Operates on direct and alternating current. U. S. mechanism in this tapper is so designed that the chuck automatically reverses when operator gives a backward pull on tapper.



U. S. Portable Die Grinder. This type grinder is especially adaptable for die grinding, grinding welded parts, fins on light castings, where speed and accuracy is required.



The U. S. ¼" Heavy Duty Drill is equipped with four S. K. F. ball bearings. All ball bearings mounted in steel castings. Bearings placed in front and back of spindle, to handle the in and out thrust. This feature, together with the overpowered motor, is claimed to insure constant service in continuous heavy duty production work. 1500 r.p.m. speed under load. List price, $38.00.

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One New Year's Resolution You Should Make Today!

Resolve today to *get set* for the New Year! Arrange now for that increased efficiency you hope to establish in your plant in 1927!

Order a sample or a supply of Lay Brooms at once from your nearest sales office, listed below, and note the changes for the better which this step will bring about!

Lay Metal Case Brooms sweep better, last longer, yet cost no more. Used by leading industrials for over 50 years.

The JOS. LAY Co.
PORTLAND, IND.

Sales Offices

New York:
110 W. 34th St.

Chicago:
920 Medinah Bldg.

Cleveland:
9343 Gorman Ave.

Milwaukee:
400 University Bldg.

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Match Honest Labor With Witt Cans

Your workers can fill a No. 2 Witt Roller Can with liquids, small parts, etc., and roll it across a rough floor without injury to the can or its contents.

The large, easy-rolling casters are "rarin' to go." Time saved, labor saved—your workmen saved for more productive labor.

Built of special analysis sheet steel, one piece steel bands top and bottom, heavy, smooth hot dip galvanized, Witt Cans are guaranteed to outlast three ordinary cans—minimizing that irritating detail of constant reorders and added expense.

Phone your jobber for one on trial, or write direct.

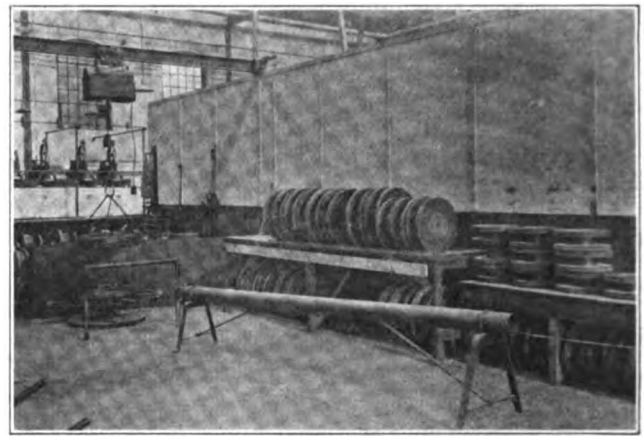
THE WITT CORNICE COMPANY
2117 Winchell Avenue
Cincinnati, Ohio

Manufacturers of

WITT
CORRUGATED
•CANS and PAILS•

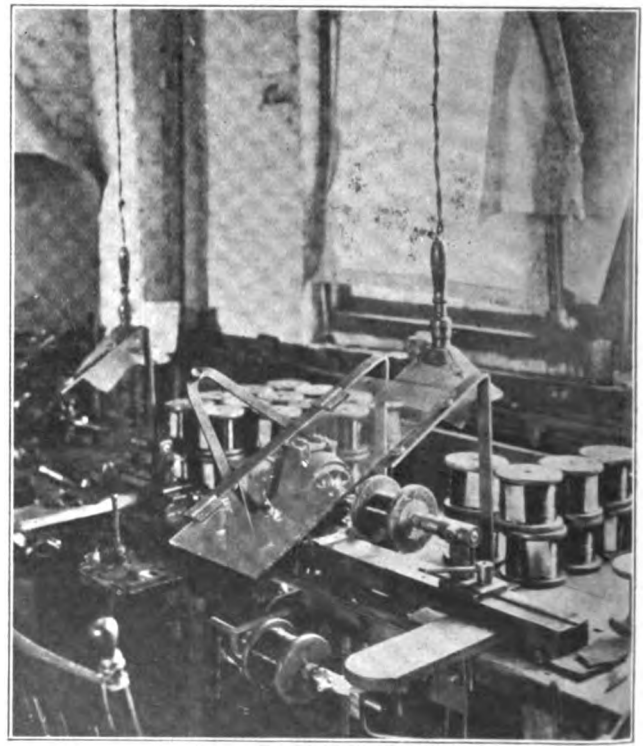
Respooling Wire Safely

AT the York Insulated Wire Works of the General Electric Company the two methods of respooling wire illustrated in the accompanying photographs protect the workmen from accidents. When respooling heavy wire from one reel to another located some distance



away, a long pipe is used, the wire running through the pipe. When the end of the wire runs off the reel, the pipe prevents it from flying around the room and tripping or injuring workmen.

A plate of glass protects the girls performing the same operation with fine wire. Should the wire break, or when the end flies off the spool, the glass prevents it from



flying up into their faces. The use of glass allows them to see the work. The glass is hinged so that it can be turned back when changing spools.

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Like Magic
~~the word is going 'round



Timken Equipped
Howell Red Band Motors
are giving Service
unparalleled in the
Electrical Industry!

Howell RED BAND ELECTRIC Motors

Make Good On The Hard Jobs

HOWELL ELECTRIC MOTORS COMPANY, HOWELL, MICHIGAN

OFFICES IN ALL THE PRINCIPAL CITIES

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Where You Put On Automatic *"Drive"*

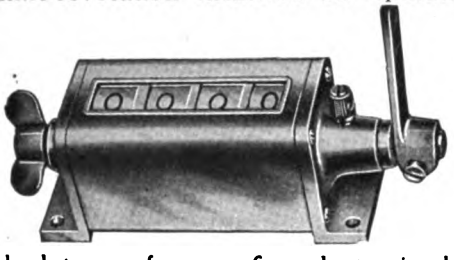
Even your newest machines—your almost human "automatics"—lack *brains*. Someone has to push them.

They need a man who's bent on *records* for fast production and fine operating.

Be he engineer or machine-hand, he's keen to beat his own best record when running up the production on a

Veeder

The *Revolution Set-Back Counter* below records the output of any machine where a shaft-revolution indicates an operation.



Sets back to zero from any figure by turning knob once round. Supplied with from four to ten figure-wheels, as required. Price, with four figures, as illustrated, $10.00—subject to discount. Large Set Back *Rotary Ratchet Counter* to count *reciprocating* movements where these count the product, $11.50 (list). Cut ½ size.

This "Form UM" Magnetic Counter counts operations or units of output from any distance that wires connect with machines.



Cut ½ size

Installed in your office, it indicates work being done by the man and machine out in the factory.

Mechanical contacts on your machine make and break the electrical circuit which operates the counter. The electro-magnetic drive can get its current from your regular lighting circuit (direct current, 110 volts), or from storage battery.

Write for the full-line Veeder booklet of mechanical and magnetic counters for all machines.

The Veeder Mfg. Co.

31 Sargeant Street, Hartford, Conn.

An Improved Electric Flow Meter

WITH the great advancement in engineering practice which has taken place, realization of the importance of making systematic and accurate measurements of the conditions and quantities involved has grown rapidly. An example of this trend is supplied by the popularity of flow meters of the electrically operated type by the use of which an indicator may be located in clear view of the boiler fireman as a guide in firing, with the recorder and integrator placed at a convenient point among a group of recording instruments.

Also, from another point of view, electrical operation is especially advantageous for flow meters, since it affords a means of producing external indications and records of conditions existing inside of a high pressure steam or water pipe, without transmission of mechanical motion—as for instance, by means of a rotating shaft, passing through a pressure-tight packing gland, which of course would be essential and would necessarily cause serious friction losses.

Naturally, however, when electrical means are introduced to avoid the objectionable features of a mechanically-operated instrument, other undesirable features are likely to be introduced unless careful planning is applied to all phases of the question.

The design of the new electric flow meter, manufactured by The Brown Instrument Co., Philadelphia, is claimed to be such that these electrical as well as mechanical difficulties previously encountered in flow meters are practically entirely eliminated.

Some of the characteristics of this new line of instruments are described by the manufacturer as follows:

The readings of the instrument are fundamentally independent of the value of the voltage impressed upon the electrical system. The instrument reads correctly, while operating on varying line voltages without the use of either voltage regulators or compensators.

The electrical circuits at the manometer, indicator and recorder consist simply of stationary, divided, inductance coils. These have only three connections which are permanently made at the time of installation. There are no make-and-break contacts, such as contacts dipping into mercury within the pressure chamber, voltage regulator contacts or similar devices.

In the manometer, or meter body, all electrical windings and connections are entirely external to the pressure chamber.

The integrator is a mechanical device operated by the electric clock which drives the charts. An equal amount of power is available for operating the integrator at all rates of flow, making possible the use of the most easily-read type of 5-figure counter for the integrator.

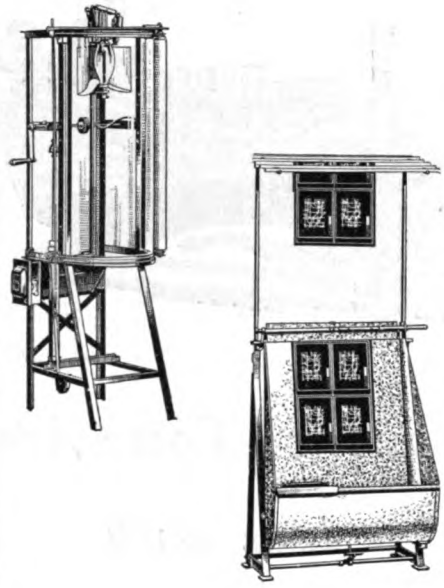
A pen operated by the action of the integrator mechanism makes a record at the outer edge of the chart each time the integrator mechanism increases the counter reading by one unit. Each tenth mark is distinguishable from the intermediate marks in order to facilitate counting when it is desirable to determine the total flow for a day, or during any hours of the day, without having to watch the counter.

The entire integrator mechanism with its individual recording pen is so simple and compact that it can be mounted in the standard recorder case along with the

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PEASE
CHICAGO

For the Moderate User of Blueprints



Now every drafting room, no matter how small, may enjoy the advantage of making perfectly finished blue prints whenever wanted. No special electrical connections are needed as the Pease Junior can be connected to the lighting circuit and will operate on either 110 volt or 220 volt AC or DC current.

No more open bath trays, dripping prints, and wet floors. The Pease Junior Machine and Sheet Washer eliminate all that and offer speedy operation—high quality work—durable construction and low price.

The Pease Junior Blue Printing Equipment requires only a small area of floor space and will accommodate a blue-print of any size up to 24x36 inches. Emergency prints can be had on a moment's notice.

SPECIAL CATALOG OF BLUE PRINTING MACHINERY

Catalog M-28 illustrates and describes completely the Pease Junior Blue-Printing Equipment. You'll find the book invaluable when choosing "Anything for Blue-Printing" or "Anything for the Drafting Room"—send for your copy.

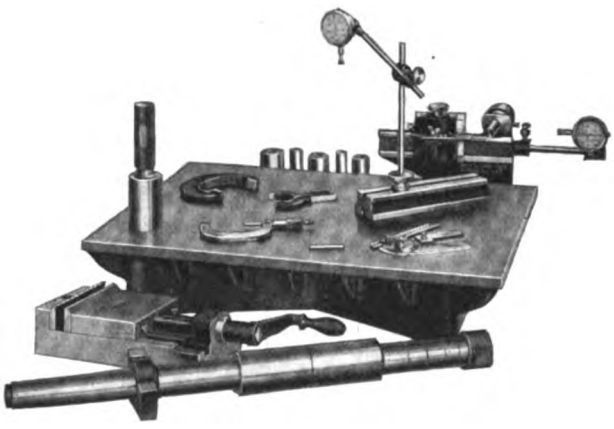
The C. F. Pease Company

828 N. Franklin Street
Chicago, Illinois

PEASE

BLUE PRINTING MACHINERY

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Production Costs Are Less With Good Tool Equipment

Your men can do no better work than the quality of your equipment will permit. With a feeling of pride in the tools they use they can do their best work with Brown & Sharpe Tools.

If your production costs are too high, look to your toolroom equipment for an explanation. With inferior equipment, men cannot do their best work. It pays you to buy tools of Brown & Sharpe Quality.

The Brown & Sharpe No. 30 Catalog is a buying guide for quality equipment. You should have a copy for reference purposes. If your dealer cannot furnish a copy, write us direct.

Dept. I.

Brown & Sharpe Mfg. Co.

Providence, R. I., U. S. A.

BROWN & SHARPE

"Standard of the Mechanical World"

recording mechanism, thus avoiding the necessity of a separate integrator case.

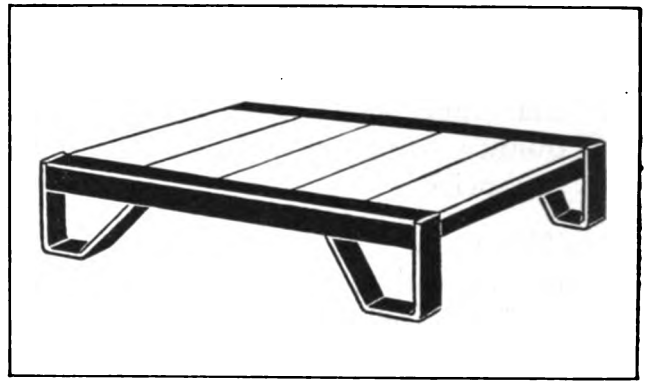
The simple inductance bridge principle upon which all of these instruments operate, their freedom from troubles obviated by electrical connections that are permanent and external to the pressure chamber, their independence of voltage fluctuation, their automatic recording planimeters, the adaptability with which their manometers handle various ranges, their easy reading 5-figure integrating counters, the compactness of their operating units and other advantages make this new flow meter especially desirable for measuring the flow of steam, water, gas, air and other fluids.

A Steel-Bound Truck Platform

LEWIS-SHEPARD COMPANY, of Boston, have recently announced a new steel frame lift truck platform, shown in the accompanying drawing. The manufacturers stress the following points in their description:

(1) The clearance from the underside of the platform to the floor is the same on both sides and both ends. This permits a lift truck to be backed in under either side or either end. Heretofore most platforms have been of such design that the lift truck could only be pushed in under at either end of the platform and it was frequently necessary to move materials in order to get access to the front of a platform.

(2) This new platform is steel bound all around. All boards are protected by steel binding. In particular the



ends are armored, which is a new development. This extra armoring protects the end boards, which must stand the bump of the lift truck backed in under either end.

(3) The steel frame is a unit in itself and does not depend upon the clamping of the steel frame and feet to the wood top for strength or rigidity. It is actually a steel to steel assembly.

(4) The entire metal structure is arc-welded into the equivalent of one solid piece. There is not one hole bored, and each part is that much stronger, for holes take away the strength. Not a bolt or rivet is used in the entire platform and so there are no bolts or rivets to loosen up.

(5) The top of the platform is flat. The steel does not extend above the boards nor the boards above the steel. There are no bolt heads protruding.

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Valdura—

the extraordinary Paint

Industrial plants always have difficult paint conditions. A paint of extraordinary qualities is as necessary to them as is power.

VALDURA ASPHALT PAINT

is out-of-the-ordinary paint. It will combat those conditions which quickly break down ordinary paints in industrial plants. VALDURA is waterproof—weatherproof—rust, acid and alkali resisting. You will find many uses for it.

Genuine 99.5% pure Gilsonite natural asphalt forms the base of VALDURA. It is used by the biggest and most critical paint buyers.

You can't go wrong in specifying VALDURA for your preservative paint needs, because it has been thoroughly tested under all manner of conditions.

Let us give you particulars.



AMERICAN ASPHALT PAINT CO.

844 Rush Street **Chicago, Ill.**

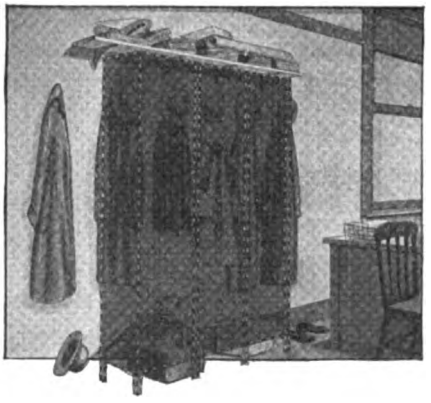
Factories: Lincoln, N. J.

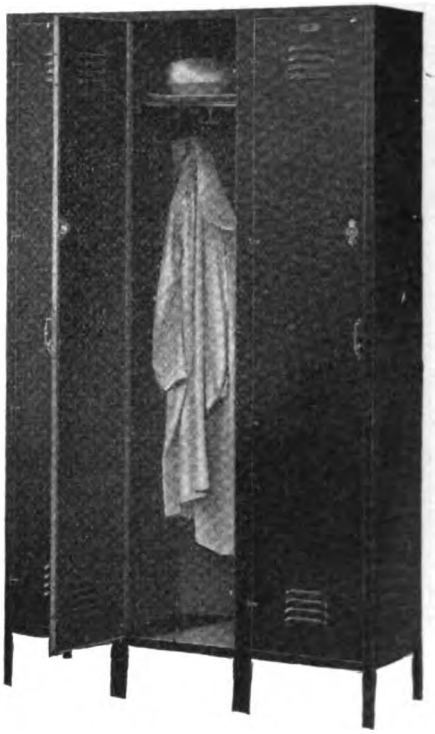
Warehouses: Oakland, Calif., Chicago, Ill.

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NECESSITY

DEMANDS STEEL LOCKERS





DURAND MEETS THE DEMAND

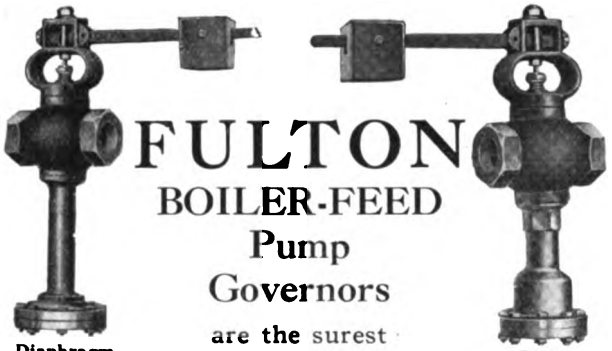
with a locker that assures extra protection against fire, contagion, rodents, vermin, petty thievery, cluttered floors and damaged walls, adding the years of service which distinguish quality from mediocrity. Our reputation for superior quality at attractive prices has been earned and sustained since the first steel locker was built for commercial use—BY DURAND.

Swing upon the doors, abuse the handles and kick the sides - Durand correctness of design and strength of construction will withstand it. That's why we get the call from buyers who know.

When you buy lockers have your engineer or ours explain the difference. It's quality built into the door, door frame, locking device, handle, top, bottom, sides and back.

DURAND STEEL LOCKER CO. INC.
1539 First National Bank Bldg.,
Chicago, Illinois

Every employer should have a copy of our catalog. Where shall we send it?



FULTON BOILER-FEED Pump Governors

are the surest guarantee of a

proper water supply for boilers

For securing the boilers maximum efficiency these governors should be a part of every BOILER-FEED pump system. They are indispensable with feed water regulators. They are made in two types,—Diaphragm and Piston. Either of these types will prove durable and satisfactory under any kind of BOILER-FEED service conditions.

We would like to send you the details.

The Chaplin-Fulton Mfg. Co.
28-36 Penn Ave., Pittsburgh, Pa.

NITROSE

.....a metal coating that can be put on right over rusty and sweat or grease covered surfaces.....and that resists very high temperatures. It sinks through the rust and grips the metal itself. It gives a black, shiny long-lived surface. Nitrose is low in price.....and very little surface preparation is necessary.

Used on

Smoke Stacks	Boiler Fronts
Condensers	Coal Bunkers
Structural Steel	Economizers
Boiler Breechings	Superheaters
Locomotive Fronts	Ash Bunkers
Steam Piping	Water Piping

Stocks of drums and cans carried in principal cities

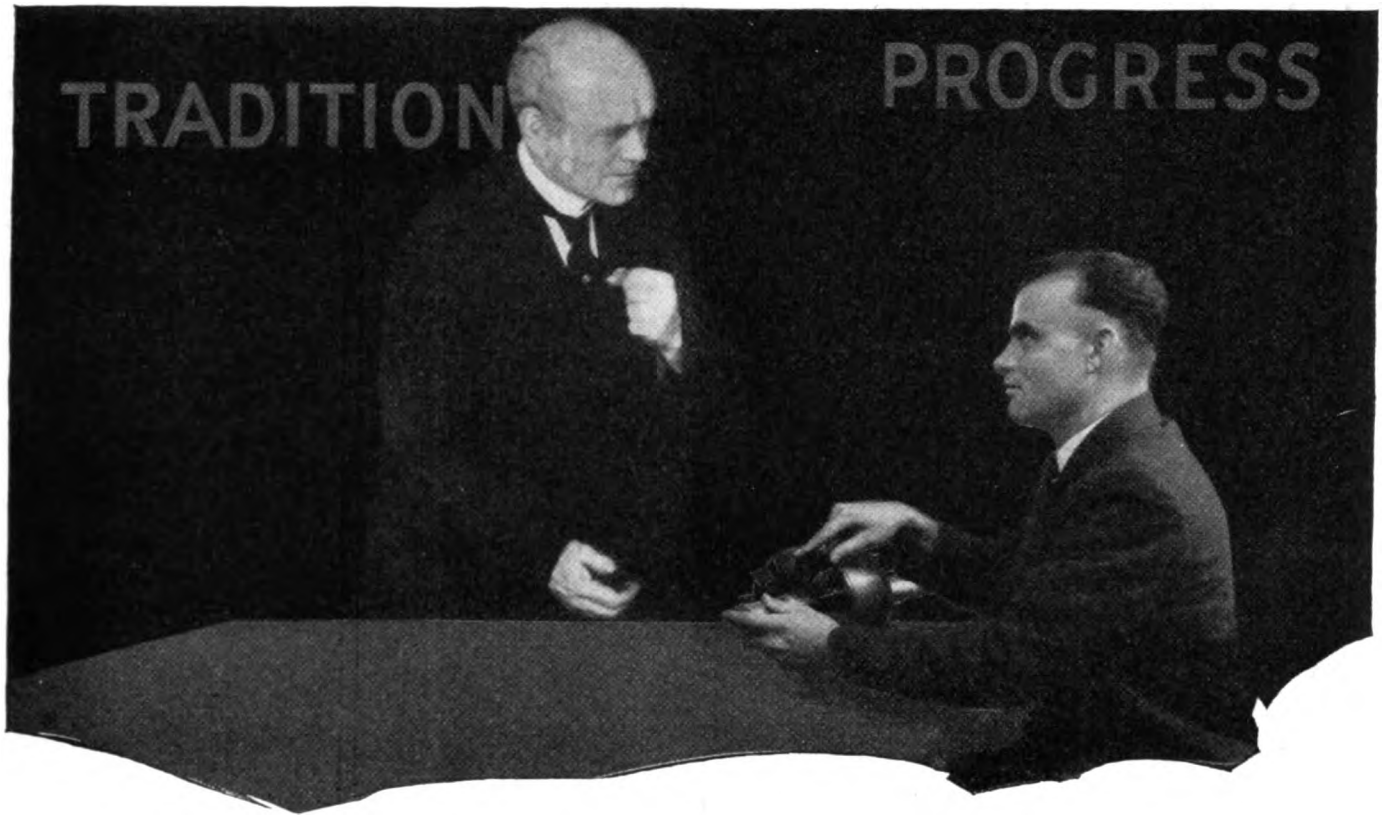
THE NITROSE COMPANY
Peoria Life Bld'g, Peoria, Ill.

Nitrose Company will be at the New York Power Show in Booth No. 744.

11-12-Gray

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Pop Gets Hot About a Hot Motor



"Lad—

I'm running to the ground every one of these shutdowns we've had on the machines. They're nearly all due to your lack of regular motor inspection. Here's a case where this fan was all loose and bent. Of course the motor heated up because you didn't catch the trouble. Then you blame it on the motor."

"Yes, Pop—

did you expect when you bought those motors from your non-development gang that you'd have to spend the price of the motors each year for private detective service to watch over the crimes that the maker put into them? That could never—yes, NEVER—happen to a Linc-Weld motor because they make their fans by punchings from He-Steel welded (Stable-Arc of course) smack up against the rotor end plate."

See how they do it—Page 9 of the Motor Book. If you haven't a copy write to—

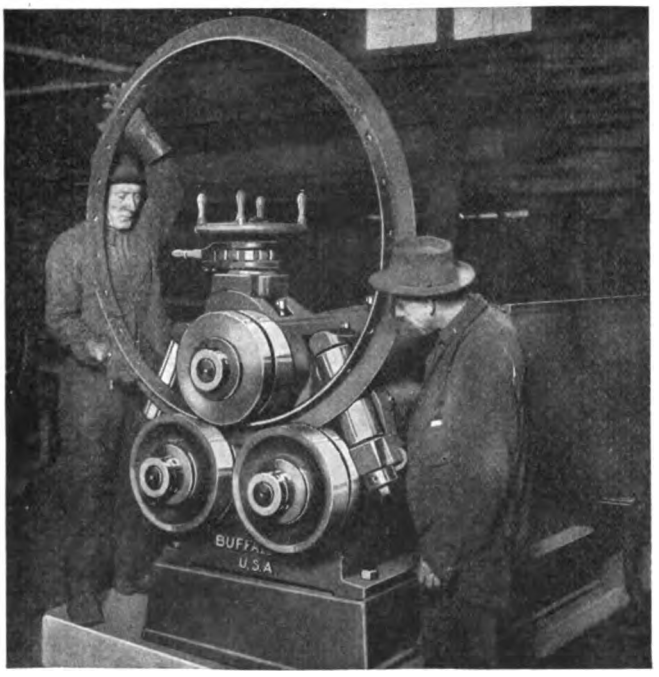
The Lincoln Electric Co., Dept. 17-12, Cleveland, Ohio

MA-1

"Linc-Weld" LINCOLN MOTOR

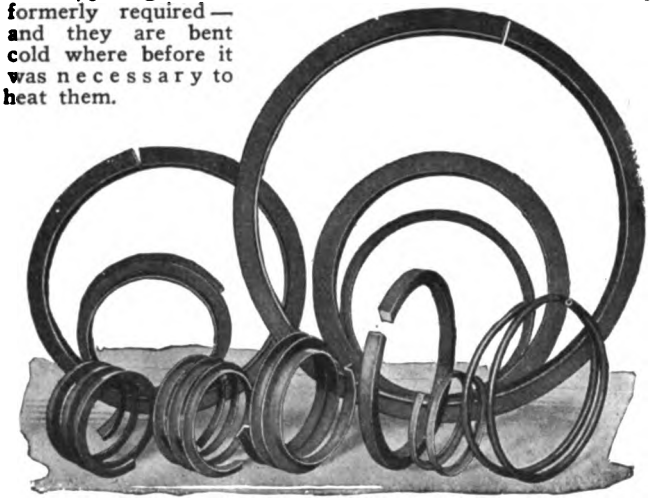
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This Machine



does a day's work in an hour!

Buffalo Bending Rolls cut bending costs to an almost unbelievable degree. The machine shown above is bending 3"x3"x⅜" angles in 42" circles in one-twelfth the time they formerly required — and they are bent cold where before it was necessary to heat them.



Why not write for detailed information?

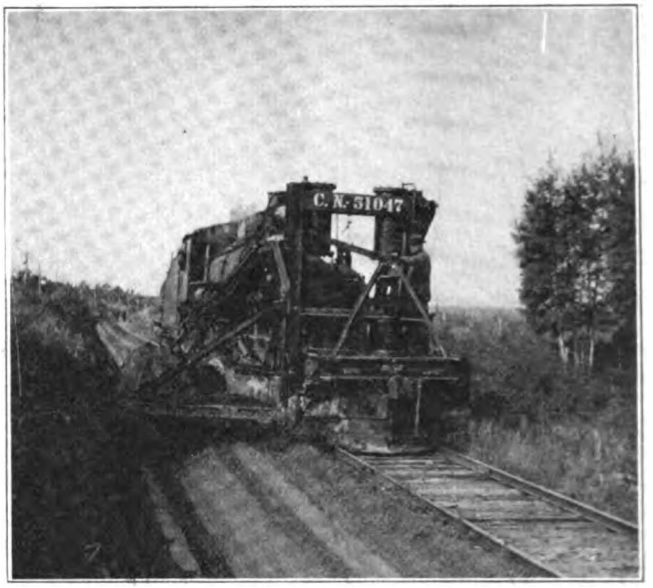
BUFFALO FORGE COMPANY

440 Broadway **Buffalo, N. Y.**

"Buffalo" Bending Rolls cut costs!

Powerful Ditching Machines Speed Up Railroad Work

POWERFUL railway ditching machines have recently been developed that do much toward simplifying one important feature of maintenance-of-way work.



Ditch cleaning by hand is slow, heavy and expensive work. It calls for many men on a railroad division. On a large portion of the track mileage it cannot be handled properly by the section gangs along with their other duties.

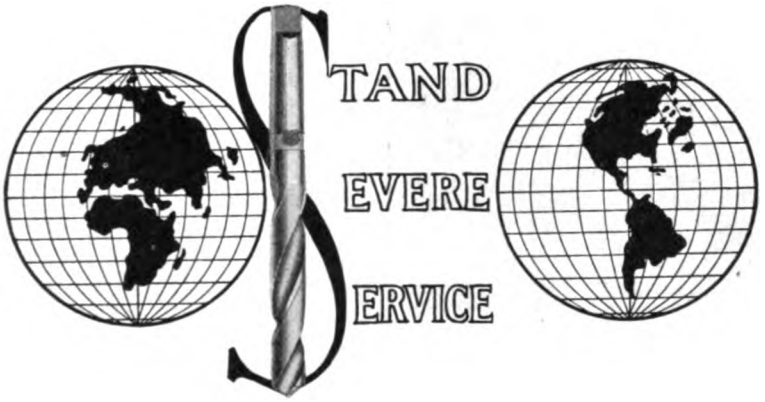


The wing type ditcher consists of a heavy car fitted with a side wing or scraper blade shaped to conform to the standard section of the ditch and roadbed shoulder. This wing cuts the soil and pushes it ahead to some point beyond the cut, where it can be thrown clear of the road-



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"Red Shield" High Speed Drills



THE STANDARD TOOL CO.

CLEVELAND

New York: 94 Reade St. Chicago: 552 W. Washington Blvd.
Fredk. Pollard & Co., Ltd., London and Leicester, England
Paris, France—Burton Fils Copenhagen, Denmark—Nienstaed & Co.



The Three Musketeers trusted good blades — so do Modern Mechanics

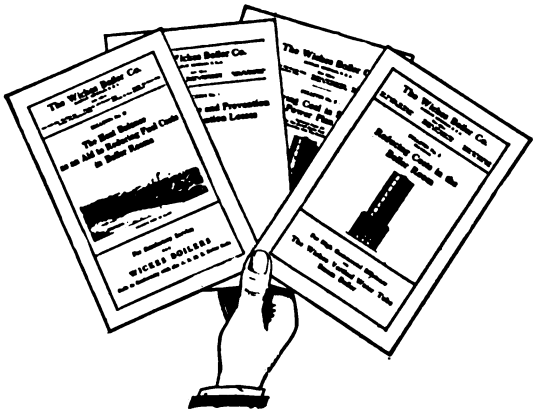
As did the Three Musketeers depend on their trusty blades in their many experiences and combats, as told by Dumas.

So to-day does the modern mechanic face the hardest cutting problems in the shop with the trusted Victor Blade.

Let us send you samples of this Wonder Blade

VICTOR SAW WORKS, Inc.
MIDDLETOWN, N. Y.

REDUCE Boiler Room Costs!



Let these Bulletins guide you to economy—they are free—send for them.

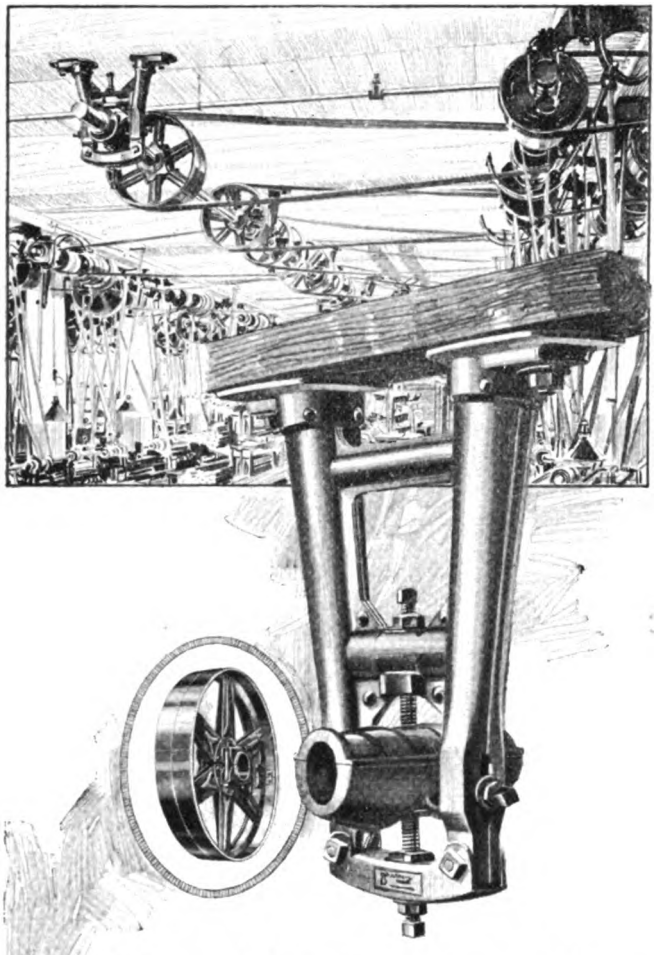
THE WICKES BOILER CO.
Saginaw, Mich.
Use the Coupon!

Gentlemen: Without obligation on my part I would like to read your helpful bulletins for reducing boiler room costs.

Bulletin 2. The Steam Boiler Analyst.
Bulletin 3. Reducing Costs in the Boiler Room.
Bulletin 4. Magnitude and Prevention of Air Infiltration Losses.
Bulletin 5. Saving Coal in Steam Power Plants.
Bulletin 10. Heat Balance as an Aid to Reducing Fuel Costs in Boiler Rooms.

Name .....
Business Address .....
Home Address .....
Date .....I. I.

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Shop Equipment Can Combine Good Appearance With Utility

THE modern idea of having the shop attractive as a place of work, has proved sound as an aid to better production, to less labor turnover, to greater pride of work and to other less tangible advantages.

Most machinery can combine every requirement of utility with graceful lines.

An excellent example of such a combination is found in "American" Steel Split Pulleys and "American" Pressed Steel Hangers.

Both are recognized as standards of efficiency in mechanical power transmission, yet this unusual mechanical excellence has been secured without any features of ugliness. Quite the contrary, the clean-cut, thoroughbred lines of both Hanger and Pulley contribute to the good appearance of any shop.

They are easy to buy. More than three hundred dealers in nearly every important city carry them in stock. For the name and address of the nearest dealer, see MacRae's Blue Book or we shall be pleased to send this and other information directly.

The American Pulley Company

Manufacturers of Steel Split Transmission Pulleys, Pressed Steel Shaft Hangers, Pressed Steel Hand Trucks and Pressed Steel Shapes

4200 Wissahickon Ave. Philadelphia, Pa.

AMERICAN PRESSED STEEL HANGERS | STEEL SPLIT PULLEYS

PATENTED PATENTED

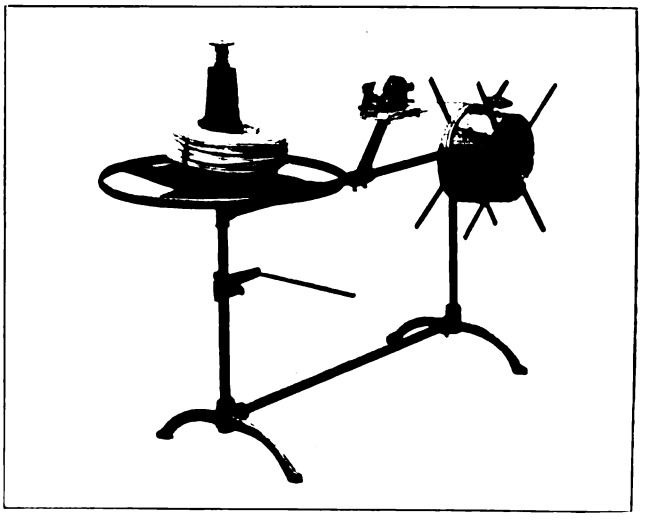
bed. A modification of this type has, instead of a wing, a scoop or a bucket hung from a derrick at the side of the car. The wings or buckets are handled by power equipment from the car, usually operated by compressed air from the locomotive that pushes the car. In general, the ditching is done on one side at a time, but the larger machines have wings on both sides and can clean both ditches at once. These machines can also be used to cut down the shoulders of a fill.

In operation, the wing ditching machine is pushed through the cut, the wing being adjusted to suit conditions. As a rule, one or two runs are made, but in some cases as many as five runs are needed to cut to the right depth and width. On the last run a steel template on the bottom of the wing finishes the roadbed shoulder, ditch and side-slope to a standard section. An average day's work is about 400 cu. yd. of material moved and about 4,700 feet of ditch finished.

A Measuring Machine for Wire or Rope

THE accompanying illustration shows a new machine developed by the Durant Manufacturing Company for measuring wire, rope, cable and tape trimming or other material on which lineal measurement is required.

It is said to be particularly useful to the electrical industry, supply houses, central stations and contractors



for issuing and checking material for specific jobs and to manufacturers for measuring of supplies as required.

The coil reel at the left is adjustable to hold wire in shape. The counting unit has ¼" black figures on white background. Measures feet or fractions. The machine is portable and so designed that wire can be taken off the original reel, or for smaller quantities it can be placed on the reel. This reel is adjustable and can be set to accommodate practically all sizes. Counter has reset feature; with a single turn of wing nut the counter is brought back to zero.

The reel at the right has a collapsible front to easily remove and tie measured material.

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What does it profit YOU

to spend thousands for modern efficient machinery and limit your production by not using the same care in the selection of tools? The measure of a production tool is the quality and quantity of the work it does.

MORSE Drills, Reamers, Cutters, Taps and Dies,

both High Speed and Carbon, invite comparison on this basis. They are the result of over half a century of tool making experience.

Let us put our facilities at your service.



MORSE
TWIST DRILL & MACHINE CO.
NEW BEDFORD, MASS., U.S.A.

Morse High Speed and Carbon Drills, Cutters, Reamers, Taps and Dies, Sold by Responsible Dealers Everywhere.

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Clipper Knows

The Clipper Belt Lacer — standard of the world. More than 225,000 now in use.



The above Diploma of Award indicates that even in far off New Zealand the value of Clipper Belt Fasteners is recognized, in this case by the awarding of the First Order of Merit. The Clipper Belt Lacer Company is justifiably proud of this award and accepts it as a sign that Clipper Fasteners are rapidly becoming standard throughout the world.

QUALITY
Clipper
BELT LACING

For products not advertised in this issue write Industry Illustrated

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No Boundaries!

IT is not surprising that the Gold Medal Award of the New Zealand and South Seas Exhibition has been awarded to the Clipper Belt Lacer Company. The widespread acceptance of *Clipper Belt Fasteners* as standard belt connections, not only in North and South America but in Europe and Asia, should have a noticeable effect upon the decisions of practically all foreign countries.

Since one-third of the enormous daily production of *4,000,000 Clipper Belt Hooks* is exported to foreign lands it is evident that *Clipper* enjoys an international reputation.

WHY CLIPPER PRODUCTS ARE SO WIDELY USED

Clipper products are sold at a low margin of profit and at prices that meet foreign competition even in foreign countries.

Clipper Hooks are mechanically perfect and are made of the best fatigue-resisting steel.

Clipper Pins are the best we know how to make.

Clipper Hooks have a staggered double grip.

Clipper Belt Lacers are the most efficient lacers for use with *Clipper Hooks*. Material and workmanship fully guaranteed.

Standardize on Clipper Products

Clipper Belt Lacer Company

GRAND RAPIDS MICHIGAN



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Get ALL the Winter Daylight

SUNBURST PASTE

Insures Clean Windows all Winter

NOW you can clean windows regularly all Winter—get all the daylight just when it is needed most. SUNBURST **Paste** Formula is a marvelously efficient cleaner. Removes carbon, rust and grime. Easy to use. Simply apply—and wipe off. No rinse water needed. Leaves glass with brilliant high polish.

SUNBURST **Paste** is absolutely harmless—you can wash your hands in it. Can't injure paint, putty or sash. And don't forget this big point—it is especially suited to cleaning on the inside of plants because of the absence of rinse water. There is nothing to drop on machinery or stock.

Use SUNBURST *HI-SPEED* WINDOW CLEANER

Try Sunburst at Our Risk

We will send all responsible concerns a barrel, half or quarter barrel lot of SUNBURST Paste or Liquid Formula on the following unqualified guarantee—use enough to satisfy yourself of its superiority. If it does not perfectly satisfy you return unused portion collect and we will cancel the entire invoice.

The G-S Chart tells you the right formula to use to meet various window cleaning needs. Sent gratis on request.

THE GERSON-STEWART CORP.
3541 E. 76th Street CLEVELAND, OHIO

What Is Your Gross Profit?

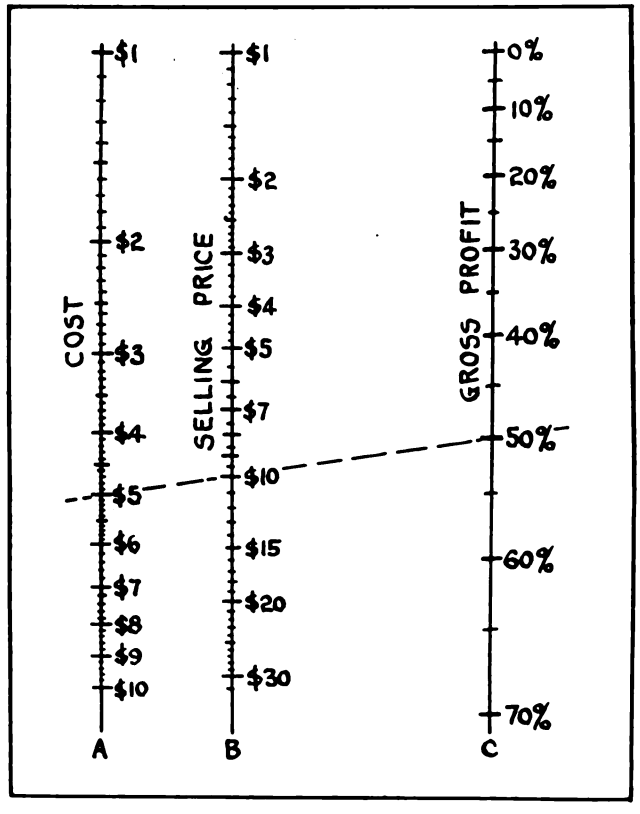
By W. F. Schaphorst

FOLLOWING is a handy chart for quickly computing gross profit. It may also be used to determine what the selling price should be, having decided upon the gross profit wanted.

Many dealers are of the opinion that when they buy an article for $5 and sell it for $10 they make a profit of 100 per cent. That, however, is incorrect because profits should be based on the selling price and not on the cost. The gross profit is therefore 50 per cent. and not 100 per cent.

To determine the gross profit, find the cost in column A and the selling price in column B. Run a straight line through those two prices and the intersection with column C gives the gross profit. Thus, in this chart the dotted line shows that if the cost is $5 and the selling price $10 the gross profit is 50 per cent.

Inversely, the chart may be used to determine the selling price. Thus, if the cost is $5 and if it is decided



to make a gross profit of 50 per cent. connect the gross profit, column C with the cost, column A, and the intersection with column B gives the selling price as $10.

As will be noted, this chart is reduced to the utmost simplicity. No calculation whatever is required. The range is great enough to take care of almost any problem. By simply adding ciphers to the figures in columns A and B the chart will take care of almost any amount. Thus, if the cost were $50 instead of $5, and the selling price $100 instead of $10, the same dotted line as shown on this chart would give the gross profit as fifty per cent. If the cost were $500 and the selling price $1,000, the same dotted line would give the result as fifty per cent. gross profit. It must be remembered, however, that the same number of ciphers must be added in both columns

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When you feel like biting your cigar in two over Damaged Floors, replace the iron wheels on your trucks with . . . .

Lansing Fibre Wheels

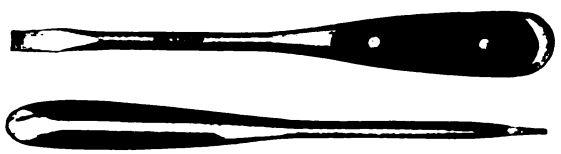
. . any size of wheel can be furnished.

Always have Lansing-Company Catalog No. 12 on file for ready reference.

LANSING-COMPANY

Factory: Lansing, Michigan. *Branches:* Boston Kansas City Minneapolis Chicago New York Philadelphia Cincinnati

Screw "LENOX" Drivers



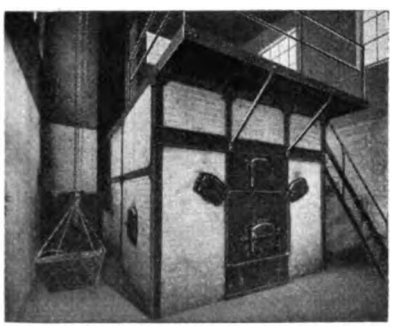
Long Life is Built In

"LENOX" Screw Drivers are forged in one piece from handle to tip, of the highest quality special analysis steel.

Points are heat treated to stand the strain without bending. And the handles cannot loosen.

Every "LENOX" is guaranteed unconditionally. Order a box from your dealer today.

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Springfield, Mass.
"The Tools in the Plaid Box"



Detroit Plant Incinerator

THE HUPP MOTOR CO.
Disposes of Factory Sweepings and Waste Matter with a

GODER INCINERATOR

GODER High Temperature Waste and Refuse Furnaces will solve your waste disposal problem perfectly. Made in all sizes and types to fit any kind of conditions. Can be installed in either OLD or NEW buildings.

Preliminary consultation and engineering service furnished without cost.

Write for descriptive literature. Free to interested executives.

GODER INCINERATOR CORP.
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CHICAGO, U. S. A.

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ASK any man in the shop and he'll tell you just that—usually with the addition of several mouth-filling adjectives to make sure that *you* get the point.

And it is "some vise." Hard work never fazed a Prentiss. It's built to stand rough stuff. From the castellated collar fastening—an exclusive Prentiss feature which keeps the front jaw tight—to the press-forged ball ends, it's a man's vise.

A Prentiss Vise is "there in the pinch"—and shop men know it. That's why they prefer it.

311

PRENTISS VISES
PRENTISS VISE CO.
106-110 LAFAYETTE ST. NEW YORK CITY
CHENEY HAMMERS

A and B. Thus, if one cipher is added to column A, only one cipher can be added to column B.

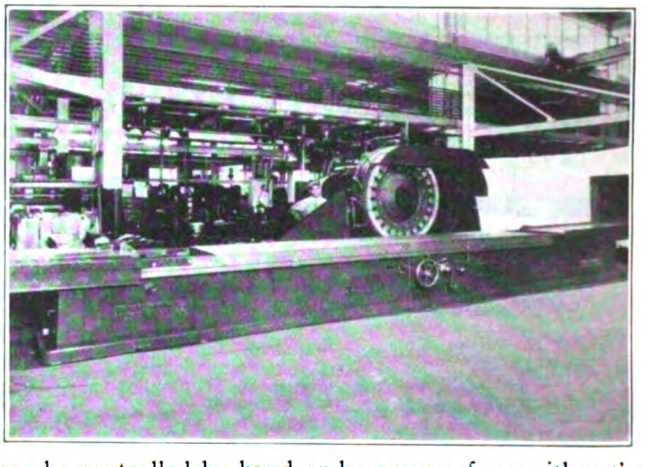
If it is desired to compute the gross profit "long hand" it may be done in this way: Subtract the cost from the selling price and divide by the selling price. The result is the gross profit.

To compute the selling price knowing the cost and having decided upon the gross profit, proceed in this way: Subtract the gross profit from 1 and divide the remainder into the cost. The result is the selling price. For example, if the gross profit is to be 60 per cent. and if the cost is $4 we have: 1 — 60 per cent. equals 40 per cent.; $4 divided by 40 per cent. equals $10. Therefore, the selling price should be $10. It will be found that this checks correctly with the chart.

An Unusually Large Face Grinder

FOR grinding flat surfaces of large area the Diamond Machine Co., of Providence, R. I., has recently developed a face grinder of rather unusual proportions. It has a net weight of 60,000 pounds and occupies a floor space 10 ft. 7 in. by 55 ft. 9 in. The machine is capable of machining surfaces 198 inches long by 42 inches high. It was designed primarily for grinding railroad frogs, but can be used for other work requiring the finishing of large flat surfaces.

The bed of the machine, which has a three-point floor bearing, is 336 inches long and the platen is 200 inches in length by 36 inches wide. Cross feed of the table is manual, from the front or rear of the grinder, and amounts to 4 inches with a new wheel. Table traverse



may be controlled by hand or by power, from either the front or rear of the machine, and the table feed is 30 ft. a minute. The abrasive wheel revolves at the rate of 215 r.p.m. and cooling water is supplied by a power driven pump at the rate of 100 gallons a minute.

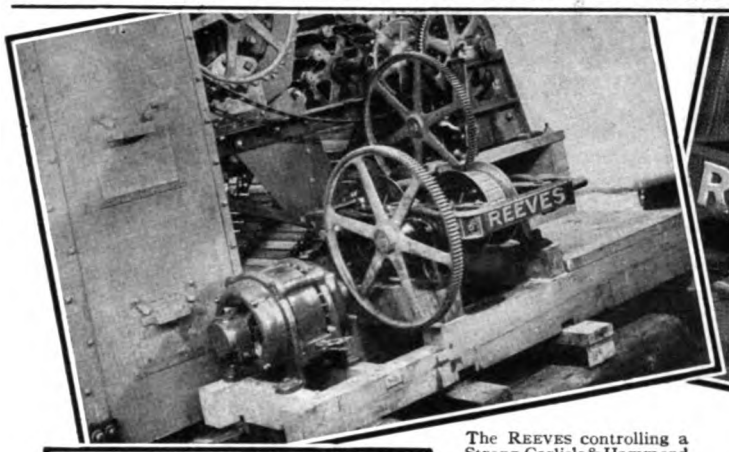
Power for driving the machine is obtained from a 75 hp. 50 degree type motor, running at 735 r.p.m. and the spindle is operated by a silent chain drive.

A special section wheel chuck is supplied to hold the 24 abrasive blocks comprising the grinding wheel. Each of the blocks is 7¼ in. deep by 2 or 3 in. thick. The segments are adjustable for wheel wear and more than 5 in. of the depth can be used before renewal. Fastened to the upper wheel guard is a permanent wheel truing device so that the wheel surface can be trued while grinding.

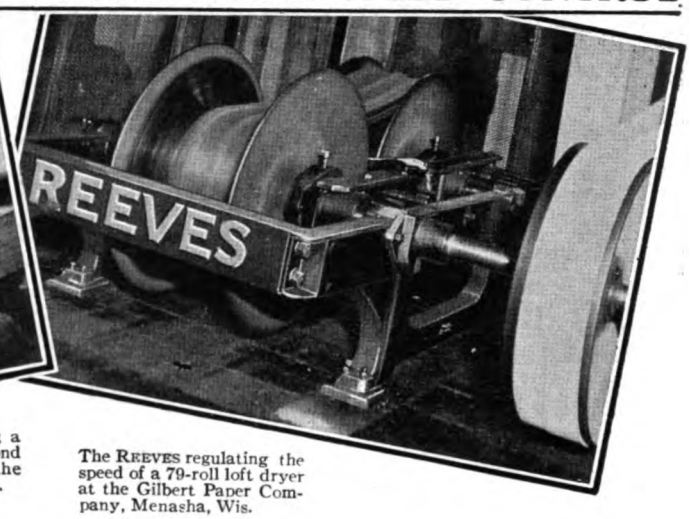
The machines are built in various sizes using wheels of from 18 to 66-inch diameter and with beds of different lengths.

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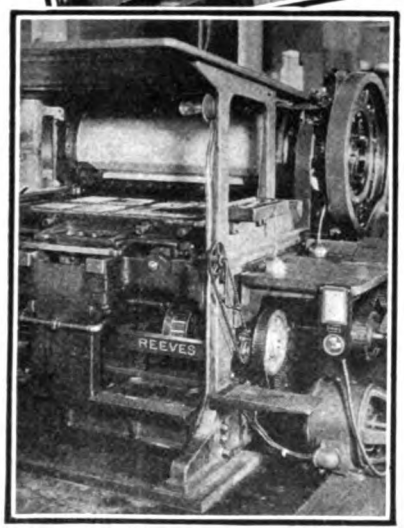
INDUSTRY COMES TO REEVES FOR ACCURATE SPEED CONTROL



The REEVES controlling a Strong, Carlisle & Hammond annealing furnace at the Chevrolet Motor Car Co.



The REEVES regulating the speed of a 79-roll loft dryer at the Gilbert Paper Company, Menasha, Wis.



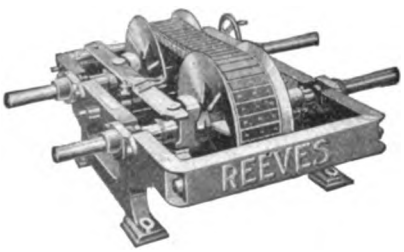
A REEVES-controlled Mobile cylinder press

In Your Industry Speed Flexibility Is Absolutely VITAL!

MODERN production methods will not tolerate make-shifts in speed control. Speed flexibility is too important—too *vital.* Take your industry, for example. If your machines and conveyors could be run at only one set speed, their usefulness would be highly questionable. They must be *flexible*—able to run at many different speeds.

The REEVES Transmission is the only method which gives this vital flexibility. It is the only method which gives you *complete* control over the speed of your machines and conveyors. You can get any speed you desire *instantly* on any machine that is REEVES-equipped. Our catalog L-66 gives full information about the advantages of the REEVES in your industry. Send for it.

The REEVES Transmission is a simple, compact mechanical device which receives power at a constant speed and delivers it at any speed desired to any machine or group. It will maintain one set speed indefinitely, or may be changed instantly to meet any different operating condition. Easy to install—simple to operate—pays for itself in a short time—lasts for years. Accurate and dependable.



REEVES PULLEY COMPANY
Established 1887
COLUMBUS, INDIANA

REEVES
Variable Speed Transmission

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Stop
This Waste!

Leaking valves are more than a hissing, dripping nuisance. They are wasting hundreds of dollars worth of steam, air or fluids.

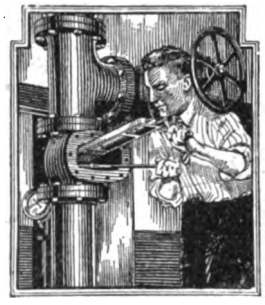
But the high cost of frequent valve replacement is equally serious.

There is only one alternative—equip your plant with a Dexter Valve Reseating Outfit.

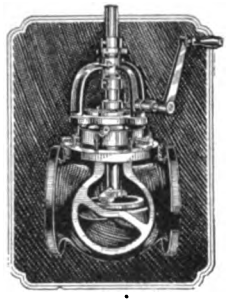
The Dexter Outfit keeps valves leak-proof indefinitely without the trouble and expense of removing them from their pipe lines.

Tell us the number and size of your globe valves and gate valves and we'll show you figures to prove that a Dexter Outfit will pay for itself many times over.

Write for Catalog 23 for complete information and prices.



Dexter
Gate Valve
Reseating Machine



Dexter
Globe Valve
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Dexter
Pump Valve
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THE LEAVITT MACHINE CO.
28 East River Street, Orange, Mass., U. S. A.
Canadian Agency: Darling Bros., Ltd., 120 Prince St., Montreal
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350

Valve Reseating Dexter Machines



Hang it wherever you are now using a Chain Block

Light in weight, but substantial and highly efficient is this ROEPER Type "R" Hoist. It has very few parts. Spur Gear and Worm Driven, with the difficulty of adjustment between worm and gear eliminated.

It has a totally enclosed Dust Proof Frame and all parts automatically lubricated.

Capacities 500 to 4000 lbs., inclusive. Write for complete description.

ROEPER CRANE & HOIST WORKS, Inc.
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TRAVELING CRANES ELECTRIC HOISTS TROLLEYS

Type MP 5
¼ H. P. Motor



Strand

Flexible Shafts
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Equipments
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1/10 to 2 H. P.
Several Types and Sizes

Grinding—Polishing—Drilling—Rotary Filing—Scratch Brushing—Power Screw Driving—Nut Setting and many other operations performed with these machines.

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That is what users say about every Union Woodworking Machine.

In quality and performance Union Machines are way in advance. In this day of keen competition, manufacturers must pay closer attention to reducing operating costs.

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Union 20-inch Portable Band Saw

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There is a Union Machine for every kind of woodworking practice, even to odd jobs in the shipping room. Begin now to enjoy the advantages of Union Machines. Write today.

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Complete Stocks Everywhere

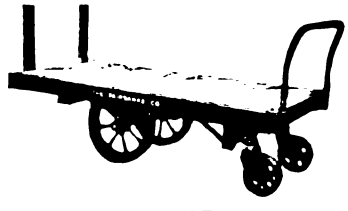
No matter where you are located, there is a mill supply dealer within a few miles who can deliver from stock any one of 26 different models.

Just keep in mind in ordering factory trucks that *the best will always be made of wood—steel-bound*, and that "best" can be delivered at your door the same day you telephone.

Order by number from our truck catalog.

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Fairbanks



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of 15 to 48% Shown in this Book



This book is not simply a catalog. It contains an abundance of evidence and testimony which shows the amazing economies obtained with Automatic Control of Temperature in offices and workrooms.

It shows how Powers Control in many of America's leading firms has reduced fuel consumption 15 to 48 per cent; and how the output of workers can be increased, and the quality of their work improved; and other profitable advantages. *For limited distribution only—*

—among plant owners, chief engineers and other executives interested in eliminating waste and increasing the profits of their company.

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I shall be glad to receive a copy of your book SHOP and OFFICE TEMPERATURES.

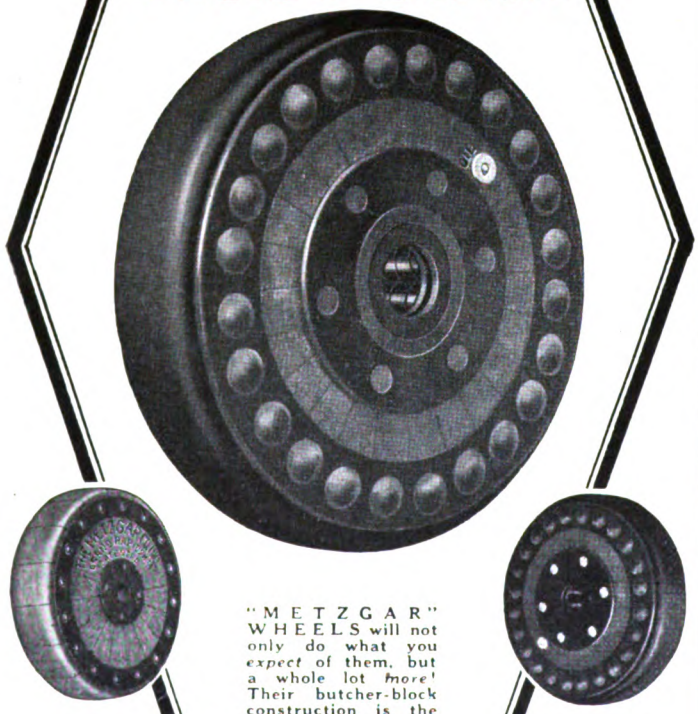
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WHEELS
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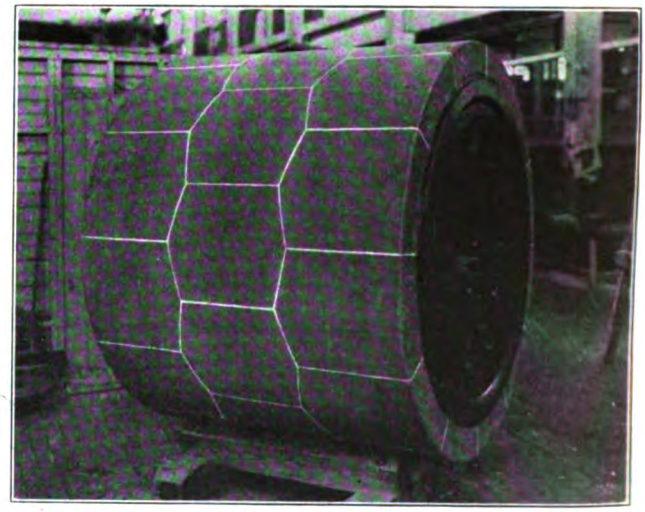
METZGAR CO., INC.

459-503
Grand
Rapids,
Mich.,
U.S.A.

New Abrasive Wheels for Paper Industry

RECENT successes in the paper industry with manufactured pulpstones indicate that the transition from the natural grindstone to the manufactured grinding wheel is taking place in another industry, the last big business to employ the sandstone in extensive production. A number of the manufactured pulpstones have been used in some of the larger mills for a considerable period with satisfactory results.

Appreciating the need for this type of pulpstone, manufacturers of grinding wheels tackled the problem in a broad way, and after much experimenting developed a wheel to replace sandstone. It is not possible to make solid vitrified wheels in the sizes required by the paper industry. The problem was finally solved after extensive research and experiments by the Norton Company by developing a wheel made up of segments, securely fastened to a cast iron center or spider. The segments are



composed of the abrasive trademarked "Crystolon," bonded by the vitrifying process. Probably one of the greatest difficulties to overcome was to decide upon the correct mechanical mounting of the large segments to hold them securely against the tremendous forces used in the operation. The form of construction of this new type of wheel is shown in the illustration.

The new pulpstone is said to have many advantages over the sandstone. Some of these are:

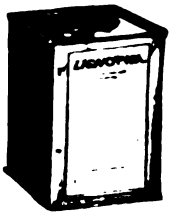
The stones have been in use for varying periods, some as long as two years. While none of them has as yet been in use long enough to be worn out completely, it can be estimated that the life of the average stone will be from four to five years. Long life is due to the fact that there is but slight wear on the stone itself, and burring is required much less frequently than with the sandstone.

There is nothing experimental about the manufacture of the abrasive stone; it is made by the processes resulting from 40 years of manufacturing experience in producing grinding wheels for the metal working shops. The structure of the stone is uniform throughout, not only within the stone itself, but from stone to stone as well. The abrasive grains are uniform in size, and there is no variation in hardness. The common defects in sand-

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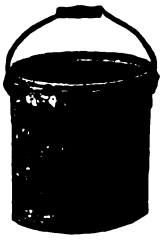


1 Lapidolith is the original concrete floor hardener. It will add years of wear to even an old concrete floor. It is a liquid, chemical compound that penetrates the porous cement, binds the loose particles together, and fills up the voids. It will make your concrete floors almost as hard as flint, and make concrete dust a thing of the past. Lapidolith is as easy to apply as water. Floors treated at night are ready for business in the morning.



2 Lignophol will add years of wear to old, worn-out wood floors. It is a preservative dressing that penetrates the wood fibres, and restores the natural gum and oils. It will give you smooth, hard, dustless wood floors.

The Standard Sanitary Mfg. Co. of Birmingham, Alabama, users of Sonneborn products. Contractors — Ferro Concrete Construction Co. of Cincinnati.



3 When your next repainting job comes around try Cemcoat. The wearing qualities of this paint are remarkable. Even on brick, plaster, or concrete walls it will not crack or peel. It may be washed again and again. Because of its unusually heavy body it generally requires one less coat to a given surface than most paints. Cemcoat comes in white and colors for exteriors and interiors.

How leading concerns cut their plant repairs

Five methods they have used for years with excellent results

1 They make their concrete floors dustproof and wearproof with a treatment of Lapidolith, the original concrete floor hardener described above.

2 They protect their wood floors against splintering, rotting, or drying out. A dressing of Lignophol adds years of wear to any wood floor. Read the detailed description at the left.

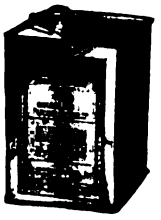
3 They cut down painting bills. Cemcoat is a paint that saves them money. It stays white long after other paints turn yellow, and may be washed again and again. See further description above.

4 They guard their buildings against dampness. A treatment of Hydrocide Colorless on your exterior walls permanently damp-proofs your buildings. Further details are given above.

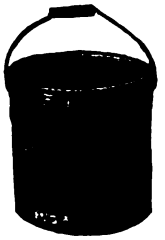
5 They stop roof leaks before they become dangerous. Stormtight is an adhesive, rubberlike substance that stops leaks instantly and permanently. See the complete description at the right.

L. Sonneborn Sons, Inc.

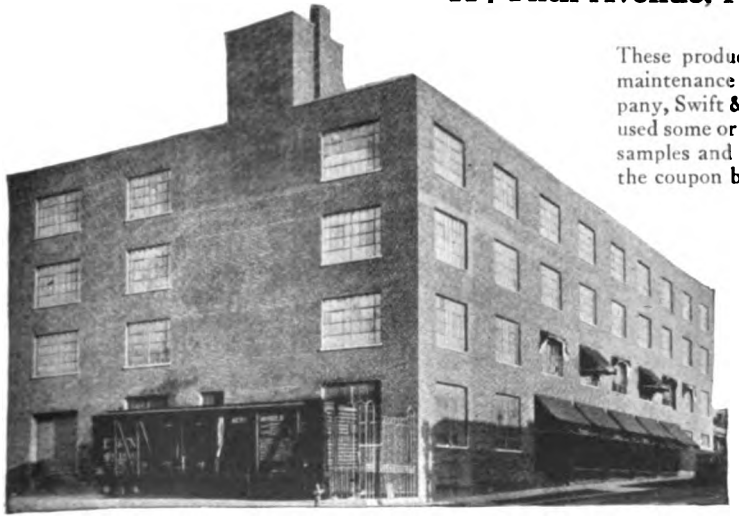
114 Fifth Avenue, New York City



4 Hydrocide Colorless, applied to the exterior of a building, penetrates the brick or concrete and effectively keeps out all moisture. As it contains no paraffin it will not run in hot weather. It will permanently dampproof the walls of your buildings, and yet since it is invisible it does not detract from the natural beauty of the walls.



5 Stormtight is an adhesive, rubber-like liquid, ten times thicker than paint. It will prolong the life of your roof and protect it against leaks quickly and permanently. Stormtight quickly stops leaks that have already started. It is very easy to apply. It is not a temporary makeshift, but has saved the cost of new roofs again and again.



These products have helped many manufacturers reduce their maintenance expense. Concerns such as the Ford Motor Company, Swift & Company, and the Bethlehem Steel Company have used some or all of these products for years. Let us send you free samples and literature that will tell you more about them. Use the coupon below.

L. Sonneborn Sons, Inc. L-2
114 Fifth Avenue, New York City

Please send me, without any obligation, demonstration sample and literature on:—Lapidolith....; Lignophol....; Cemcoat....; Hydrocide Colorless....; Stormtight.... (Check those products that interest you)

Name.....

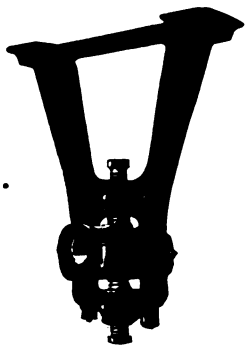
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Each purchase of a Wood's Cast Iron Power Transmission Unit goes beyond the mere thought of buying a hanger, pulley, flexible coupling, etc.,—on into the realm of continuous, dependable service over the years and years.

Wood's Cast Iron Power Transmission Products must serve reliably and economically for they are built to do just that. Cast Iron Hangers, Pulleys, Friction Clutches,—in fact, the complete line is made for permanence by an organization mellowed through 70 years of manufacturing experience, assisted by an engineering corps always alert to provide improvements that save time, labor and money.

Your local Wood's Dealer is a man equipped for service and savings. He's dependable. 'Phone him on that next order.

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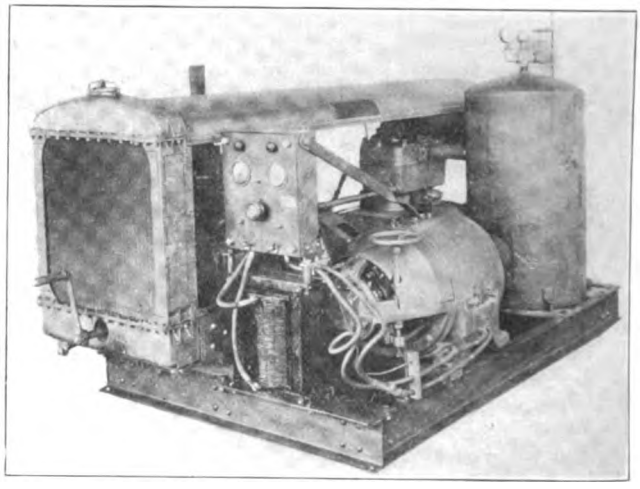
stones such as spalling and pockets are not present in the manufactured stone.

No seasoning is necessary, which is another advantage. Manufactured stones can be obtained at any time upon reasonably short notice, and it is therefore not necessary for the mills to carry a supply on hand.

A Combination Air Compressor and Arc-Welder

A COMBINATION air compressor and arc welder driven by a gas engine and mounted on a single base has been placed on the market by Schramm, Inc., of West Chester, Pa. The outfit consists of a Buda gasoline engine, a Schramm compressor and a General Electric welding outfit. The complete equipment may be mounted on a standard two-ton truck or can be made portable by adding steel or rubber-tired wheels.

The Buda engine is a 24-horsepower, 800 r.p.m. unit which may be started and operated independently of either the compressor or welding generator. The Schramm



compressor is a two-cylinder, water-cooled machine with a capacity of 120 cubic feet a minute and is equipped with an automatic unloading device. The air receiver is 16 inches in diameter by 42 inches high. The General Electric welding equipment consists of a belt-driven WD-12 arc welder with an idler pulley for belt tightening. By the use of a Borg & Beck 12-inch clutch coupling, either of the machines may be connected to the engine.

This combination outfit is expected to be of great value in field work. The air compressor can be used to operate drills, grinders and chipping hammers for cutting, peening, caulking and cleaning off scale. The compressor can also be used in preparing work for welding. With the WD-12 welder light and heavy gauge steel can be welded as well as cast iron. After the welding is completed, the compressor clutch is thrown and the weld can be ground or chipped as desired. Thus a complete job can be done with the single machine.

The structural steel base is 8 feet 4 inches long, 5 feet 11 inches wide, and is 3 feet 10 inches high. The total net weight of the equipment is 4,000 pounds.

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Typical Experiences with Whiting Cranes

"Whiting Cranes require the least maintenance."

••••

"Installed Whiting Crane 17 years ago. Like it better than any other. Next crane will be a Whiting."

••••

"We forget that we have cranes—they give good service and so little trouble."

••••

"Whiting Crane about 24 years old—still in good condition. Haven't spent over $200 for repair parts since it was erected."

••••

"Whiting Cranes are easy to get at to repair."

••••

"In the installation of two new units and the removal of old machinery from one of our plants to another, the Whiting Crane has fully saved its cost."

••••

"Very much pleased with our Whiting Crane. We are able to unload material for about 6c a ton which is very good practice considering the material we have in our warehouses."

••••

"Our Whiting Crane is only shut down 12 hours a week. Has never given a bit of trouble since it was put in operation."

••••

"Our Whiting Crane is always on the go."

••••

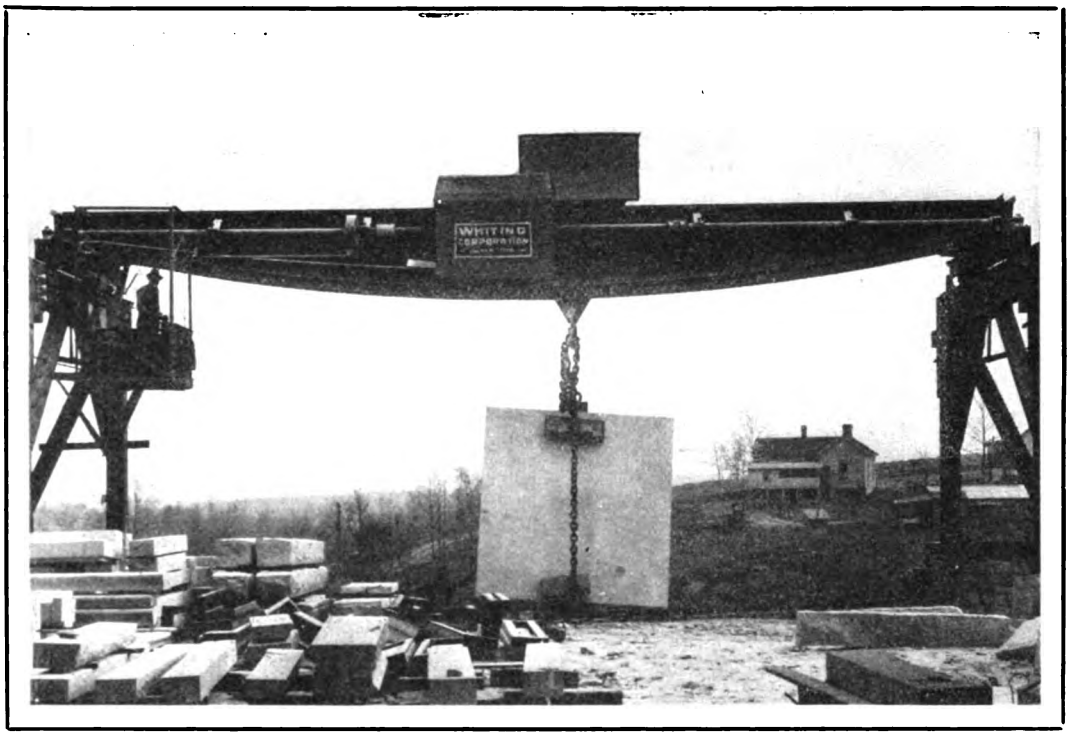
"During its three years of service, our Whiting Crane has more than paid for itself."

••••

"Our operator unloads car of coal in 20 minutes with Whiting Crane."

••••

"Whiting Crane handles 600 tons every day—since installation eight years ago, it has been down for repairs only once when motor burned out."



Hard service only emphasizes Whiting Crane Quality

For thirteen years this 25-ton crane has been handling blocks of granite often weighing 35 tons and once it lifted a 42-ton block. It was dropped from the runway 23 feet by a fire and later went through a similar experience in a tornado.

After such tests, see what the owner says. "Giving as good service as ever . . . wouldn't sell today for what we paid. Excepting damage to cage in its two falls, only replacements in thirteen years have been contacts and fingers, and one set of pinions."

Only built-in quality like that found in Whiting Cranes can produce such a record. Note the similar expressions in the adjacent column.

WHITING CORPORATION
15651 Lathrop Avenue
Harvey, Ill. (Chicago Suburb)

WHITING

IM-11-Gray

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Adjustable ranges:
17-23"
21-27"
25-31"
28-34"



ROYAL
factory
the seat of production
chair

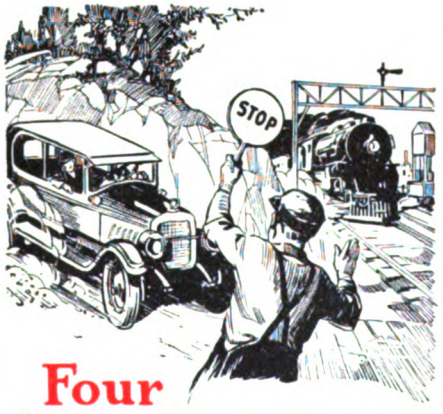
For 9 years Royal Seats of Production have incorporated not only posture and health principles, but have essential common sense working comfort, without which posture alone cannot increase production.

Adjustable chairs with broad seats and properly fitting backs reduce fatigue, diverting lost energy to greater output.

Over a thousand of the largest factories have proven that a Royal Adjustable Factory Chair costs less than a tired worker.

Write for samples for Free Trial —no expense—no obligation

ROYAL METAL MFG. COMPANY
Largest Manufacturers of Industrial Chairs and Stools
2316-22 SOUTH WESTERN AVENUE, CHICAGO, ILLINOIS



Four Wheel Brakes ~ On the Vise!

A turn of the bolt—the base is locked! As quick and positive as four wheel brakes in an emergency. Nor is that all. You will find this type of locking feature on the Parker Vise only—an exclusive patented feature which gives the Parker Swivel base a big advantage over all others. Here's how it works. When the bolt is turned down the wedge is pulled up, expanding the split ring with a positive grip around the whole 360° of the base. The vise is locked as solidly as if it was made with a stationary base.

Write to W. R. B. for Catalog 57B

THE CHARLES PARKER COMPANY
Master Vise Makers
Meriden, Conn., U. S. A.

Other Exclusive Features of Parker Vises


Renewable Steel Jaws


Solid Underportion in Slide


Handle Stays Put


Swivel Base 360° Gripping Power

PARKER VISES

Beaumont Skip Lifts Will Handle All Kinds of Bulk Materials

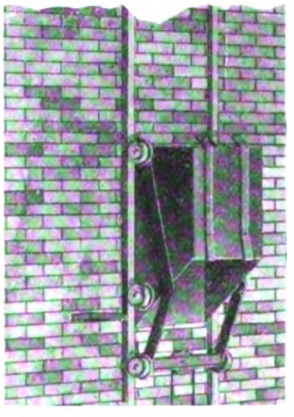
AN easy and simple way to elevate bulk materials has been made possible by the recent development and perfection of a new type of skip lift, a product of the R. H. Beaumont Co. of Philadelphia.

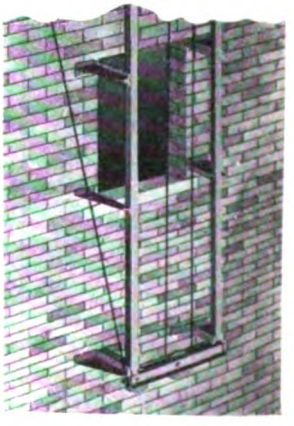
The skip lift is very simple, consisting of only a bucket, guides, cable and electrically operated winding machine, and may be used for elevating granular products.

Two distinct applications can be made with the skip-lift; one where the elevating is adjacent to a building, the guides being supported by the building wall; the other where the elevating is in isolated locations and the skip lift is of a self-supporting type.

Three methods of operation are possible with the skip-lift; full automatic, semi-automatic and manual. The full automatic type does not require an attendant, except to press a button to start and stop the machine. When the button is pressed, the bucket descends to the pit where it engages with the patented simplex loader, receives its load of material and ascends, discharges, descends, reloads and continues this cycle of operation as long as material is to be handled.

The patented simplex automatic loader, used in connection with the automatic skip-lift, is not dependent on electrical timing devices for operation. It is opened and closed only by contact with the skip bucket. In descending into the pit, the bucket engages with a hook on the loader, pulling the loader down into an open position and permitting material to pass into the bucket. Being of the self-damming type, the loader passes full loads of material at each opening, yet prevents flooding and underloading of the bucket. As the bucket ascends, it pushes the loader into an upright and closed position. Counterweights on the loader assist in closing and keep it closed.





The second type is semi-automatic. This is the type generally used for handling ashes and similar service requiring intermittent duty. Here the workman loads the bucket by means of small cars, wheel-barrows, etc., and when the bucket is loaded presses a button to elevate it; the bucket ascends, discharges, descends and comes to rest in the pit ready for another load. The operation of this type of skip-lift is automatic except that it only makes one cycle and stops in the pit after each trip.

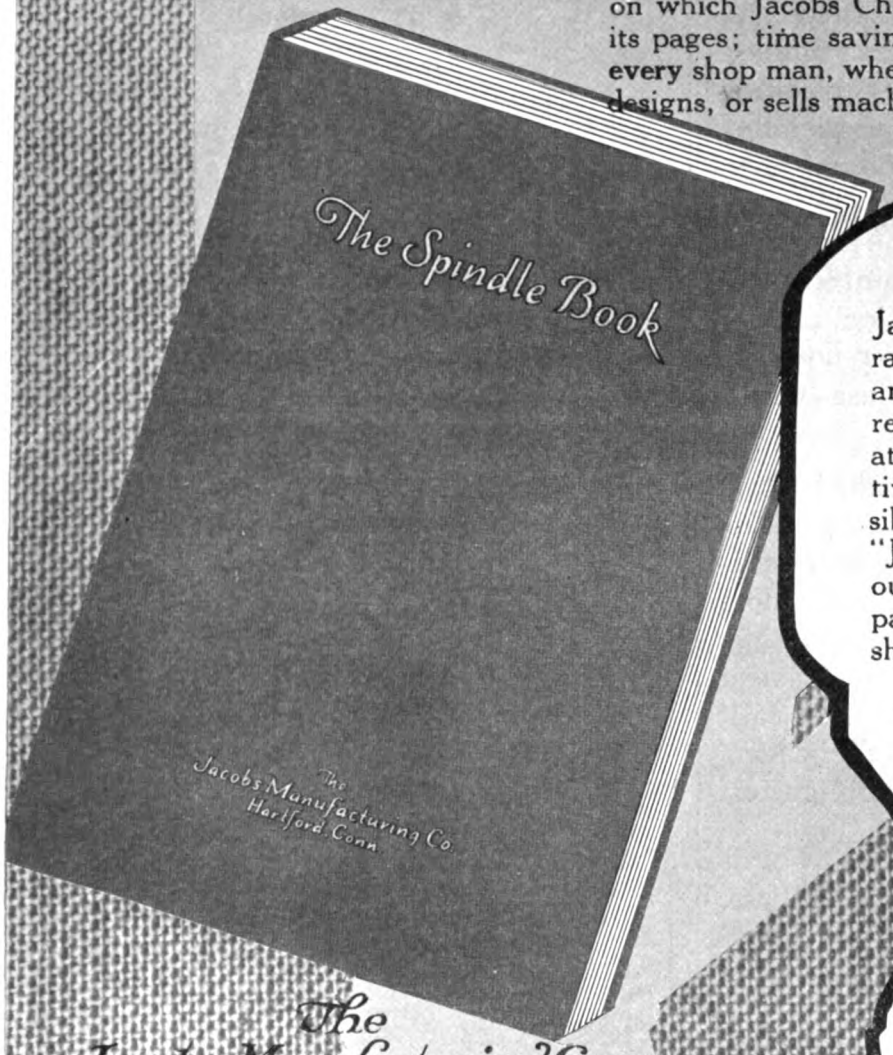
The third type is manually operated. One man is required to both load and control the skip lift of this type.

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Who Needs the Spindle Book?

Executive, Designer, Foreman, Operator, Salesman—practically every man in the plant, from president to apprentice, finds good use for the spindle book!

Information on every type of machine on which Jacobs Chucks are used is in its pages; time saving data of value to **every** shop man, whether he buys, uses, designs, or sells machines.



Jacobs Chucks — accurate, perfectly balanced and mechanically correct. The easily operated, quick acting, positive grip makes it possible to operate machines "Jacobs equipped" without danger of tool slippage or marred drill shanks.

Send for your copy of the Spindle Book today.

Jacobs Quality Chucks

The Jacobs Manufacturing Co.
Hartford, Conn.
The world's largest producers of "Drill Chucks"

COUPON

THE JACOBS MFG. CO., Hartford, Conn.
Please send me a copy of your new Spindle Book.

Name .....
Address .....
Firm ..... Position .....

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Old-time cleaning was good enough

—*in olden times*



With Oakite materials, one big railroad cuts locomotive paint stripping costs over 50%.



A canning plant saved $300 on one cleaning job alone.



A dairy gets better cleaning with 60 lbs. of OAKITE than with 300 lbs. of old cleaner.



An oil concern finds gasoline shows no discoloration after storage in tank cleaned with OAKITE.



At a paper mill, felts cleaned with OAKITE last six weeks instead of four as formerly.



A laundry owner attributes 10% increase in business to use of OAKITE in washing.

BUT today's needs demand today's methods. Obsolete practices are giving way. In industrial cleaning as in everything else.

There is no longer any place in industry for hit-or-miss cleaning. Nor is there any justification for it. Modern scientific Oakite cleaning methods have put cleaning on a sound, common-sense, economical basis. Industry has benefited through simplified handling, uninterrupted flow of production, better quality and greater uniformity of product, less waste, lower cost.

You, too, can benefit by taking advantage of our 18 years experience helping other concerns find better and more economical ways of cleaning. One of our service men is near you. Ask to have him call; or write for booklets bearing on your work. No obligation.

Oakite Service Men, cleaning specialists, are located at:—

Albany, Allentown, Pa., *Atlanta, Ga., Baltimore, *Boston, Bridgeport, *Brooklyn, Buffalo, Camden, Charlotte, N. C., *Chicago, *Cincinnati, *Cleveland, *Columbus, Ohio, *Dallas, *Davenport, *Dayton, *Denver, *Des Moines, *Detroit, Erie, Flint, Mich., Fresno, Cal., *Grand Rapids, Harrisburg, Hartford, *Indianapolis, Jacksonville, Fla., *Kansas City, *Los Angeles, Louisville, Ky., *Milwaukee, *Minneapolis, *Montreal, Newark, Newburgh, N. Y., New Haven, *New York, *Oakland, Cal., *Omaha, Neb., Philadelphia, *Pittsburgh, Portland, Me., *Portland, Ore., Providence, Reading, *Rochester, Rockford, Rock Island, *San Francisco, *Seattle, *St. Louis, South Bend, Ind., Springfield, Ill., Syracuse, *Toledo, *Toronto, *Tulsa, Okla., Utica, *Vancouver, B. C., Williamsport, Worcester.

*Stocks of Oakite Materials are carried in these cities.

OAKITE

TRADE MARK REG. U.S. PAT. OFF.

Industrial Cleaning Materials and Methods

OAKITE IS MANUFACTURED BY OAKITE PRODUCTS, INC.

formerly OAKLEY CHEMICAL CO. 40 THAMES ST., NEW YORK, N.Y.

When material in the pit is to be elevated, he loads the bucket by pulling a lever, which opens the unloading gate and permits material in the pit to pass into the bucket. When the bucket is full, he reverses the throw on the lever closing the gate, then by operating a controller, he starts the skip bucket elevating, and, as the bucket reaches the discharge position, he stops it. After material is discharged from the bucket, he reverses the controller, lowering the bucket to the pit and again stops it for reloading.

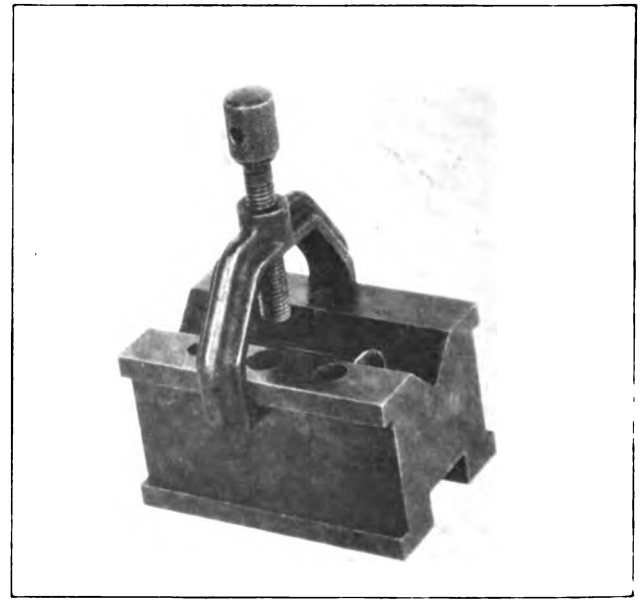
The loader used with the manually operated skip lift consists of a vertical undercut slide gate made of steel plate and runs in cast iron guides. It is operated by means of a lever located above the pit in a position where the operator is very easy to operate and very positive in its action.

The winding machine is the only piece of machinery used in connection with the skip lift. This is always placed in a position remote from dirt and grit and so located that it is readily accessible for oiling, etc.

A Handy Block and Clamp

ONE of the recent additions to the line of small tools manufactured by the Brown & Sharpe Mfg. Co., Providence, R. I., is a small handy block and clamp, especially useful for holding small circular or flat pieces while being milled, ground or drilled.

The block is 3 inches long and is very similar to an



ordinary V-block except that it has flanged sides to accommodate the clamp. In the side opposite the V is a rectangular slot for holding flat stock.

It will accommodate flat stock ¾ in. by 1¼ in. and round bars up to 1 in. diameter.

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6 Famous Names



Bulldog Grit

GRIT in the bulldog makes him the master of his kind. He sticks to tough tasks—and finishes.

That same factor makes the superior small tool.

TRADE MARK REG. U. S. PAT. OFF.

The CLEVELAND TWIST DRILL COMPANY CLEVELAND NEW YORK-CHICAGO-LONDON

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

TRADE MARK REG. U. S. PAT. OFF.

Manufacturers of

Carbon and Cle-Forge High Speed Drills for every purpose; "Mezzo" Super-Carbon Drills; Hand, Jobbers' and Shell Reamers; "Peerless" High Speed Reamers; "Paradox" Adjustable Reamers; "Quick-Set" Reamers; "Spirex" Machine Taper Pin Reamers; Chucking Reamers for Turret Lathes; Counterbores; Countersinks; Sockets; End Mills; and the "Ezy-Out" Screw Extractor.

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Unloads 2 Tons of Coal a Minute

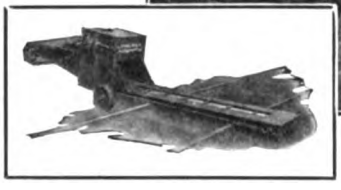
Just think what that would mean in your plant — how much lower your power costs would be!

That is why you need the new Chicago Automatic Model T. V. Truck Unloader. No shoveling—unloads a whole car of coal in an hour—no pits necessary. Only three inches high on the rail — goes under any car.

Chicago Automatic Conveyors have for years reduced coal handling costs in hundreds of industrial plants in the United States and Canada.

There's a Chicago Automatic Conveyor right in your neighborhood handling coal more economically year after year. Let us tell you about it.





"A few selected territories are still open for sales representatives. If interested, write for our proposition."

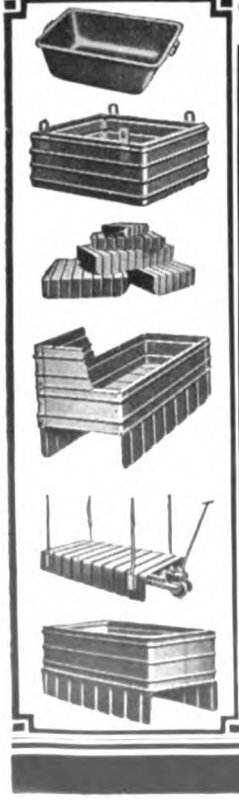
Branches in all principal cities

CHICAGO AUTOMATIC CONVEYOR CO.

Originators of the Portable Conveyor

982 Old Colony Building, CHICAGO, ILL.

POWELL
PRESSED STEEL
MATERIAL HANDLING EQUIPMENT



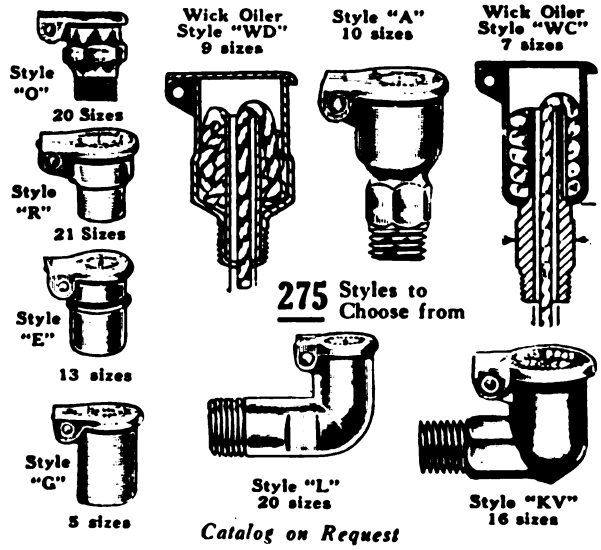
Your Handling Problems Greatly Simplified

POWELL Pressed Steel Handling Equipment offers untold opportunities to effect savings in cost and to speed up production in plants both large and small. Your material handling problems can be greatly simplified by using this efficient, modern equipment.

Let us send you complete illustrated literature and prices

The **POWELL**
PRESSED STEEL CO.
HUBBARD, OHIO
Suburb of Youngstown

GITS BROS.
Standard of Comparison
BETTER OILERS



275 Styles to Choose from

Catalog on Request

Gits Bros. Manufacturing Co.
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Chicago, Ill.

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EASTON
CONCRETE



Fig. 5477

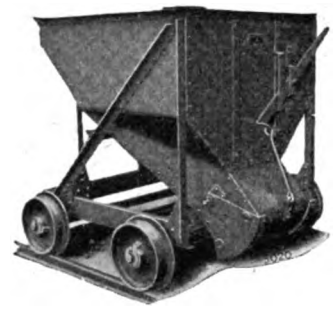


Fig. 5020

Side or end discharge.
Capacities 16 to 54 cubic feet.
Gauges 24" to 36".
The most economical method of distributing mixed concrete or other similar material.

EASTON CAR & CONSTRUCTION COMPANY

211 Scarritt Arcade, Kansas City, Mo.
Hilton St., Easton, Pa.

FOR EVERY INDUSTRIAL PURPOSE



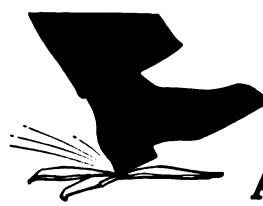
LIGHT!
where and when needed

The economy of an American System as compared with a flood light system is found in the fact that the light is placed exactly where needed, and it is used only when needed.

No flood lighting of great areas with the resultant shadows on the tools just where light is most needed—but light accurately placed which guarantees greater and better production.

Let us make a survey of your lighting needs—write today for booklets, or a representative's service, or both.

American Fixture Company
230 West Water Street **Milwaukee, Wis.**



slip!
A slip of the belt is no fault of the belt

TIGHTENING the belts does not prevent belt slip. This is a scientific fact. Cling-Surface preservative absolutely prevents slipping and enables you to run the belts slack, thereby increasing the arcs of contact, preventing hot-boxes, and often quadrupling the life of your belts. Besides, Cling-Surface prevents a large per cent. of shutdowns. The coupon represents an opportunity for you to effect large savings of power. In addition it will bring you the means of saving belts, machinery, fuel and money. Mail it today.

Cling-Surface — preserver of belts—has been made for thirty years by the only company whose sole product is belt treatment. It is used in every country of industrial importance in the world. It saves belts and machinery. It increases transmission efficiency and prevents all loss due to slipping.



CLING-SURFACE COMPANY
PRESERVES BELTS—ELIMINATES BELT SLIP

FREE 60 Day Return Privilege COUPON

Conditions in our plant are about as checked:

☐ cold ☐ hot
☐ damp ☐ dry
☐ dusty ☐ clean
☐ 3 gal. Tin at $3.40 gal.
☐ 6 gal. Tin at $3.25 gal.
F. O. B. nearest Warehouse.

Cling-Surface Co., 1056 Niagara St., Buffalo, N. Y.

Gentlemen: I am always willing to give a belt-saving, money-saving proposition a trial on its own merits. Send tin to fit conditions noted and of the size checked. If need be, I shall use the entire contents. If satisfactory I shall pay in 60 days. Otherwise no pay.

Company ..... Attention .....

Address II-12-26

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for steam-

The Armstrong is unequalled in service on steam. Thousands and thousands in use. No air-binding, no clogging, no steam waste, no scored valves. Positive in action.

for vacuum-

No thermostatic vents or other attachments are needed where the Armstrong discharges into a line in which a vacuum is maintained. The standard Armstrong is used. It will not air-bind.

for air-

The Armstrong is equally efficient for such service on air as draining water from intercoolers, aftercoolers, expansion tanks, separators, and drip pockets. No attachments are required.

for oil-

The Standard Armstrong is ideal for service on oil. This is because oil rises to the top of the trap. It does not interfere with trap operation.

—use the Armstrong trap

It will cost you just two cents to send in the coupon below and try out an Armstrong under your own conditions. No obligation.

Please ship prepaid an Armstrong for 90-day test. It is understood that when test is completed the trap is to be returned collect.

For service on .....

Size of pipe connections .....

Steam pressure.....**(Do not neglect to state maximum)**

Firm .....

Address .....

.....

Signed ..... **position** .....

☐ **Send the catalog only; send no trap**

Mail to Armstrong Machine Works
326 Maple Street, Three Rivers, Michigan
District representative in 36 cities

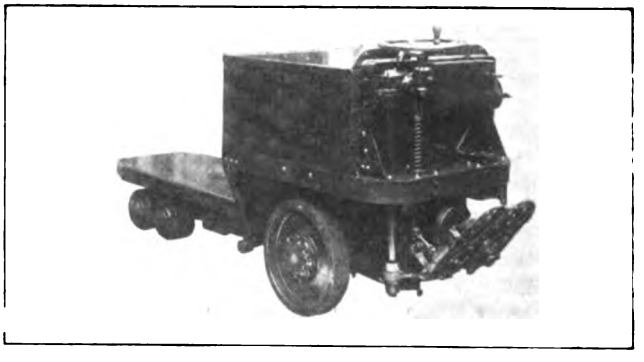
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A New Development in Lift Trucks

TO facilitate the handling of larger quantities of materials by lift trucks the Elwell-Parker Electric Co., of Cleveland, has introduced a new development in mill type elevating platform trucks, of 5 tons capacity. This new unit has a platform 27½ x 60 x 11 inches with special compartments arranged to accommodate up to a 30A8 or 18 cell 21 plate Ironclad battery in place of the Edison cells formerly used.

Heavy steel plate with the edges bent downward into a deep flange and welded at the corners forms the platform. The end is tapered with the upper corners rounded to assure easy entrance of skid without damage. Reinforcement provided for the platform consists of heavy angles at the rear, where the jack ram is connected; channel where the taper begins, and two intermediate reinforcing bars. The front link bearing casting meets the cross reinforcing bars over the trailing axle, and extra heavy lift links fitted with renewable hardened and ground pressure lubricated bushings are used. Because of the increased capacity of the new "Tructor," as it is called, the lift unit is heavier and is located between the propelling power plant and the platform.

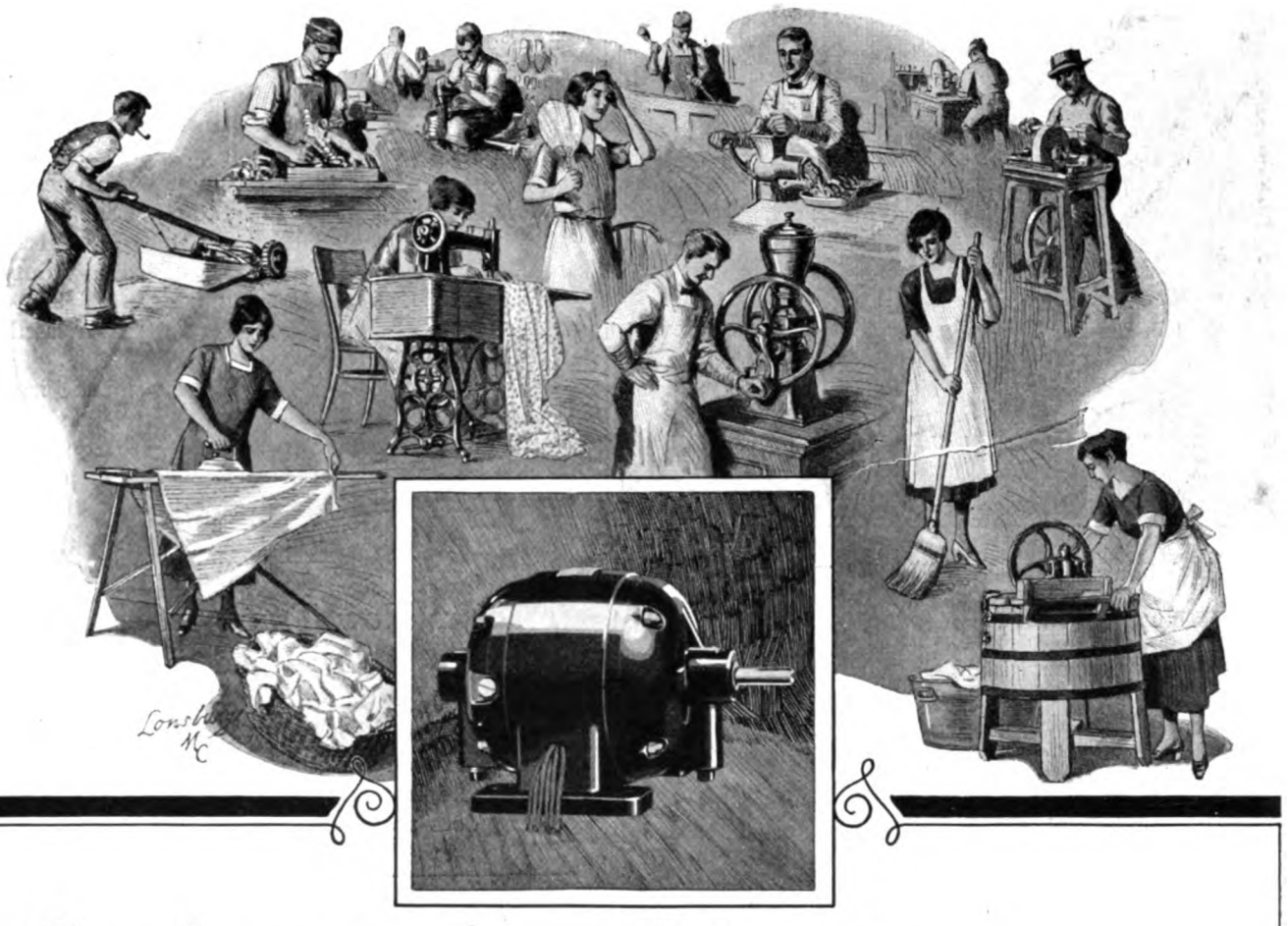
Naturally in transporting a heavier load the bulk of the increased capacity is imposed on trail axle. Consequently to facilitate the employment of this unit with 11½ inch high skids already in use it has been necessary to add two more wheels with tires and bearings for the distribution of the weight, as tire diameter and tread could not well be increased. This new type of cluster wheel or tandem axle is unique in design when consideration is given the fact that all four wheels steer simultaneously, all levers are over the axle and none are exposed either below or behind the axle.



The two wheel axles are really one steel casting with heavier cross pin bearings in a special steel casting, anchored to the "Tructor" center sills. In traveling over uneven floors the axle may rock. The design and construction is simple and practical with all operating parts protected against accidents which would render them inoperative. Each of the four wheels is fitted with a 10 x 6 inch tire and dust proof double roller bearing.

Steering is by means of a 16-inch horizontal hand wheel at the left of the operator. The left switch is of the drum type with four fingers interchangeable with those in the main controller and fitted with reversible tips. This switch, located beneath the battery on the left of the truck, is tripped by means of a rod attached to the platform near the ram connection. Adjustment for

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Industry's Biggest "Little Thing"

Gone are the mazes of belts and shafts that made jungles of our factories. Gone—or going—is the day of hand-power in household and industrial tasks.

Individual electric motors, fractional horsepower motors, have come into their own—the biggest "little thing" in business—speeding up processes, cutting costs, increasing output, banishing irksome domestic duties, extending the benefits of time and labor-saving appliances to more millions every year.



For protection from overload — the Domestic Automatic Safety Switch

In opening up new and profitable fields for manufacturers and dealers, to the benefit of the public, Domestic Electric motors have rendered a unique and spectacular service. Every Domestic motor is specifically engineered and built for the purpose it is to serve; every Domestic motor is a special motor; every Domestic representative is a consulting expert—without the expected price penalty. Details of a service and policy exclusive to this company will interest every builder and distributor of electrical appliances.

A request will promptly bring this information.

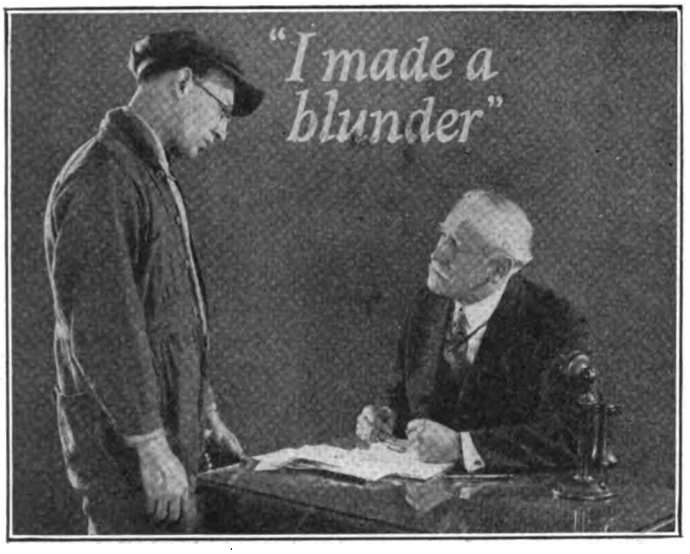
THE DOMESTIC ELECTRIC COMPANY (84)

7209-25 St. Clair Ave. Cleveland, Ohio

Manufacturers of fractional horsepower motors exclusively

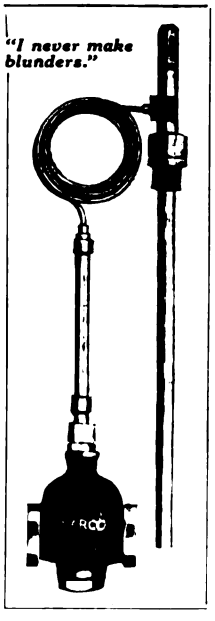
Domestic Electric Motors

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In a trembling voice, he confessed to the "big boss" that he had made a costly blunder. In a moment of forgetfulness he had allowed the temperature to get out of bounds in an important heat-treat process.

Every day, all over the country, mistakes of this kind occur sometimes running into the thousands, simply because the management tries to make men do the work of a machine, instead of putting the men on more important work. Mistakes of this kind cannot occur when temperatures are controlled by the infallible



SARCO

Temperature Regulator

Don't wait until it is too late. Don't procrastinate until the inevitable happens. Wherever uniform temperatures must be maintained, let the Sarco stand guard against excessive temperature variations and losses resulting therefrom.

In processes where excess of heat is not of itself detrimental, the Sarco makes big steam savings possible through close regulation.

Simplicity of principle and construction is the chief feature of the Sarco Temperature Regulator. It is entirely self-contained and does not depend upon auxiliary apparatus of any kind for its operation. A simple, practical, durable thermostatic device that quickly proves itself to be one of the most profitable investments you have ever made in plant equipment.

Operates on gas, steam or hot water heat within a range of 30 degrees to 300 degrees F.

To skeptics, we offer the Sarco on Thirty Days' Free Trial without obligation. Write for full particulars and Booklet R-95.

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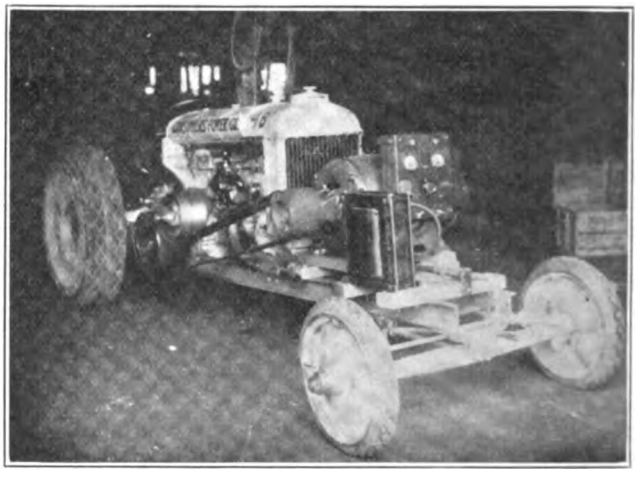
the trip is beneath the battery deck and is accessible from the side.

A heavy duty type controller with reverse drum that remains locked in off position until the operator steps on one pedal is used. All fingers and tips are interchangeable and the tips are reversible. The main drum and reverse drum return to off position when operator releases or steps off truck pedals and the brake remains set until operator's weight depresses brake pedal against spring. The power plant consists of a heavy duty type fully enclosed motor with all moving parts between it and the drive wheels of drop forged heat treated alloy steel.

With the use of this new lift type truck iron and steel, foundry and mill raw materials and finished products may now be stored and handled in large units outside of crane covered areas. The short turning radius also permits its use in narrow aisles in cars or elevators.

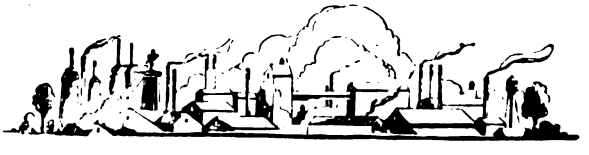
Tractors Now Transport and Drive Arc Welders

A NEW development in electric arc welding equipment is the assembly of General Electric gas engine driven welders on Fordson tractors for portable use at points remote from power lines. The General Electric Company does not market the complete outfit.



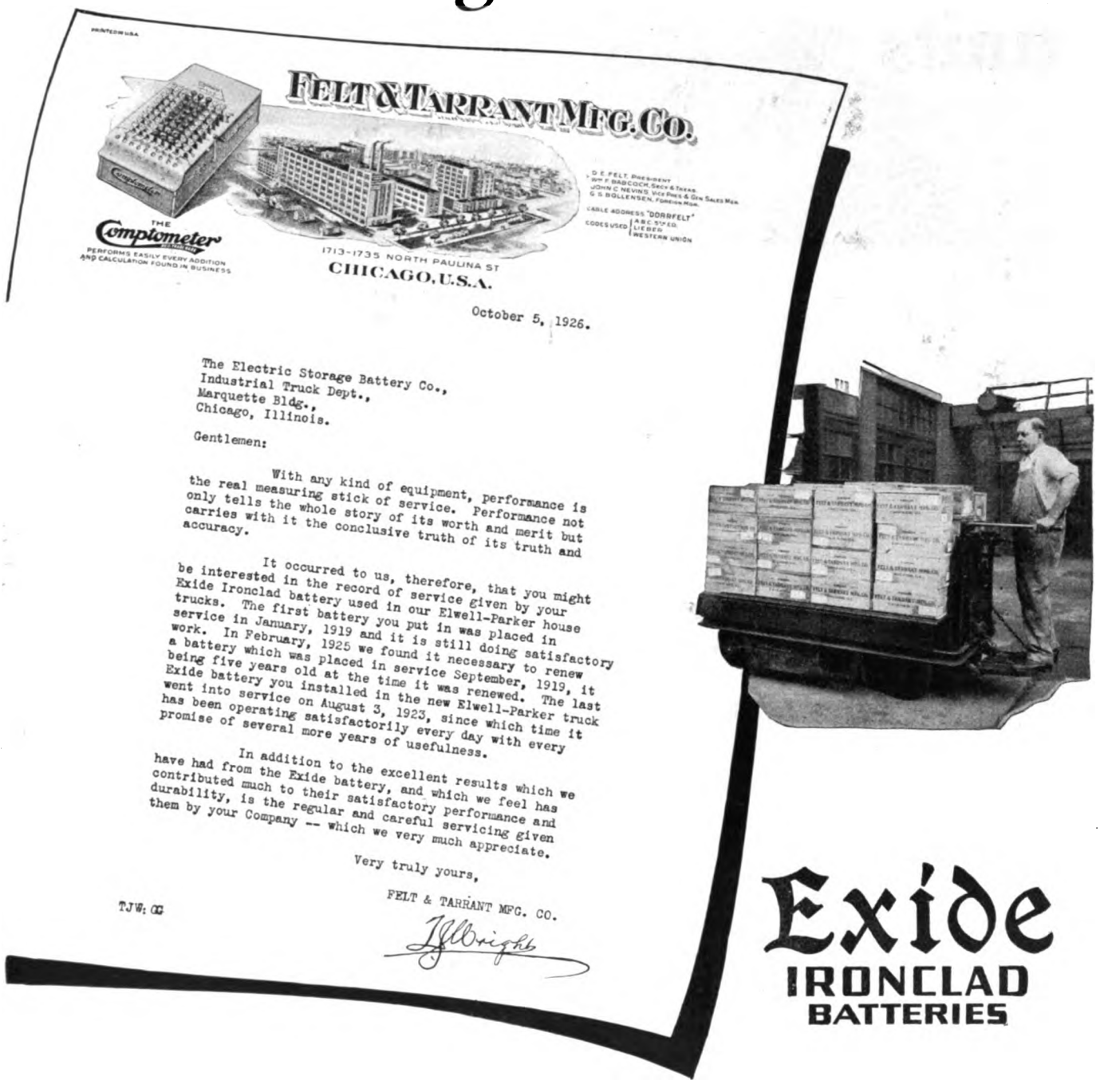
In such a combination, the same gas engine drives both the tractor and the generator which supplies the current for the welding electrodes. The tractor is equipped with rubber tires and can be driven to the job at a speed of from 15 to 18 miles an hour. The belt is then connected to the generator and the outfit is ready for performing welding operations.

Such equipment would be useful to welding contractors, boiler shops, marine repair shops, structural field contractors, oil well drilling companies, oil refineries, pipe line owners and tank builders for field work.



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"Performance is the real measuring stick of service!"



FELT & TARRANT MFG. CO.

1713-1735 NORTH PAULINA ST
CHICAGO, U.S.A.

October 5, 1926.

The Electric Storage Battery Co.,
Industrial Truck Dept.,
Marquette Bldg.,
Chicago, Illinois.

Gentlemen:

With any kind of equipment, performance is the real measuring stick of service. Performance not only tells the whole story of its worth and merit but carries with it the conclusive truth of its truth and accuracy.

It occurred to us, therefore, that you might be interested in the record of service given by your Exide Ironclad battery used in our Elwell-Parker house trucks. The first battery you put in was placed in service in January, 1919 and it is still doing satisfactory work. In February, 1925 we found it necessary to renew a battery which was placed in service September, 1919, it being five years old at the time it was renewed. The last Exide battery you installed in the new Elwell-Parker truck went into service on August 3, 1923, since which time it has been operating satisfactorily every day with every promise of several more years of usefulness.

In addition to the excellent results which we have had from the Exide battery, and which we feel has contributed much to their satisfactory performance and durability, is the regular and careful servicing given them by your Company -- which we very much appreciate.

Very truly yours,

FELT & TARRANT MFG. CO.

TJW: CC

Exide
IRONCLAD
BATTERIES

The performance of Exide-Ironclad Batteries receives another striking tribute

IT is impressive when a prominent electric industrial truck user speaks in such glowing terms of the performance of Exide-Ironclad Batteries. Yet the Felt & Tarrant Mfg. Co. is only one of the hundreds of firms that have discovered what the dependability and long life of Exide-Ironclad Batteries can do to lower material-handling costs.

It will pay you to know all about this remarkably dependable battery. Write now for a copy of our booklet, "Facts for consideration in selecting a Storage Battery," form number 2865.

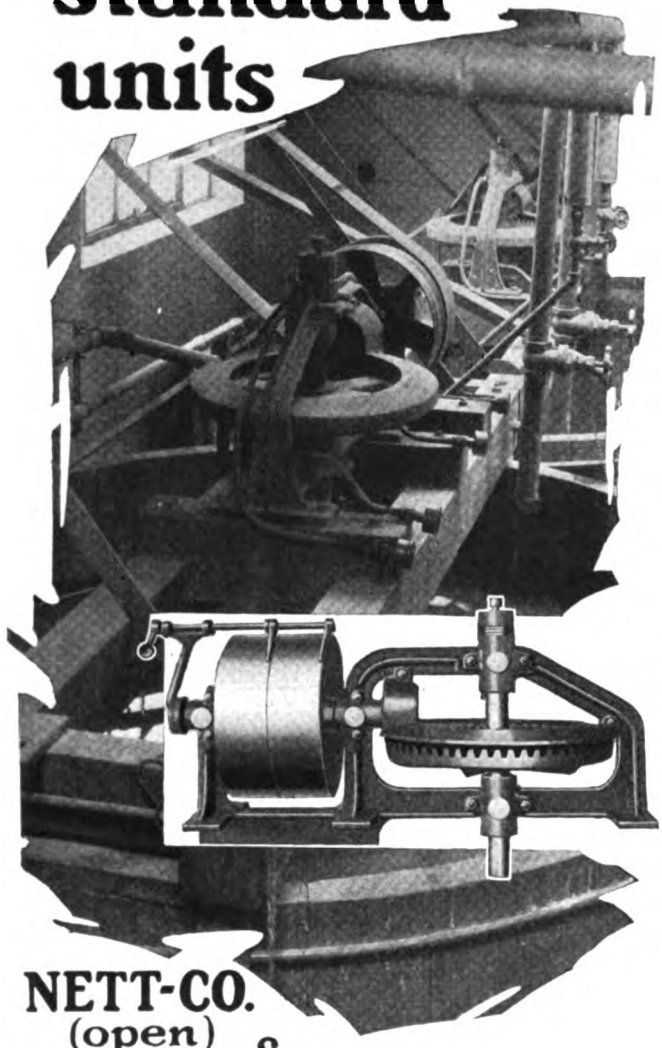
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adaptable standard units



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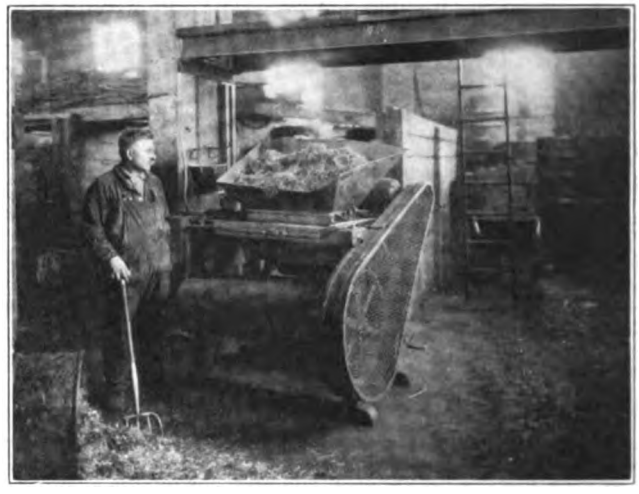
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Separating Monel Metal Turnings from Iron and Steel

BY the use of a magnetic device for separating iron and steel from monel turnings when mixed, the General Electric plant at Schenectady was able to save approximately $20,000 annually in the disposal of its scrap.



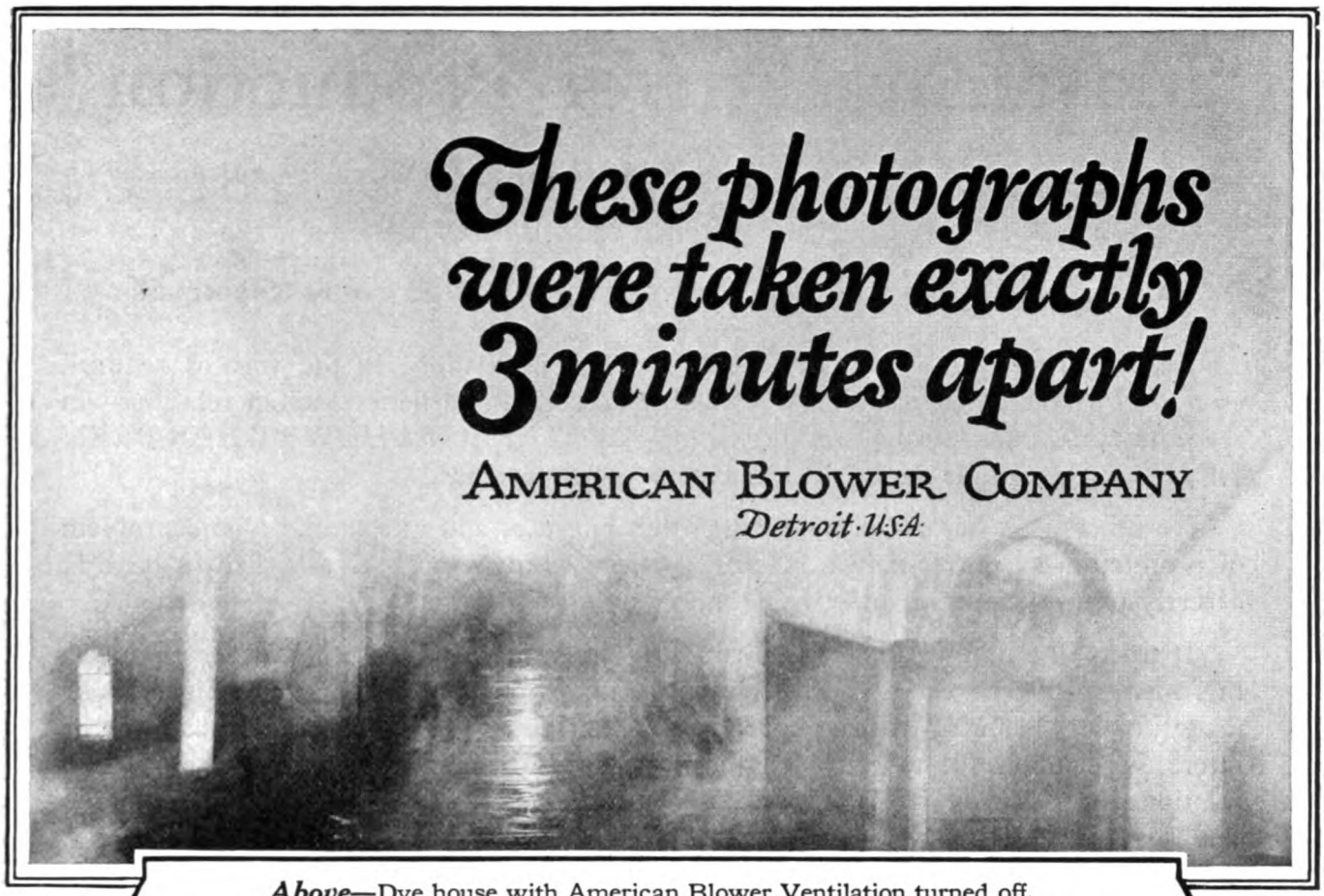
Approximately 70 gross tons of mixed metal turnings were scrapped each year, as no method was known of separating the high-value monel from the lower-value iron and steel. Mixed metal turnings were sold for an average price of $15 a gross ton, while clean monel metal turnings brought approximately $300 a gross ton.

Many methods of separating the two kinds of scrap had been tried without success, including the use of magnetism. The magnetic method was not successful because the monel metal was also picked up by the magnet. Finally, by using a rheostat on the magnetic separator and reducing the current to a minimum, a point was reached where the iron and steel were picked up and the monel metal dropped.



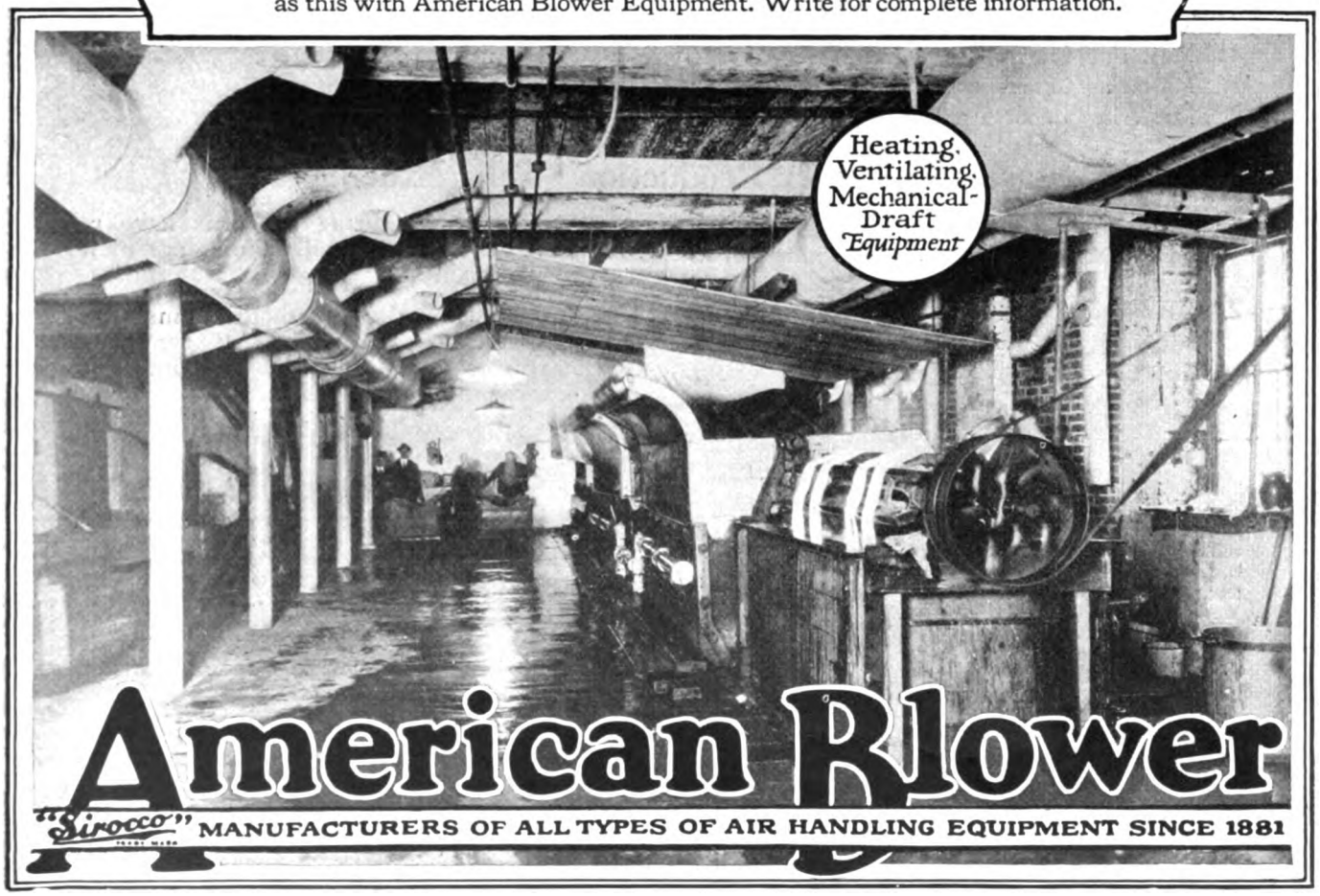
During the cold weather a clean separation was difficult because of oil congealing on the turnings and holding the two metals together. One of the plant workmen suggested that the turnings be dried on large steel plates with fires beneath. This was tried and was found to be successful.

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Above—Dye house with American Blower Ventilation turned off.
Below—Same room exactly 3 minutes after starting American Blower Ventilating Equipment. Your ventilation can be cared for as easily, quickly, and efficiently as this with American Blower Equipment. Write for complete information.

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"Mastering Power Production"

A Most Unusual Book

By Walter N. Polakov

455 pages—138 illustrations **Red cloth—$5 postpaid**

"Mastering Power Production" shows what can be done in the way of reduced costs, more efficient operation, expanded production and better human relations—in the power plant and throughout the factory—BY TELLING HOW IT HAS BEEN DONE in the author's own extended personal experience.

No other book has ever been written that analyzes and attacks the whole problem of production by power-driven machinery from so many angles—all of them bearing directly on the conditions now confronting industry.

It treats in a unique, thoroughly readable, intensely practical manner the engineering, managerial and economic fundamentals underlying the better uses which can be made in every plant of existing equipment, materials and personnel, and as such will be interesting and useful to every engineer, manager, economist and student of human relations.

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Index.

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3. **Many manufacturing concerns have reduced their power bill to one-half of its former figure.**
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The Author

has served the New Haven Railroad as superintendent of power; the Board of Estimates and Apportionments of the City of New York as expert engineer for municipal plants; and, during the war, the United States Shipping Board Emergency Fleet as power expert. In the public utility field he established a record for economical operation, both on electric railways and in central stations, his pioneer work for the Penn Central Light and Power Company particularly receiving much attention.

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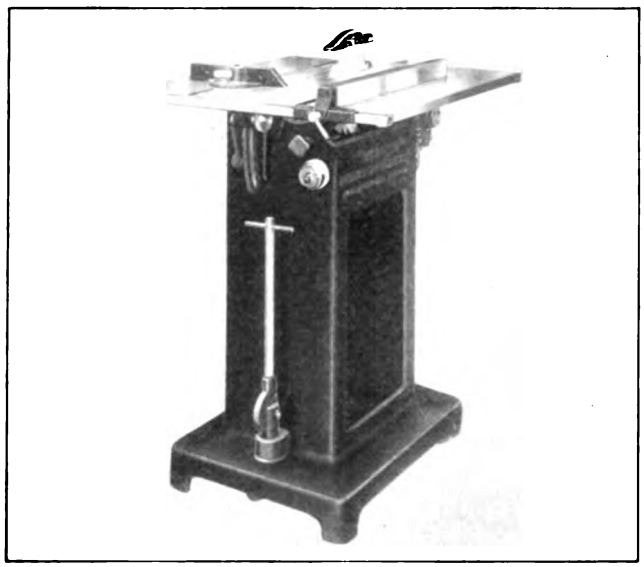
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A Portable Universal Saw

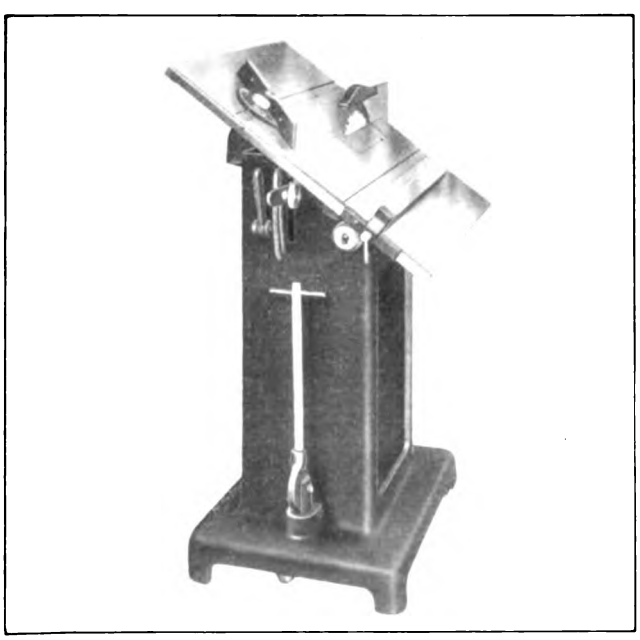
GALLMEYER & LIVINGSTON CO., Grand Rapids, Mich., have recently added to their line the portable saw illustrated here.

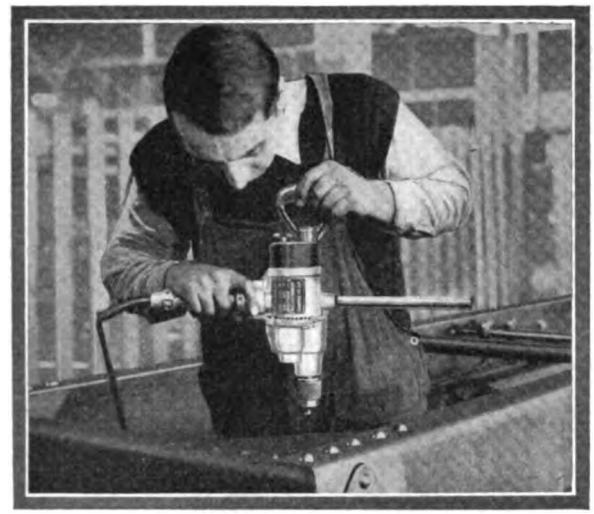
This portable floor type machine is claimed to combine all the advantages of the portable bench machine with the additional advantage of having a rigid cast iron pedestal in place of the ordinary work bench. This pedestal provides not only a convenient operation position when the saw is in use but a convenient means of moving it out of the way when not needed. Two rollers at the back and two stationary feet at the front of the base give a firm setting on the floor when in operation.



When the handle is pulled forward in a position for moving the machine a cam automatically raises the feet from the floor and brings the weight of the front of the machine onto a third roller, which is carried on a swivel bearing moving with the handle.

The motor and all working parts are built into the upper portion of the machine so as to afford a thoroughly self-contained outfit. The upper part of the machine can





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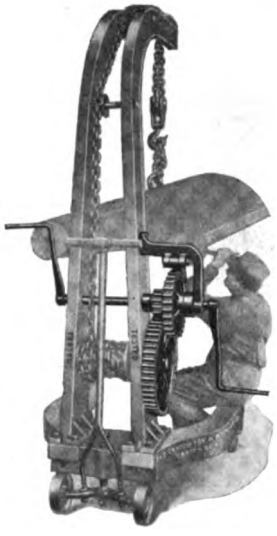
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Does the work of six men, and in less time, too



The "Canton" Portable Crane, known as the "Handiest Tool in the Shop," is indispensable for the quick and economical handling of those heavy and awkward loads. It's an easily handled Hoist that goes quickly to parts of your shop where nothing else can reach.

Those who are using it tell us this "Handy Tool" does away with the six and eight man job—it saves them no end of time and labor—and that they wouldn't be without it for many times the cost.

These Cranes are made in various sizes and capacities and when desired, can now be furnished with the NEW SAFETY FRICTION LOAD BRAKE shown on illustration.

Shipped on thirty days' trial.
All good jobbers handle them.
Write for price and descriptive catalog IN.

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PERMANENCE



Ruggedness—long life—ability to "stand the gaff"—*permanence* - - - these are some of the Master Standards of Quality built in *every* MASTER GUARANTEED MOTOR. Included in these motors are many other characteristics which cause an ever-increasing number of leading appliance manufacturers and jobbers to use them.



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MASTER GUARANTEED MOTORS

⅛ TO 7½ H.P. Dayton THE MASTER ELECTRIC CO. Ohio Less than 40°

be removed from the pedestal and used as a bench type machine should occasion demand.

The new Union Portable Universal Saw can be supplied with either a ½-hp. repulsion induction type motor to operate from lamp socket or with a 1-hp. repulsion induction type motor to operate from power line. When equipped with a power line motor and 8" diameter saw, the machine will handle stock up to 12" wide by 2½" thick.

The repulsion induction type motor is belted to the saw arbor.

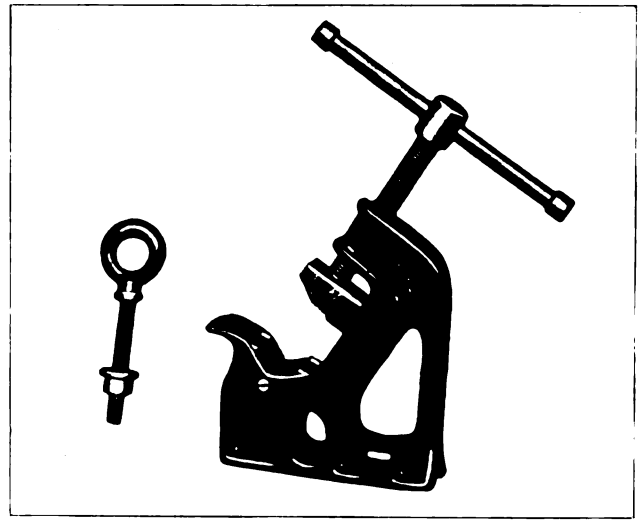
The table is a solid one-piece casting 25 x 26" fitted with removabe throat plate to allow for the use of dado heads, cope heads, grooving saws, etc. The saw can be raised and lowered from flush with the table to 2½" above the table, making it possible to cut 2½" stock.

A Quick Acting Pipe Vise

THE Oster Manufacturing Company of Cleveland, Ohio, announces a new inclined side opening pipe vise which grips and releases the pipe with one turn of the handle and is said to require less than half the time of the old type hinged vise.

It is equipped with oil tempered, tool steel jaws designed to grip the pipe securely without danger of squeezing it out of round.

A special chain and clamp for fastening the vise to a



post are furnished for use where it is not possible to bolt the vise to work bench. Another useful accessory is a special eye bolt for pipe bending.

This new vise has an unusually wide range of ⅛ to 2½ inch pipe, the jaws opening wide enough to accommodate a 2 inch coupling so that short nipples can be handled.



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"HALLOWELL" ALL-STEEL Factory Equipment



ready-made work benches

HERE you see a "Hallowell" All-Steel work bench that needs no carpenter's costly time. It won't splinter. It can't burn. It's far ahead of any wooden bench for wearing qualities. All-Steel Benches come in various sizes to fit every factory need and they are always in stock so you can have them when you want them and in any number, too!

IF you prefer wooden tops—"Hallowell" Steel Bench Legs are at your service. They save time and a lot of money. No bench can get wobbly when built on "Hallowell" Steel Legs. Our all-steel tables, Steel Bench Drawers, with or without locks, or Steel Tool Stands, mounted on casters might be just what you are looking for.

WRITE today for our special folder that gives complete description of these various items and illustrates our All-Steel Benches, too! At the same time, we'll be glad to send you our complete factory equipment catalog.

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Manufacturers' Bulletins and Catalogs

Helpful new literature for the man who selects and directs industrial equipment

Festooning Machines

An illustrated bulletin which explains modern methods of festooning by mechanical means and describes the new types of machines for this work has been issued by the John Waldron Corp., New Brunswick, N. J.

Handbook for Drillers

A 47-page booklet describing and illustrating parts of and the grinding of a twist drill, has been issued in the form of a Handbook for Drillers by The Cleveland Twist Drill Co., Cleveland, Ohio.

"From Plans to Pour"

is the title of a 36-page booklet, which is a treatise on Austin complete foundry service which embraces industrial reports and appraisals, financing, plant layout, design, construction, foundry equipment and its installation. This booklet has been issued by The Austin Co., Cleveland, Ohio.

Worm Reduction Gear, Helical Gears and Pumps

Three booklets, illustrating and describing De Laval Worm Reduction Gear with Pressure Oiling System, De Laval Helical Gears, and De Laval Pumps for Cleveland (Fairmount Pumping Station), have been issued by the De Laval Steam Turbine Co., Trenton, N. J.

Optical Pyrometer

The H-K Optical Pyrometer is described and illustrated in Bulletin 293, which has been issued by the Bacharach Industrial Instrument Co., 7000 Bennett St., Pittsburgh, Pa.

Spiral Flute Expansion Reamer

A circular illustrating and describing the Morse No. 717 Spiral Flute Expansion Reamer has been issued by the Morse Twist Drill & Machine Co., New Bedford, Mass.

Oil and Gas Burners

Rockwell Oil and Gas Burners for Industrial Heating Furnaces are illustrated and described in Bulletin No. 270, which has been issued by the W. S. Rockwell Co., 50 Church St., New York.

Electric Traveling Cranes and Hoists

Catalog No. 100 containing 52 pages of illustrations and description of Milwaukee Electric Traveling Cranes and Hoists has been issued by the Milwaukee Electric Crane and Mfg. Corp., of Milwaukee, Wis.

Bitulumin

A 30-page booklet, containing 77 questions and answers on Bitulumin and other Aluminum Paints and Metal Primers, has been issued by Hill, Hubbell & Co., San Francisco, Calif.

Chains and Sprockets

Catalog No. 46, containing 96 pages of illustrations and description of Webster Quality Chains and Sprockets, has been issued by the Webster Mfg. Co., Chicago, Ill.

Right Angle Drives

A small booklet containing detailed information with prices of standardized worm, miter, bevel, and spiral gears, has been issued by the Boston Gear Works Sales Co., Norfolk Downs, Mass.

Lubrication of Electric Cranes and Hoists

Bulletin No. 98, containing 16 pages illustrated with elaborate phantom views explaining the entire lubricating needs of the mechanisms involved in Shepard Electric Cranes and Hoists, has been issued by the Shepard Electric Crane & Hoist Co., Montour Falls, N. Y.

Concrete Floor Treatments and Waterproofing and Dampproofing

Folders 1 and 2 containing data and specifications on Master Builders Hardened Concrete Floors, etc., and on Master Builders Waterproofings and Dampproofings, respectively, have been issued by The Master Builders Co., Cleveland, Ohio.

Pneumatic Tools

A handbook of 107 pages showing the principal uses of pneumatic tools in railway shops, and the sizes of tools found best adapted for the different operations, has been issued by the Ingersoll-Rand Co., 11 Broadway, New York.

Models

Schumann Models are described in an illustrated circular which has been issued by Paul F. Hermann, Keenan Bldg., Pittsburgh, Pa. Mr. Hermann is sole distributor for these models in the U. S. A. and Canada.

Cylindrical Grinding Machines

Several booklets illustrating and describing Norton Cylindrical Grinding Machines of the Power Traverse, Hand Traverse, Special Purpose and Multipurpose Types, have been issued by the Norton Co., Worcester, Mass.

Another booklet issued by this company is entitled "Flexible Grinding and Polishing of Metals."

Baby Conoidal Fans and Electric Blowers

Catalog No. 475 illustrating and describing Buffalo Baby Conoidal Fans, and Form 2386 describing Buffalo Electric Blowers, Type "FB" Variable and Constant Speed, have been issued by the Buffalo Forge Co., Buffalo, N. Y.

Variable Speed Blower

Bulletin 36 illustrating and describing the Wing Type E M Variable Speed Blower has been issued by the L. J. Wing Mfg. Co., 352-362 West 13th St., New York.

Garage Unit for Heating and Ventilating

An illustrated folder describing the York Garage Unit for Heating and Ventilating has been issued by the York Heating & Ventilating Corp., 1502 Locust St., Philadelphia, Pa.

Control of Combustion

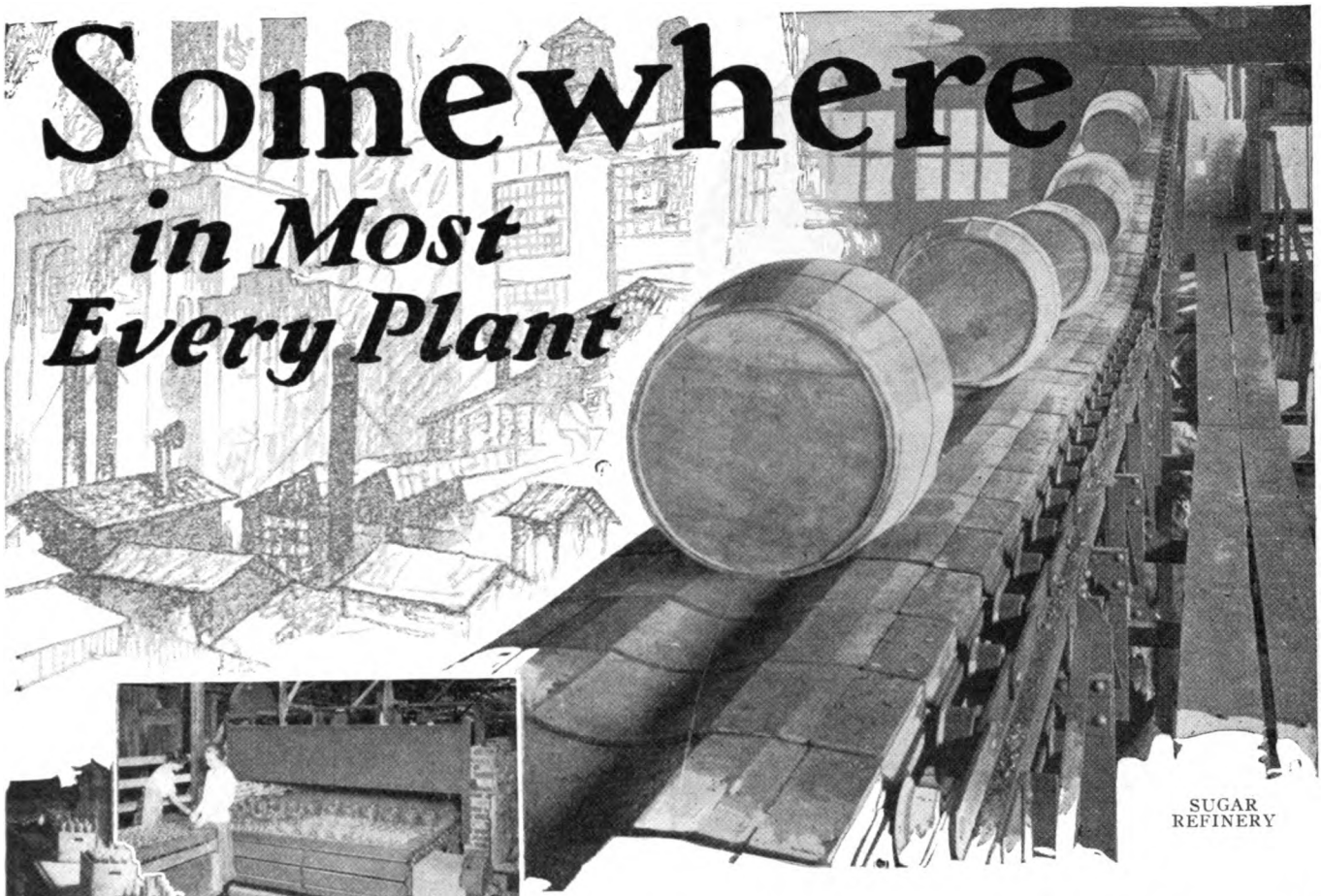
Smoot Control of Combustion for Traveling Grate Stoker Fired Boilers is described and illustrated in Bulletin 28, which has been issued by the Smoot Engineering Corp., 136 Liberty St., New York.

"The Gospel of Fresh Air"

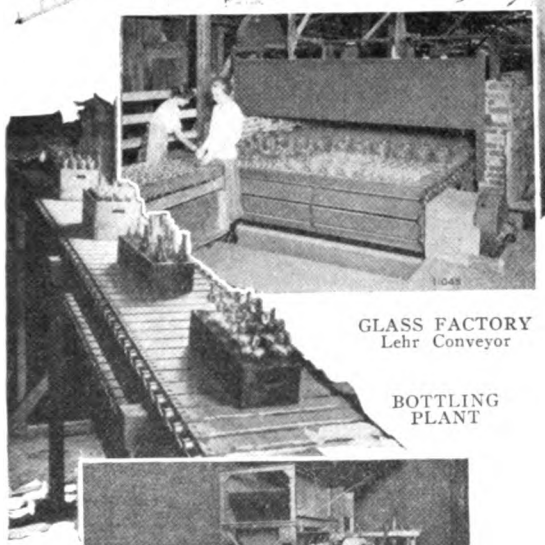
is the title of a booklet which illustrates and describes Swartwout Rotary Ball Bearing Ventilators, and which has been issued by The Swartwout Co., Cleveland, Ohio.

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Somewhere in Most Every Plant

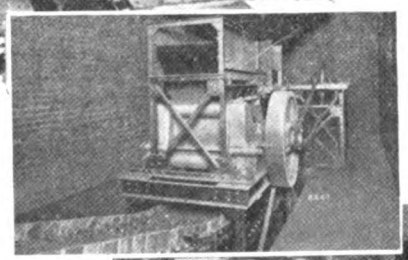


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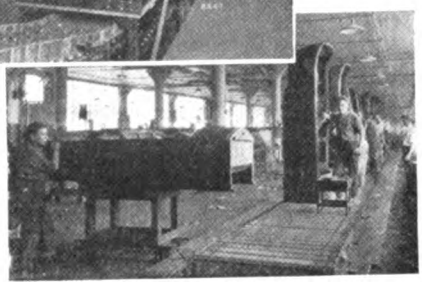


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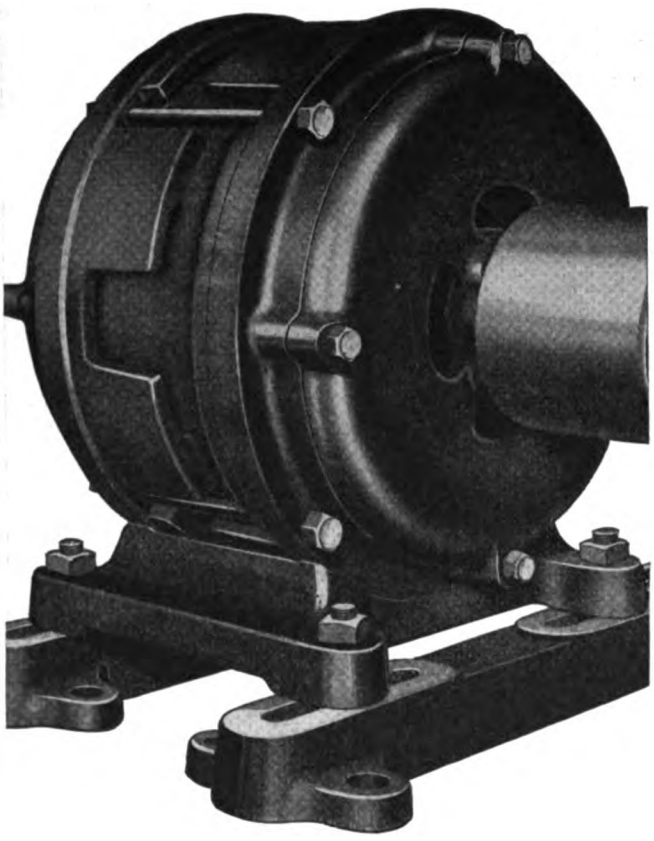
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Valley

Pipe Tools and Machines

A 48-page illustrated booklet with thumb index, describing Oster Pipe Tools and Machines, has been issued by the Oster Mfg. Co., Cleveland, Ohio.

Portable Electric Pipe Machine

The Red-E-Hall Portable Electric Pipe Machine is described and illustrated in a 12-page booklet issued by Hall-Will, Inc., Erie, Pa. Price List has also been issued.

Stop and Check Valves

The Jenkins Automatic Equalizing Stop and Check (Non-Return) Valve is illustrated and described is a folder issued by Jenkins Bros., 80 White St., New York.

Motors

A small booklet entitled "Brass Tacks About Small Motors" has been issued by The Master Electric Co., Linden & Master Aves., Dayton, Ohio.

Cycloidal Vacuum Pumps

Cycloidal Vacuum Pumps with two-lobed impellers for suction rolls, flat boxes, dryers, etc., are described and illustrated in 8-page Bulletin 20B, which has been issued by the Connersville Blower Co., Connersville, Ind.

Multi-Stage Centrifugal Pumps

Bulletin No. 602, containing 12 pages of illustrations and description of Multi-Stage Centrifugal Pumps has been issued by the Dean Hill Pump Co., Anderson, Ind.

Turret Lathe

A 32-page illustrated catalog describing the new 3-A Turret Lathe has been issued by the manufacturers, The Warner & Swasey Co., of Cleveland, Ohio.

Stator Construction and Field Windings

An illustrated circular describing the Stator Construction and Field Windings of the Century Squirrel-Cage Induction Polyphase Motor, has been issued by the Century Electric Co., St. Louis, Mo.

Lubricating System

The Alemite-Zerk Industrial Lubricating System is described in an illustrated folder, which has been issued by The Bassick Mfg. Co., 2650 N. Crawford Ave., Chicago, Ill.

Diesel Engines

Bulletin No. 1010, containing 36 pages of illustrations and description of Fairbanks-Morse Diesel Engines, which includes an analysis of the various factors which affect the cost of power, such as fuel cost, operating labor, maintenance, etc., has been issued by Fairbanks, Morse & Co., of Chicago, Ill.

Boiler Feed Water Regulation

An illustrated bulletin which describes the Campbell Boiler Feed Water Regulator has been issued by the Atlas Valve Co., 282 South St., Newark, N. J.

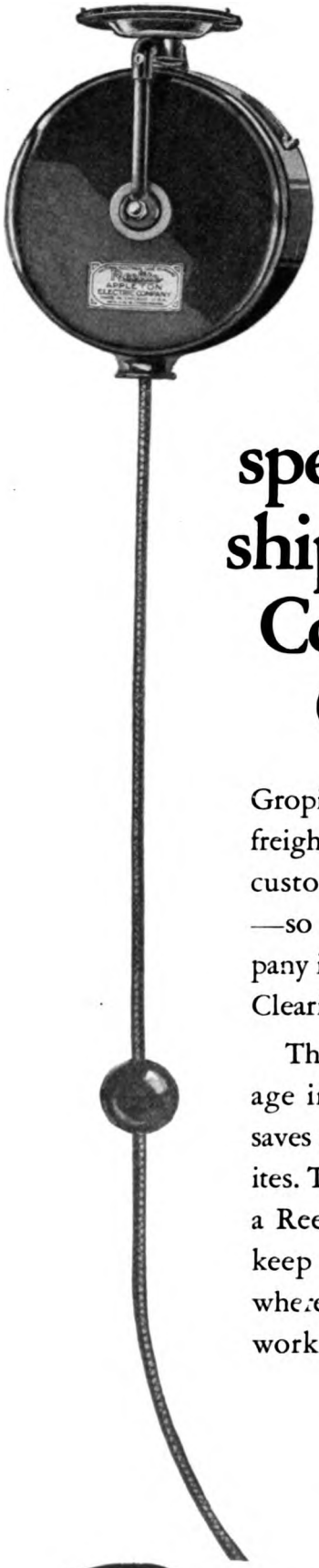
Cadmium

A 12-page booklet which deals with Cadmium and its properties and tells why it prevents rust, has been issued by the Udylite Process Co., Kokomo, Ind.

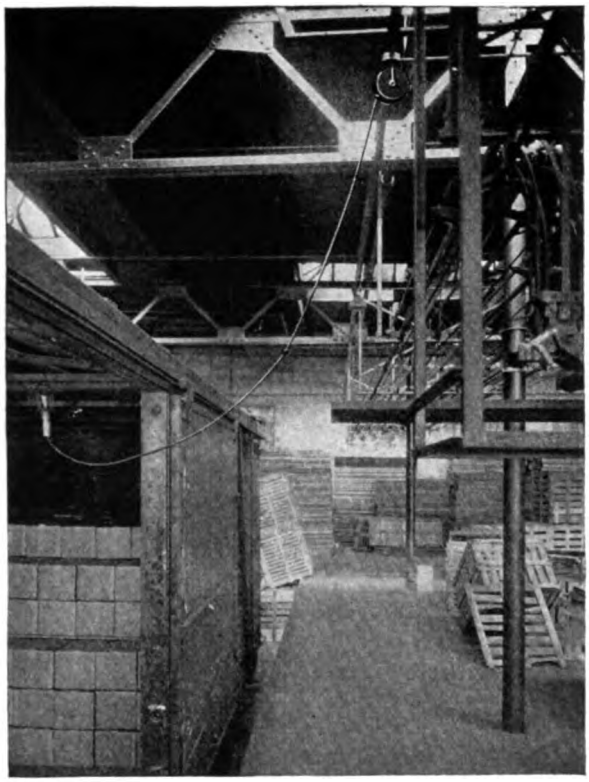
Tanks for Fire Protection

A 24-page illustrated booklet describing Horton Tanks for Sprinkler Service and General Fire Protection has been issued by the Chicago Bridge and Iron Works, 37 West Van Buren St., Chicago, Ill.

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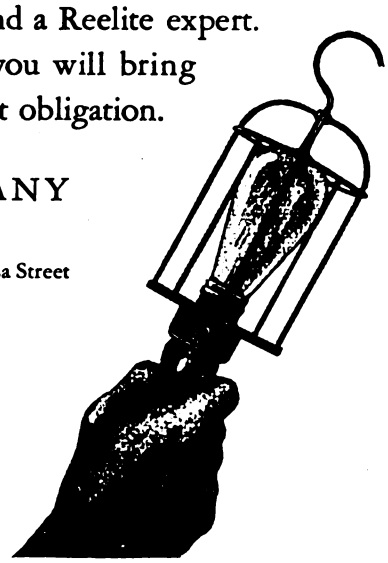
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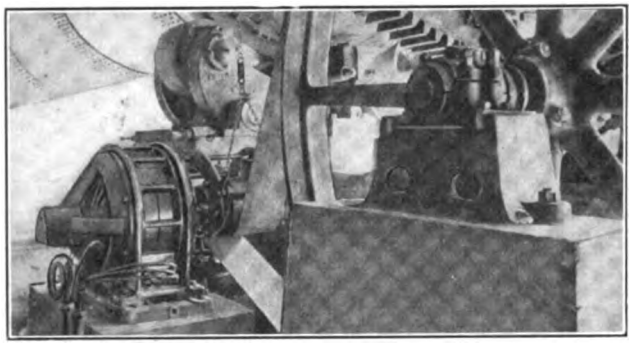
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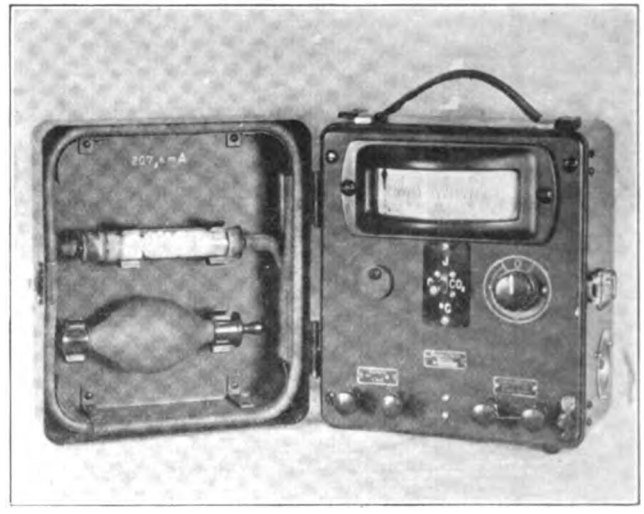
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A Portable CO_2 Meter

A NEW type of portable CO_2 meter has been recently introduced by the Bacharach Instrument Co., of Pittsburgh. The instrument consists of a precision profile indicator at the top, below which is arranged from left to right, the bridge zero adjuster, a tumble switch and the variable resistance for current adjustment. To set the proper bridge current, the tumble switch is thrown into the upper position, this cuts the precision indicator into the circuit as an ammeter and the current is set to the top mark deflection by means of the variable resistor. Three standard dry cells are used as the current source and are connected to the two binding posts in the lower left hand corner. When making temperature measurements, the tumble switch is thrown into the downward position, any standard thermocouple can be connected to the lower right hand terminals and the reading made on the millivolt scale. By means of a millivolt-temperature curve the temperature is determined.



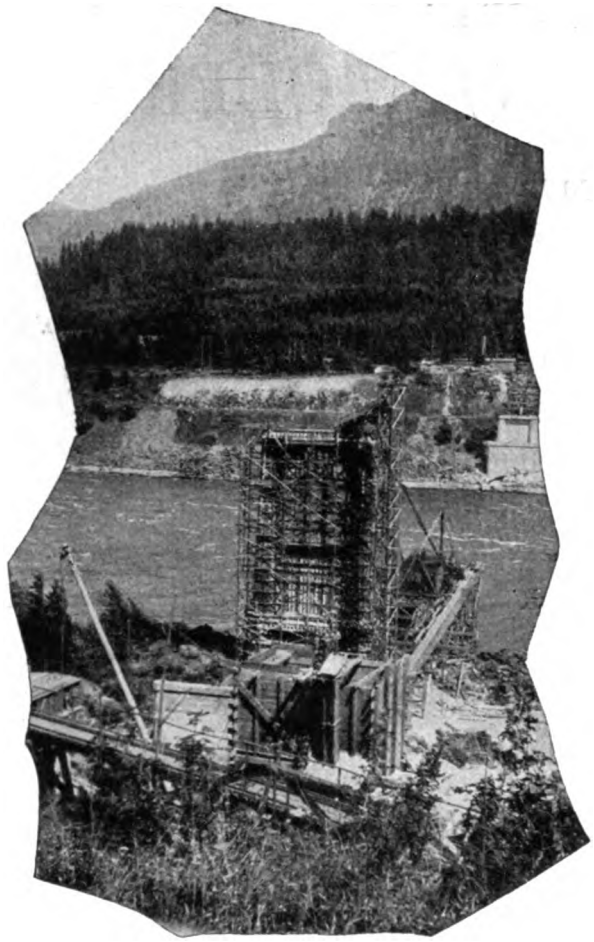
For the analysis of flue gas the tumble switch is thrown into the center position. The gas is sampled by means of a hand aspirator which draws the gas through a small calcium chloride and cotton filter, which when not in use is conveniently held in the cover of the instrument as shown. The instrument is guaranteed to have an accuracy of one-half of one per cent. CO_2, and is contained in a case 6½ x 7½ x 9 inches, weighing 14½ pounds.

A LOOK at past records shows that the grand total of manufacturing activities has recently been at the high point of record. Considering 1919 as 100 and keeping in mind that 1919 was a year of tremendous manufacturing output and business volume, it should be gratifying to know that manufacturing activities for 1926 are setting a mark fully 33 per cent. above the 1919 level. And in this 33 per cent. average gain, there has been absorbed the several losses in individual industries where totals have fallen below 1919.—*La Salle Extension University.*

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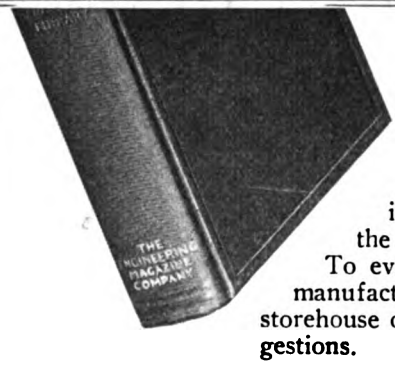
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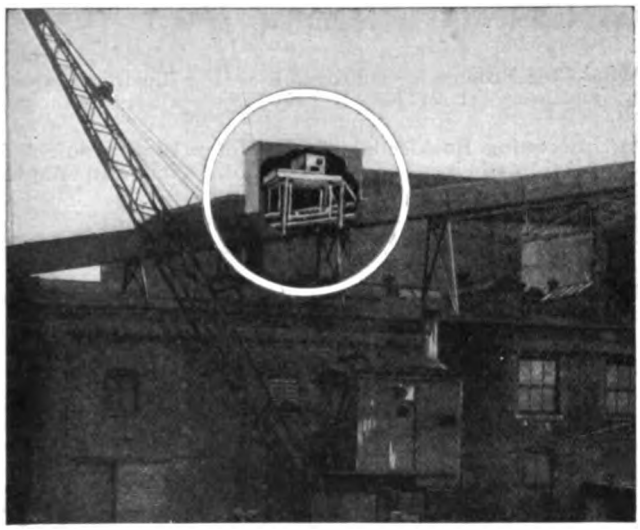
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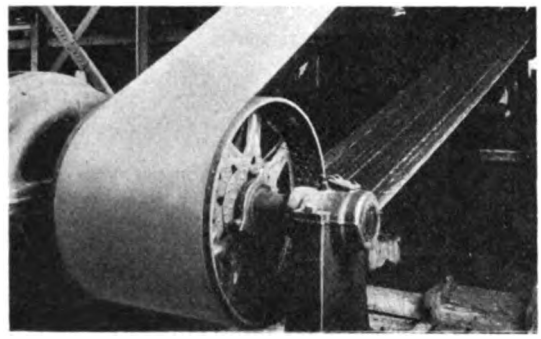
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A 10-day free trial on Thor Electric Drills that cut drilling costs 90%. See page 89. Independent Pneumatic Tool Co.

Tap Drill Chart Cards useful for designers and builders of machinery are being issued by Wisconsin Electric Co. See page 7.

Bulletins Describing a Ball Bearing Motor are offered by The Valley Electric Co. See page 94.

Catalog "E" very interestingly describes an adjustable speed grinder that saves its cost in one year. See page 10. The U. S. Electrical Tool Co.

Information on a Drop Cord System that saves its cost many times in lamp renewals. See page 95. Appleton Electric Co.

A Motor That Is Giving Remarkable Service is illustrated on page 53 by Howells Electric Motors Co.

Descriptive Bulletins on Motors for practically every purpose are offered by Diehl Manufacturing Company. See page 107.

Complete Details can be obtained on a Motor that gives long service. See page 190. Master Electric Company.

The Motor Book describes a new type of motor that prevents shutdowns and has eliminated a great many motor trucks. For a copy, write The Lincoln Elec. Co. Page 59.

More Production through better lighting. See page 38. National Electric Light Association.

Motors Built for Specific Production Requirements. See page 83. The Domestic Electric Company.

Information on Lighting Fixtures, adjustable for any operation, is given in the catalog offered by the American Fixture Co. See page 81.

MAINTENANCE

A Portfolio showing a Number of Blower Fan Tests can be obtained from the New York Blower Company. See page 107.

A Description of an Apron Flight Conveyor that can find a use in every plant. See page 93. The Jeffrey Manufacturing Company.

Descriptive Bulletins on Metal Coating that can be applied right over wet, rusty, oily and hot surfaces. For information see page 58. The Nitrose Company.

A New Chart and a Folder which aid in the selection of the exact liquid window cleaner for every purpose are offered by The Gerson-Stewart Corp. Mfrs. See page 66.

A Sample of a Roller Can that holds liquids, small parts, etc., can be obtained from your dealer or The Witt Cornice Company. See page 52.

Coatings that Cut Down Upkeep on Roofs, Floors and Walls, Choice of samples offered by L. Sonneborn Sons, Inc. See page 73.

A New Book, "Kirk & Blum Blower Systems," shows the possibilities of using air in new ways to cut production costs is offered by The Kirk & Blum Mfg. Co. Page 6.

Information on Scientifically Prepared Coatings for all industrial purposes can be obtained from The Goheen Corporation. See Inside Back Cover.

Brushes for every industrial purpose. Also brooms. See page 11. The Osborn Mfg. Co.

Metal Case Brooms for industrial use. For illustrated booklet and price list see Joseph Lay Co. advertisement on page 51.

An Interesting Booklet and Sample of a Waterproof, Acid, Alkali and Brine resisting Paint. American Asphalt Paint Co. See page 57.

A Catalog, Showing some Valuable Suggestions for Steel Lockers, Bins, Racks and Shelving. See page 58. Durand Steel Locker Co.

A Door Made Especially for Easy Operation and suitable for industrial plants is shown on pages 22-23. Richards-Wilcox Mfg. Co.

Literature on Mechanically Operated Steel Windows for industrial use. Page 3. Truscon Steel Co.

An Illustrated Booklet, "More Light" on the use of factory paint is offered by the U. S. Gutta Percha Paint Co. See page 9.

Catalog No. 23 contains information on valve reseating machines, useful in any power plant and factory. The Leavitt Machine Co., page 70.

A Painting Method that makes the painting of industrial plants an economical and low cost labor saving method. See page 43 The Vortex Manufacturing Co.

A Trial Offer on Factory Chairs, that eliminate fatigue. See page 76. Royal Metal Mfg. Co.

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A New Track Unloader that fits right on to the coal car is described on page 80 by the Chicago Automatic Conveyor Company.

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Industrial Tractors, Trucks and Cranes that save enough on handling costs to charge off the purchase price in six months. See page 99. The Baker-Raulang Co.

A Booklet "Facts for Consideration in Selecting a Storage Battery" is offered by the Electric Storage Battery Co. See page 85.

"Mr. Barber's Famous Scrapbook" contains many and various materials handling layouts. For a copy, see page 31. Barber Greene.

Factory Certified Wire Rope for use as a conveyor cable. See page 97. Williamsport Wire Rope Co.

Conveyor Belting. See page 101. U. S. Rubber Co.

"The Atlas of Mechanical Handling" is a book containing information on overhead carrying systems which applies the railroad principle of two rails. See page 13. The Atlas-Chicago Co.

Fifty Years of Conveyor Service, the record of the Logan Company. Page 1.

Four Different Types and Fifteen Different Models of Tractors are described in Bulletin 106. Other bulletins are offered: A100 showing all purpose Industrial Trailers. A125 and A120 also give complete descriptions of their line of trailers for every industrial requirement See page 36-37. Mercury Manufacturing Company.

The Crane Catalog contains information on cranes that have a record for reliability during the past 35 years. See page 75. Whiting Corporation.

A Practical Book describing an Overhead Monorail System that can be applied to every industry is shown on page 49 by The Louden Machinery Company.

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The "Merrick Catalog" shows how bulk materials can be weighed while conveyor handled. The Merrick-Scale Co. See page 99.

"Snapshots of Sensible Savings" is a book describing various uses of a Tier-Lift Truck. See page 106. Lakewood Engineering Co.

An Illustrated Catalog on Hand Trucks that are steel-bound wherever wooden surfaces must be protected can be obtained from The Fairbanks Company. See page 71.

A Light Weight Substantial and Highly Efficient Electric Hoist that can be used anywhere that a chain block is used. See page 70. Roeper Crane & Hoist Wks., Inc.

POWER PLANT EQUIPMENT AND AUXILIARIES

Catalog and Price Lists on Steam Unions that prevent loss of steam, can be obtained from the E. M. Dart Mfg. Company. See page 109.

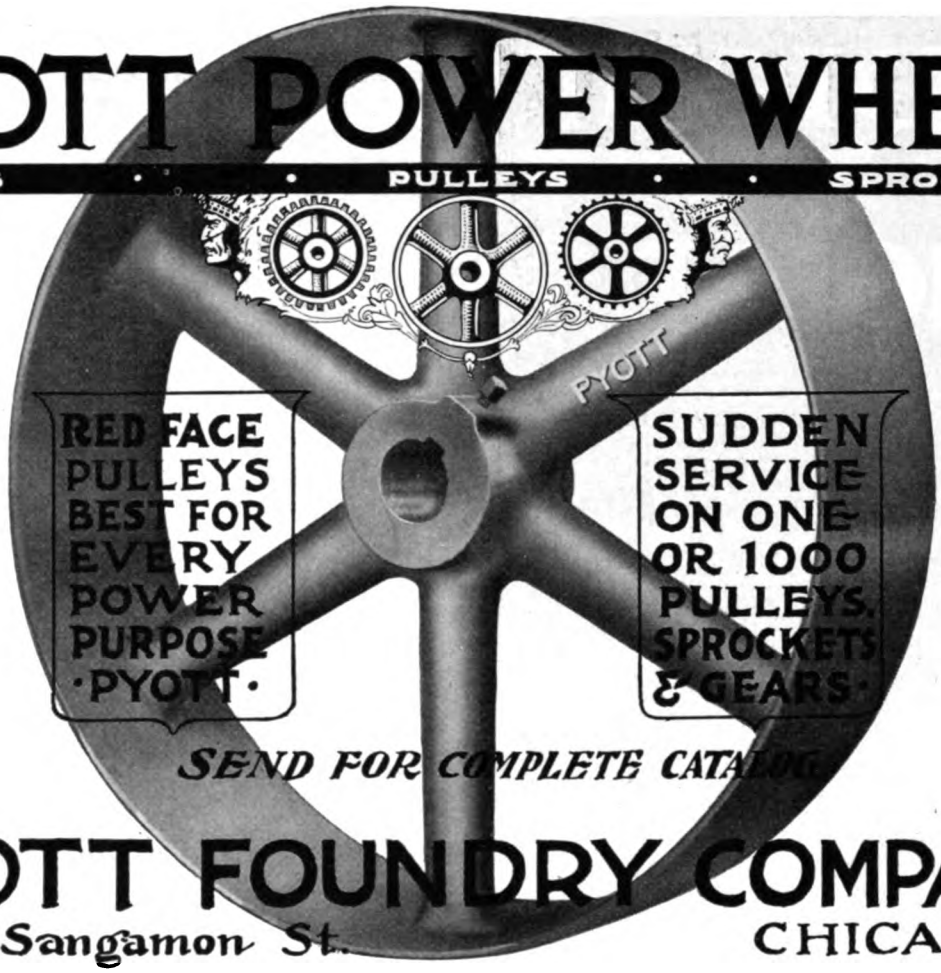
Catalog Describing a Boiler Feed Water Pump Governor can be obtained from the Chaplin-Fulton Mfg. Co. See page 58.

"Shop and Office Temperatures" is the name of catalog which shows power savings of 15 to 48 per cent. in many of

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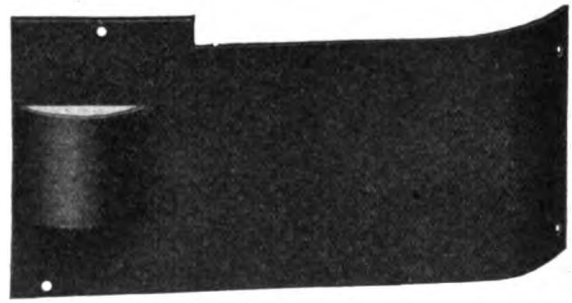
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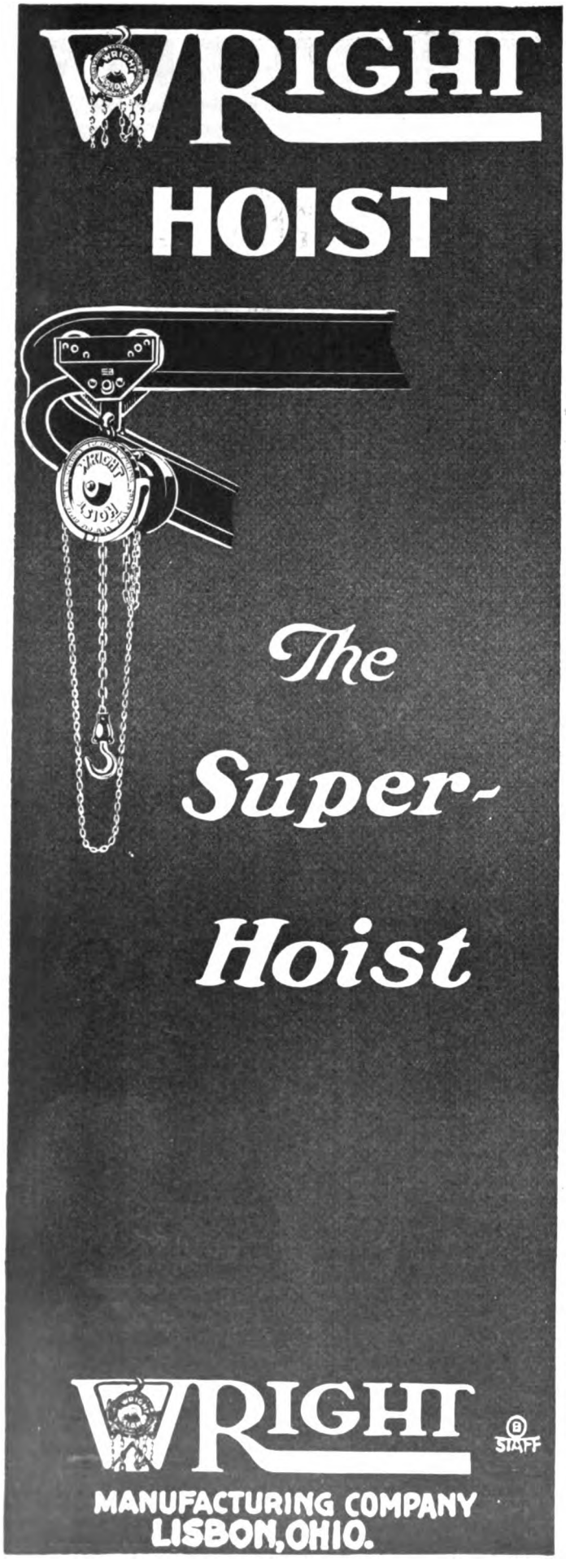
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America's leading firms. For a copy, see page 71. The Powers Regulator Co.

Very Interesting Bulletins on Boiler Room Economies are offered by the Wickes Boiler Co. See page 61.

A Steam Trap on a 90-Day Trial also catalog. Offered by the Armstrong Machine Wks. See page 82.

Free Trial Offer of a Steam Trap that spells fuel economy can be obtained from the Sarco Co., Inc. Also write for booklet R. 268. See page 84.

Bulletins on Jennings Heating Pumps, containing valuable information on heating systems installations. Nash Engineering Co. on page 16.

Mechanical Rubber Goods for Every Power Plant Purpose. See page 101. U. S. Rubber Company.

TOOLS. Shop Tools, Saws, Files, Chucks, etc.

An Interesting File Catalog and Price List can be obtained from the Simonds Saw and Steel Co. See page 48.

An Iron that Resists Rust, Acid, and Corrosion. See page 103. Ludlum Steel Company.

Sample Blades are Offered by Victor Saw Works. See page 61.

A Screw Driver forged in one piece from handle to tip. See page 67. American Saw & Mfg. Co.

Screws in Low Carbon, High Carbon and Nickel Steels. See page 107. The Ferry Cap and Set Screw Co.

Information on Portable and Bench Type Woodworking Machines is offered by Gallmeyer & Livingston Co., page 71.

Chrome Vanadium Wrench Kits for Millwrights, Loom-fixers and other Shop Mechanics. See Bonney Forge and Tool Works. Inside Front Cover.

Drills, Reamers, Cutters, Taps and Dies. See page 63. Morse Twist Drill & Machine Co.

High Speed Drills for high speed production. See page 79. The Cleveland Twist Drill Co.

A Description of a Vise built to stand plenty of rough stuff. See page 68. Prentiss Vise Co.

The Spindle Book, now ready, shows a complete list and information about different classes of machines and their spindle specifications. For a copy see page 77. Jacobs Mfg. Co.

High Speed Drills with forty-five years experience behind them. See page 61. The Standard Tool Company.

Bulletin No. 35 contains a standard clutch chart. For a copy, see page 105. The Conway Clutch Co.

Catalog 57B describes a vise with seven distinct and exclusive features of construction. See page 76. The Charles Parker Company.

Bending Rolls that cut bending costs. See page 60. Buffalo Forge Co.

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Catalog No. 1 describes a flexible shafting that is a great improvement. For a copy as well as a sample, see page 109. Biax Flexible Shafting Co.

Catalog L66 explains a vital necessity for speeding flexibility of transmission drives. Reeves Pulley Co. See page 69.

Medart Catalog No. 43 and Discount Sheet cover dimensions, details and list prices of the entire range of power trans-

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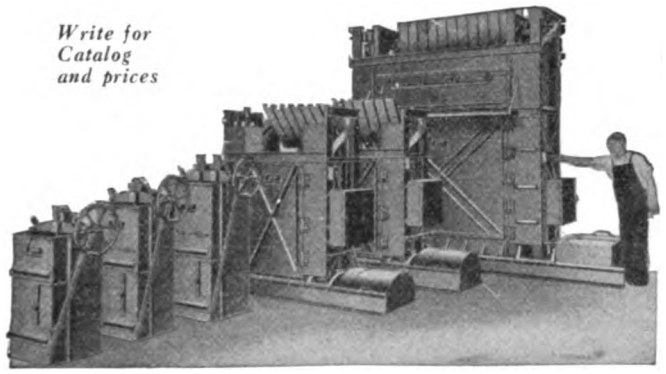
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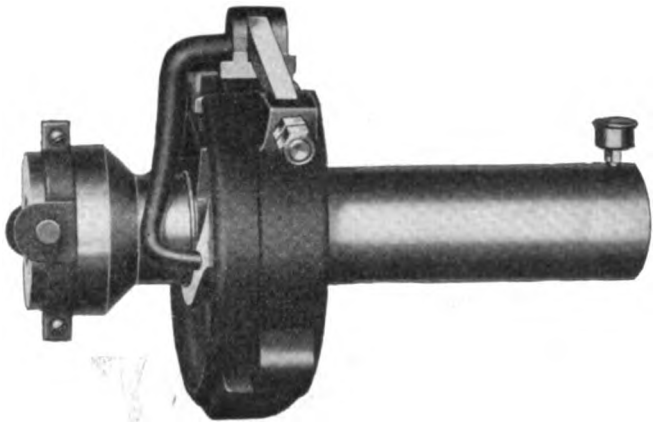
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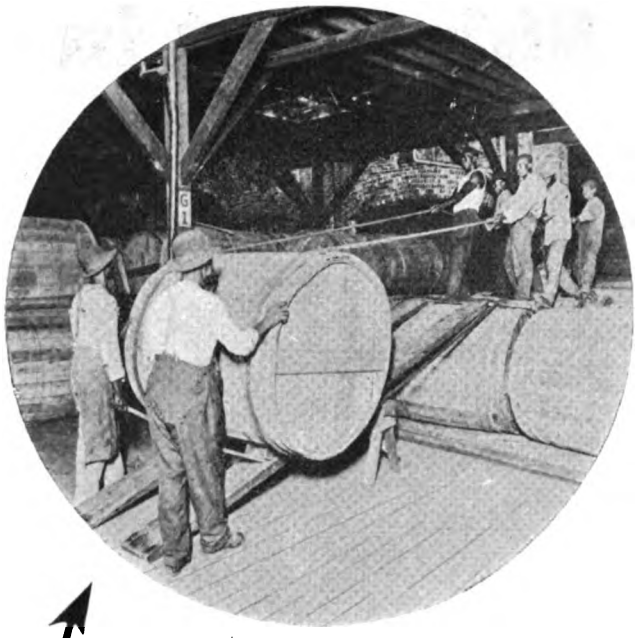
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Literature that Explains the Advantages of Pulleys and Pressed Steel Hangers is offered by the American Pulley Co. See page 62.

Cast Iron Hangers, Pulleys, Flexible Couplings, Clutches etc., are described on page 74. T. B. Wood Sons Co.

Belt Lacers that result in greater transmission efficiency. See page 64-65. Clipper Belt Lacer Co.

A Line shaft Bearing that requires oiling only twice a year is shown on page 4 by S. K. F. Industries.

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A Catalog on Flexible Shafting for tool room, machine shop, pattern shop and foundry. See page 70. N. A. Strand & Co.

MISCELLANEOUS

A New Catalog M-28 gives complete information and data on Blue Printing. C. F. Pease Co. See page 55.

"Clearing The Way For Bigger Business," is the name of a booklet offered by Globe-Wernicke Co., and shows a method of more efficient filing systems. See page 111.

A Weighing Scale that eliminates five operations in the handling of products is shown on page 14 by The Toledo Scale Co.

Ventilating Installation of remarkable character is shown on page 87 by American Blower Co.

Literature Describing a Power Baler that saves waste storage space and is fire-proof is offered by Davenport Mfg. Co. See page 105.

Descriptive Literature on a high temperature waste and refuse furnace is given on page 67 by Goder Incinerator Inc.

Fabricated Sheet Metal Parts. An engineering service offered by The Breese Bros. Co. See page 103.

Agitator Drives for every stirring and mixing purpose. See page 86. New England Tank & Tower Co.

A Booklet Describing Counters for rate setting and production work. See page 54. The Veeder Mfg. Co.

Illustrated Folders on the Hallowell Pressed Steel Bench Legs and Workbenches should interest every industrial executive. See page 91. Standard Pressed Steel Company.

An Economical Means of Cleaning Parts and Products is shown on page 78. Oakite Products, Inc.

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Catalog Describing 275 Styles and sizes of oilers for all types of machinery. Gits Bros. Mfg. Co. Page 80.

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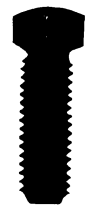
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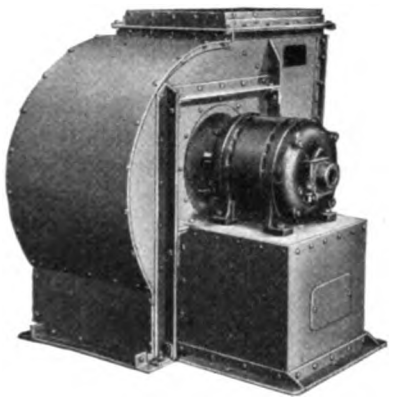
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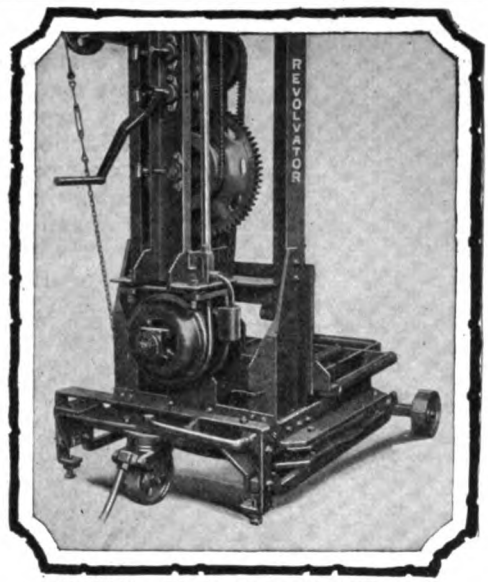
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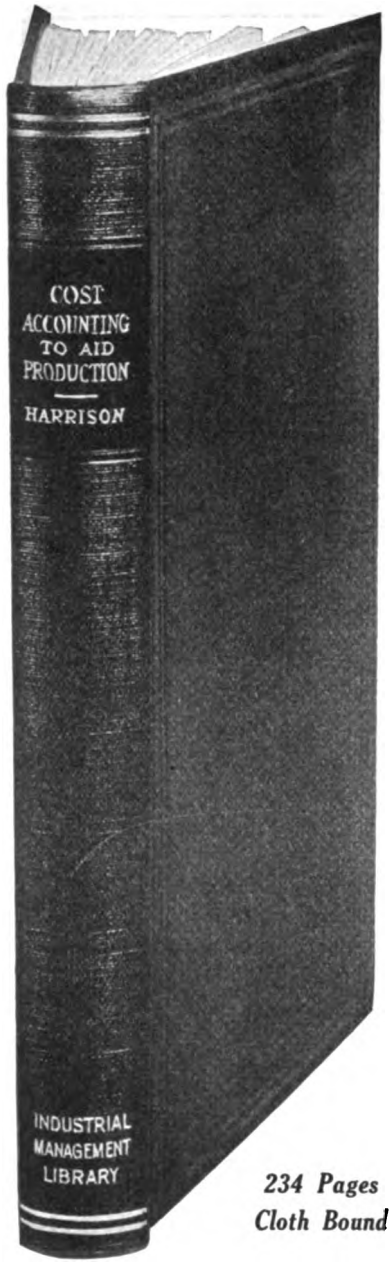
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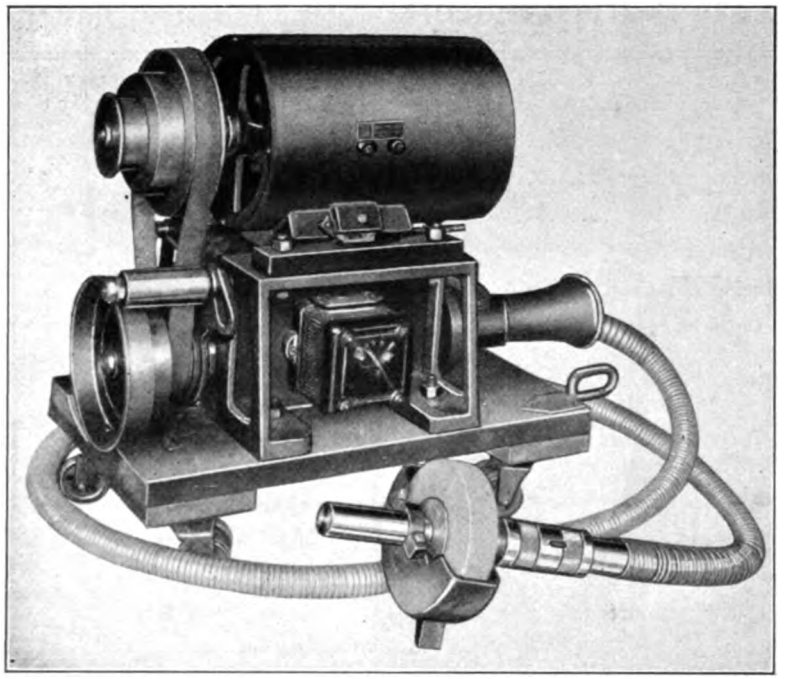
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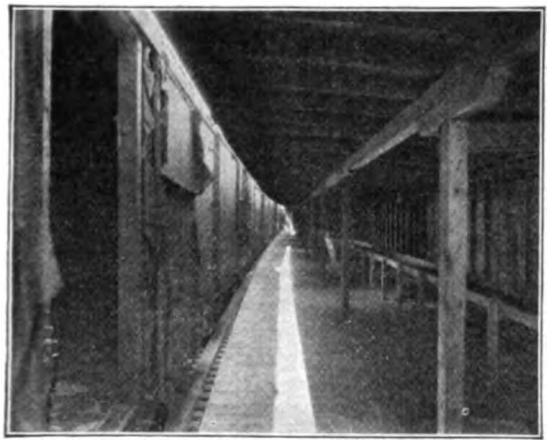
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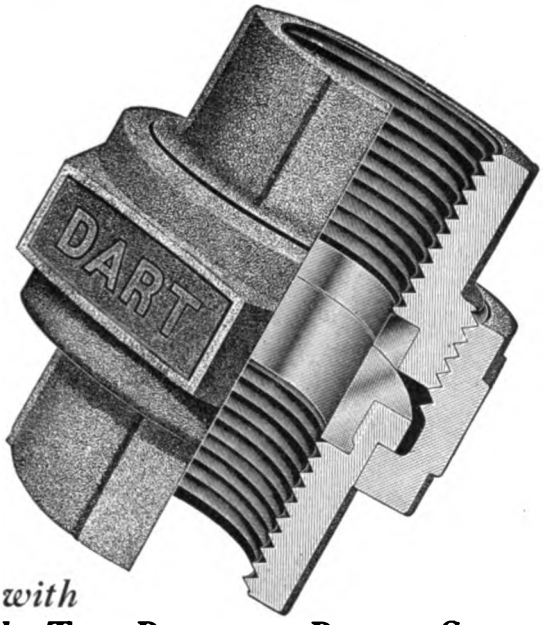
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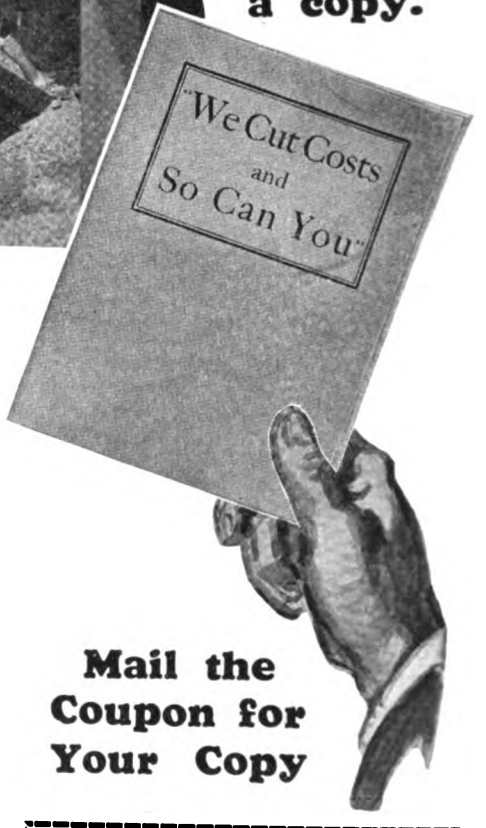
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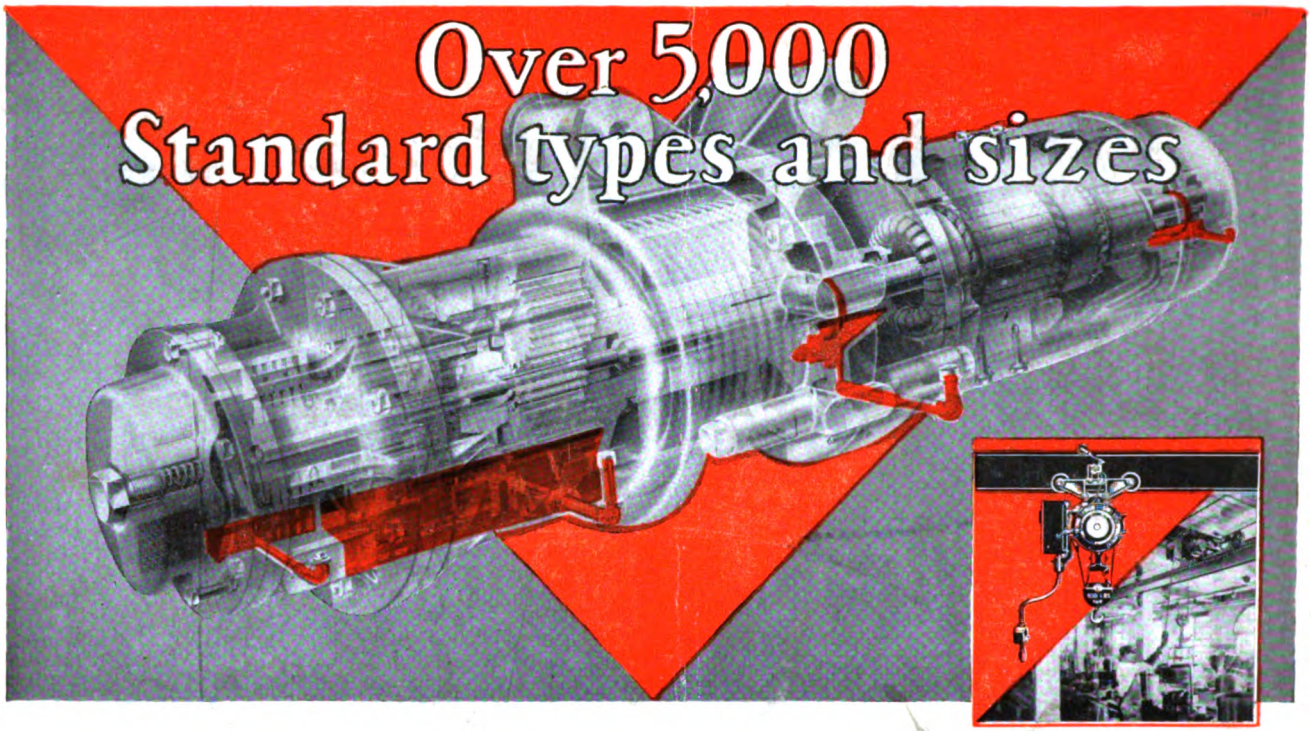
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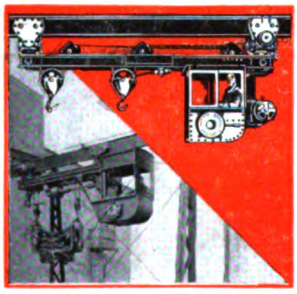
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Experience demonstrates that one type of hoist will not meet every plant condition, that's why we have developed a line comprising over 5000 standard types and sizes of floor and cage operated electric hoists—each a practical unit, proved in service.

There are Shepard Hoists of single and variable speed control for alternating and direct current; hoists for long lifts, short lifts, for cramped quarters and limited clearances, with lug, or hook suspension, and plain, geared, or motor driven trolleys—a hoist for every requirement.

A Shepard Hoist is precisely suited to its job without sacrifice of sound design. **Every hoist has the Shepard Balanced Drive, enclosed unit straight line construction and automatic oil bath lubrication.**

Shepard Hoists are sold to you by competent men, trained in the efficient application of electric hoists. Your purchase is backed by a service-giving organization with a quarter century's electric crane and hoist experience.



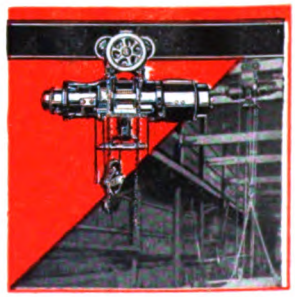
Shepard Form 18, Twin Hook Cage Operated Electric Hoist



Shepard Form 1, Floor Operated Electric Hoist



Shepard Form 25, Cage Operated Electric Hoist (Trailer Cage Type)



Shepard Form 3, Floor Operated Electric Hoist with long winding drum for high lifts



Shepard Form 19-13, Cage Operated Grab Bucket Hoist



Shepard Form 23, Floor Operated Electric Hoist for close clearances

SHEPARD
ELECTRIC CRANES & HOISTS

We have published specific information about Shepard Electric Cranes and Hoists in numerous industries. Write to us regarding any application you have in mind.

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